PP 100010900

VOLUME 41 I NUMBER 1 I MARCH 2018

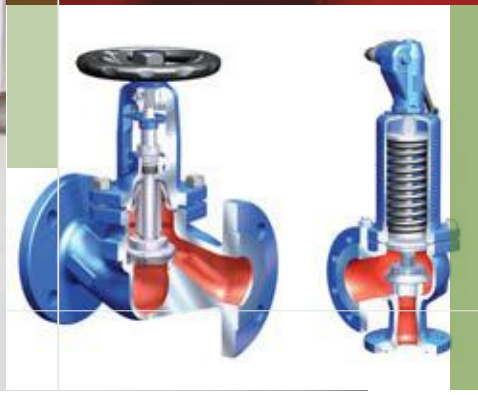
INSTITUTE OF HEALTHCARE ENGINEERING AUSTRALIA

HEALTHCARE FACILITIES

CLIMATE CHANGE ACT 2017 – *Implications for Healthcare*

WATER QUALITY – *Management and Planning*

ST ANDREWS HOSPITAL – *The Co-gen Journey*



RCR Energy for Reliable & Quality Boiler Supply and Service

Over 100 years' history of providing thermal energy products and service. Including design, supply, installation, commissioning, service & upgrades for steam boilers, hot water heaters, thermal oil and heat recovery solutions.

-weishaupt- Burners

- Agent & stockist for market-leading German burner equipment
- Exceptionally high quality for enhanced reliability
- High efficiency and Low emissions
- Digital control systems with integral VSD and O2 trim options.

BOSCH Thermotechnology

Partnership between RCR Energy Service and Bosch provides the benefits of two long-established leaders in their respective fields. The products on offer include:

- Condensing, High-efficiency Heaters (up to 108%)
- Steam and Hot Water Boilers
- Cast Iron Sectional Hot Water Heaters.
- Exceptional quality, performance and reliability when coupled with Weishaupt burners

ARI ARMATUREN Valves

RCR Energy is an agent for ARI, offering their comprehensive range of high quality isolation and control valves, strainers and safety valves. Bellow sealed valves provide maintenance free operation.

Benefits of Partnering with RCR Energy Service

- Over 50 service technicians nationwide, on call 24/7 for Emergency Breakdown & Service
- Audits and upgrades for performance and reliability
- Quality, Health & Safety system accreditation to ISO9001 & AS4801
- Comprehensive training packages
- RCR Tomlinson is publicly listed with substantial financial resources & security. As part of the RCR Infrastructure business, Haden a leading mechanical engineering and air conditioning solutions provider, can also offer additional total whole-of-life service for HVAC, refrigeration and Building Management Systems.

RCR Energy Service

For further information please email energy@rcrtom.com.au or contact:

Victoria	03 9541 8600	Queensland	07 3259 6400
New South Wales	02 9681 4177	Western Australia	08 9455 5511
South Australia	08 8297 9688	Auckland	0800 727 783

CONTENTS

Visit the Institute of Healthcare Engineering online by visiting www.ihea.org.au or scanning here →

ADBOURNE PUBLISHING
18/69 Acacia Road
Ferntree Gully, VIC 3156
PO Box 735, Belgrave, VIC 3160
www.adbourne.com

ADVERTISING

Melbourne:
Neil Muir
T: (03) 9758 1433
F: (03) 9758 1432
E: neil@adbourne.com

Adelaide:
Robert Spowart
T: 0488 390 039
E: robert@adbourne.com

PRODUCTION
Emily Wallis
T: (03) 9758 1436
E: production@adbourne.com

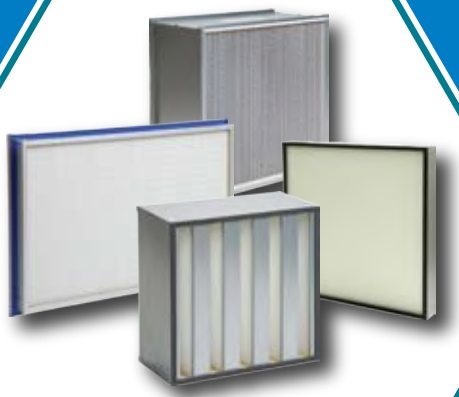
ADMINISTRATION
Tarnia Hiosan
T: (03) 9758 1436
E: admin@adbourne.com

Adbourne PUBLISHING

QUALITY AIR FILTRATION FOR YOUR FACILITY NEEDS

HEPA Housings & Modules

- terminal & inline HEPA housings
- off the shelf and custom designed
- insect screen housing options



Ultra-Clean HEPA / ULPA Filters

- stocked gasket & gel seal filters
- E11, H14, U15 rated to EN1822:2009
- individually tested & certified

NATA

ACCREDITED FOR
TECHNICAL COMPETENCE

On-site NATA Testing Services

- HEPA filter integrity testing
- HEPA validation & certification
- fumigation services

UCV Operating Theatre Ventilation

- high quality, high efficiency
- integrated return air & lighting
- custom engineered solutions

Custom Engineered Solutions

- in house engineering department
- custom designed solutions
- national system design & support

Custom Laminar Flow Systems

Our in house engineering capabilities allow customisation of UCV systems to suit individual requirements

ph: 1300 886 353
www.airepure.com.au

airepure® australia

EDITOR'S MESSAGE

With this edition of "Healthcare Facilities" we share some international experiences from the UK and a particularly interesting story from John Clynes of New Zealand about the Africa Mercy ships.

We take an in depth look at the implications for the Healthcare Sector, particularly from a Victorian perspective, of the Climate Change Act 2017. Healthcare services are being impacted by changing climate, but these services are also a contributor to the various causes of climate change – which creates an additional challenge for government agencies committed to improving the response to changing climate, whilst on the other hand, potentially impacting it with increased demand for services. The healthcare engineering professional will need to be engaged with the strategies and targets proposed.

We also take another look at compliance – or rather the risk of non-compliance, and the potential for hospital acquired infections (HAIs) as a result of non-compliance. We all know that hospitals are supposed to be safe, and promote improved healthcare, however it is also recognised that achieving compliance has a direct connection with patient outcomes. Systems are usually developed and implemented to manage a risk, or prevent an adverse outcome, or to promote a positive outcome – it doesn't matter which way you spin it – we want better outcomes, and quality systems help us do that.

Compliance however is another matter – keeping systems on track, and making sure they are being utilised as planned is a bigger issue, and that is likely the stuff that will keep healthcare engineers and managers awake at night. One of our feature articles explores in depth a study undertaken around infection control strategies and the challenges of changing behaviours and achieving compliance with a system of safety.

There is a great follow-up article on who is responsible for the regulation of various components of our healthcare system.

The articles herein are largely taken from the Australian National Conference of the IHEA from October 2017 and are a sample of the relevant and useful material that our Conferences share with members. Planning is well underway to produce an exciting conference program for the upcoming IHEA National Conference in conjunction with the IFHE Congress being held in Brisbane in October this year. See inside or our website (www.ihea.org.au) for more information. Registrations are now open and we look forward to sharing the Conference program with you shortly.

Regards
Darryl Pitcher

NATIONAL PRESIDENT'S MESSAGE

The Board has been very active during the first quarter of the new year with a number of key activities being undertaken prior to the first Board meeting of 2018.

As a not-for-profit (NFP) organisation the Directors of the IHEA play a critical part in ensuring that the organisation identifies, aligns and manages strategies to achieve our outcomes. Not only do the Directors give up their time they also bring a wide range of knowledge, skills and experience to ensure that the Board continues to meet its responsibility to the overall governance, management and strategic direction of the organisation.

One of the most important positions within the organisation is the role of Treasurer. While the Treasurer has a responsibility to ensure that the fiscal aspects of the organisation are managed and maintained, the role also has a responsibility to ensure that Directors and State Treasurers have an understanding and awareness in all financial matters, and apply and adhere to financial policies and procedures at all times.

Prior to February's Board meeting, State Treasurers and Directors undertook a training and awareness session on the organisations governance and application of financial processes. An online assessment tool was launched at this time, allowing future training for all office holders on the IHEA financial processes to be conducted annually, without the need to incur additional travel and accommodation expenses.

To ensure that the Board continues to operate in an effective and efficient manner whilst maintaining strong governance, a self-assessment was undertaken involving an external Management Consultancy, which focused on various aspects of the Boards operational functions, including:

- To assess Directors expectations as to the Chair's
  - o commitment, skills and experience,
  - o relationship between the Chair and the CEO and;
  - o the extent to which a Chair should fulfil a strong leadership role for the Board.
- To evaluate the Boards performance during 2016/17 in a number of areas including
  - o progress against strategic targets,
  - o effective working relationships with the CEO,
  - o positive relationships with stakeholders,
  - o identification and management of risk,
  - o sound and timely decision making and;
  - o how well the Board functions as a high-performance team.
- To determine the level of capability the Board requires, and for Directors to individually assess their own competence in areas necessary for a Board to function effectively and appropriately including;

- o Legal
- o Financial
- o Information Technology
- o Public Policy
- o Ethics and Privacy
- o Health Facilities
- o Strategy
- o Networking
- o Directors Roles and Responsibilities
- o Governance
- o Government Relations
- o Communication Skills
- o Emotional Intelligence
- o Decision Making

On completion of a questionnaire, followed by a one-on-one interview between each Director and a Management Consultant, an unbiased, in-depth appraisal on the effectiveness of the Board was delivered.

Based on the findings, a number of recommendations were put forward by the Management Consultants. These were discussed at length during a workshop session from which a number of initiatives were agreed to underpin and build on the strengths and functionality of the Board.

It is very encouraging to note that the Managing Consultants summary stated "In our experience, the IHEA Board performs its governance role very well, particularly given the voluntary nature of its directorship, the generous personal time commitment that Directors give, and the dispersed membership spread geographically across Australia. Like all Boards it has challenges but it is open to discuss these. The Board displays a high level of respect for its Directors.

For a Not for Profit Board it has a good diversity of talent and skill set and it is evident that it strives for improvement in all facets of its operations and wants to keep abreast of best practice. There is much goodwill amongst its Directors and strong relationships with the very capable CEO."

I look forward to continuing to work together with the Directors and CEO, to achieve the outcomes defined in our Strategic Plan.

Peter Easson

IHEA National President

BOC
A Member of The Linde Group

Qi Medical Gas Services

Preventive Maintenance.
Compliance, safety, reliability and efficiency.

With over 60 years experience providing gas solutions and support, BOC's Qi Maintenance program's dedicated resources are backed by the technical expertise and professional standards that the hospital environment demands.

With our broad Qi Medical Gas Services portfolio, BOC can help you meet the considerable challenges of compliance and safety in today's healthcare environment.

The development and maintenance of a hospital's medical gas system is Qi. Ask us how we can help you manage your servicing needs with a tailored servicing and repair plan for best practice preventive maintenance.

For more information
call us on **1300 363 109**,
email **hospital.care@boc.com**
or visit **www.bochealthcare.com.au**

Qi Risk

Hazard identification and compliance auditing.

In-depth inspection of your medical gas supply system ensuring it complies with international standards.

Qi Preventive Maintenance

A proactive approach.

Preventive and responsive maintenance services for medical gas installations, ensuring your gas equipment and pipelines deliver the performance, safety and reliability as originally intended.

Qi Engineering

One-stop design and engineering service.

Covering calculations of flow rates, pipe sizing, plant sizing, manifold and cylinder storeroom sizing, ward-based storage and recommendations for vessel positioning and cylinder store locations.

Qi Tracking

Reliable way to manage and optimise your cylinder assets.

With you, on-site, every step of the way for cylinder management.

BOC: Living healthcare

CEO'S MESSAGE

The National Board of IHEA spent two days in Adelaide on February 15 and 16. This incredibly valuable time together included the regular quarterly board meeting along with training for our Branch Treasurers, a review by an external expert on the performance of Directors and the board as a whole and importantly a review of progress to date on our current Strategic Plan. I am pleased to report that all of the performance indicators have either been completed or have had significant progress made with completion due throughout 2018.

In February 2019 when the board meets again for its annual two days of review, the current strategic plan will be evaluated and a new three-year plan constructed. It is timely therefore that progress on the plan to date be shared with you all. The plan below is available to members on our website, however for your information this version includes a progress summary. The Board and I believe it is critical to share this with you as part of transparency in the work of the Board and my role as CEO.

IHEA – STRATEGIC PLAN 2016-2018 – UPDATED FEB 2018

Vision IHEA is the recognised peak professional body for health engineers and facilities management, designing and delivering relevant professional development, providing a sound and accessible knowledge base and connecting professionals within the field for advancement of knowledge and skills.

Strategic objectives, strategic priorities and high level performance indicators

Karen Taylor – CEO

Strategic objectives	Strategic priorities	Performance indicators	Progress
1. Build and maintain membership base	- Engagement of younger members - Increase member numbers - Increase member benefits and value of membership - Broaden membership grades	- Marketing plan and strategy developed - Website reviewed and updated - Communication strategy developed - Review membership offerings - Rule/regulation book completed	Significant progress made in this area including new website launched, rule book completed that sits alongside and supports new constitution and membership offering review in progress.
2. Enhance and increase education and training offerings	- Structured National professional development program - Strategic review of CHCFM in conjunction with possible partnership	- PD program established - Investigate short courses available for members - Decision on future direction of CHCFM	Some progress made with a complete review planned for 2018. New CPD program to be launched in 2018.
3. Provide sound organisational governance	- Compliant organisation - Consistent across State and National activities - Directors trained in best practice governance	- Maintain an endorsed and current suite of documents including policies and procedures - All office bearers have clearly defined and understood roles and responsibilities - Director performance reviewed annually	Excellent progress with all performance indicators completed. Ongoing annual monitoring, reviewing and updating program in place to ensure the excellent standard is maintained.
4. Improved use of technology	- Increased appropriate use of technology	- Improved communication with members - Effective and efficient storage of all documents and records - Develop social media strategy	Significant progress with monthly e-Bulletin, reviewed and refreshed journal, structured use of Google Drive for storage. Social Media strategy agreed and due to be implemented over the next few months.
5. Build and maintain strategic partnerships	- Increase recognition for IHEA - Enable increased member benefits	- Strategic review of Assetmark - Strategic partnerships developed and implemented	Some progress made including meeting with Federal Health Minister's Chief of Staff, increased participation in Standards Reviews, partnership developed with FMA providing increased customer service and member benefits.

No progress In progress Completed

WA BRANCH REPORT

Sundowner Function Dec 2017, Generous Squire

Members headed into the city to attend the last official function of the year and enjoyed good company, good food and a few festivities at The Generous Squire rooftop bar in Perth CBD. Mr Alex Foster was presented his 10 year membership certificate by WA President Greg Truscott. Greg also reviewed the activities and milestones of the year and thanked everyone for their support and wished all a very happy festive season.

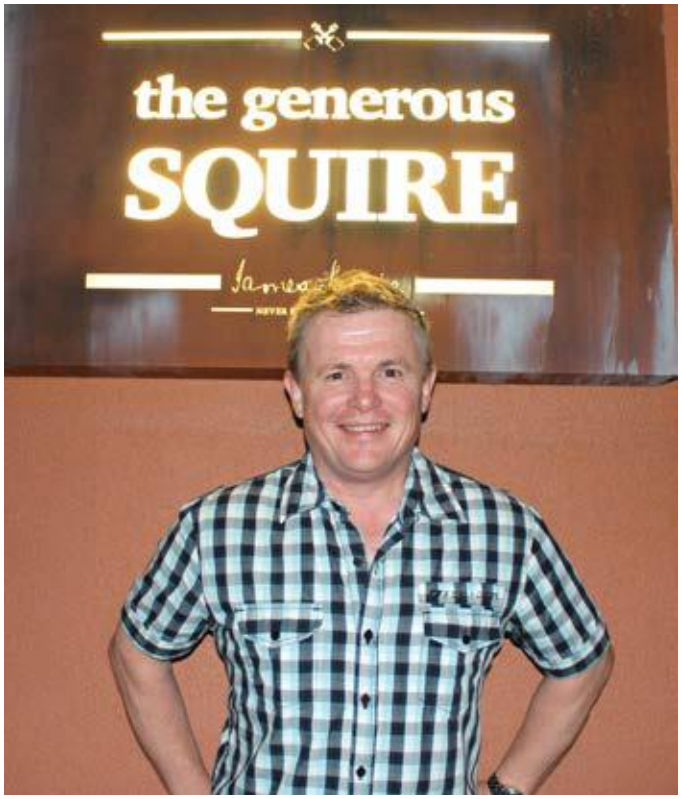
Alex Foster being presented his 10 Year IHEA Membership Certificate

End-of-year sundowner celebrations

Gillian, Colin, Neil, Mark & Gillian

Alex, Colin and Andrew compare matching shirts

Rob, the generous squire



Scott, Sandy and Clayton

Branch Meeting February 2018, BOC Gas

The first of two Professional Development meetings on Medical Gases was hosted by Stuart Main, the Facility Manager for BOC Gas located at Canning Vale, who also welcomed the 23 members in attendance. Stuart gave an in-depth talk on the range of services BOC offer various industries, including the medical sector and the high level of safety and internal checks routinely observed during their daily operation, as the facility is also classed as a major hazard facility by the local council.

Stuart Main presenting during the professional development session

Medical Oxygen cylinders ready for dispatch

The contents of all BOC medical gas cylinders appear on the label affixed to the cylinder shoulder, body or collar. The cylinder necks are also colour coded and fitted with different valve outlets to provide product differentiation to eliminate incorrect use for patients. Each cylinder also has a unique barcode to aid both identification and advanced tracking to and from their clients.

Management of medical gases is a critical function of any healthcare engineering department, so it was timely and beneficial to be able to consider this together with the WA members of the IHEA. We recommend all available members consider attending the future professional development seminars to stay abreast of changes and improvements in technology and standards. We will keep you posted through our regular bulletins and emails.

Greg Truscott

WA Branch President

VIC/TAS BRANCH REPORT

Activities

Professional Development No 4 was held on Friday 24 November 2017

The branch in conjunction with the Department of Health held a joint workshop focusing on practical health energy / environmental strategies. There were 20 attendees, including consultants who will document the agreed outcomes for the Department of Health. Special thanks to Steve Jones, for coordinating the day.

Following PD 4 the branch held its annual Christmas function at the Rising Sun Hotel, South Melbourne, 19 members and partners attended, enjoyed a great night which included a spectacular lightning show from the storm! Membership certificates were issued to Kevin Moon, Honorary Fellow and Lyndon Smith, Honorary Member. Kevin's long time contribution to the IHEA in Victoria and nationally is well known and was recognized by the awarding of this position. Lyndon has played an important role as the former IHEA accountant and business and governance adviser, and continues to support the IHEA in a less formal but important way.

Kevin Moon (Honorary Fellow)

Lynden Smith (Honorary Member)

Below: Members enjoying the annual Christmas function at the Rising Sun Hotel, South Melbourne

The Committee of Management will explore options for a Saturday lunch for the 2018 Christmas function in an effort to entice more members to attend, especially retired members.

Membership

Follow up with outstanding members has continued to reconnect members to the branch activities. The Committee of Management has commenced organizing the branch professional development calendar for 2018.

Actions

Professional Development event 1 for 2018 will be held late March (keep an eye out for details shortly). The feasibility of holding a meeting in Tasmania is also being considered either later this year or early 2019.

Committee of Management

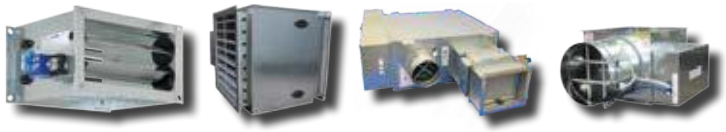
Branch President	**Michael McCambridge**	michael.mccambridge@mh.org.au
Branch Secretary	**Peter Crammond**	peter.crammond@whcg.org.au
Branch Treasurer	**Steve Ball**	steve.ball@epworth.org.au
CoM	**Howard Bulmer**	howardjbulmer@gmail.com
CoM	**Sujee Panagoda**	sujee.panagoda@monashhealth.org
CoM	**Simon Roberts**	wavenhoe@labyrinth.net.au
CoM	**Mark Hooper**	mhooper@erh.org.au
CoM	**Roderick Woodford**	rwoodford@castlemainehealth.org.au
National Board Reps	**Michael McCambridge** **Mark Hooper**	michael.mccambridge@mh.org.au mhooper@erh.org.au

Michael McCambridge – *VIC/TAS Branch President*

TOTAL SOLUTIONS FOR EVERY HOSPITAL DESIGN APPLICATION

■ Grills & slot diffusers

■ Variable volume control

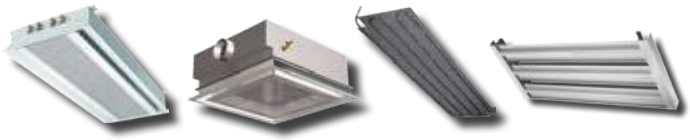


■ Ceiling & swirl diffusers

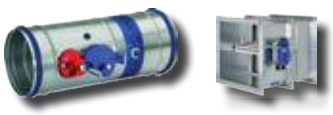
■ Constant volume control

■ Jet nozzles

■ Chilled beams & ceilings



■ Fire dampers



■ Hepa filters & casings

TROX® TECHNIK
The art of handling air

TROX Australia Pty Ltd
Level 32, 101 Miller street
North Sydney 2060, NSW
Tel: Sydney (+61) 2 8923 2551
www.troxaustralia.com

QLD BRANCH REPORT

Another exciting year is being planned by the Queensland Branch of the IHEA – 2018 will be another big year for our branch as we plan for four professional development seminars and our country meeting. The IHEA will also be hosting the International Federation of Hospital Engineering bi-annual Congress in Brisbane in October, so we are looking forward to an engaging time with members and supporters in preparation for and during this great Conference.

I would like to acknowledge the continued support of the QLD Branch Committee of Management, in planning and delivering the program of activities.

Our last Professional Development Seminar for 2017 was held at the Pineapple Hotel on the theme of Data Centre Security and Critical Power Supplies. It was held on December 14th and incorporated our annual branch Christmas function and it was enjoyed by all in attendance. The afternoon included a discussion on the concepts of backup power supply to enterprise data centres, the pros, cons and pitfalls of installation. It also included some useful information in relation to new standards for compliance of UPS and DC power systems used in data centres. It was exciting to see a full house at the and great to have e-Health staff representation from the Royal Brisbane Women's Hospital and Queensland Health State Data Centre Services

My congratulations and many thanks to the Staff and Management of the Pineapple Hotel for the provision of excellent meeting facilities and their continued support.

The Professional Development seminar included the following speakers and topics:

Kirk Wetherell and Tony Pantano from Vertiv
"Overview of mission critical applications that support patient information systems."

There is an intricate ecosystem of technologies that support life critical system, starting from connectivity, to the servers crunching data to support the mission-critical applications that capture customer information for future use in the main data centre or the cloud. Every point in this chain of processes can potentially be a point of failure. Therefore, it is important that in-patient information systems data is secure and has enterprise-grade availability and reliability from the core to the network end-users.

Nick Quinnell, Director for cyber security services at Queensland Health

The presentation discussed the convergence of traditionally separate networks, such as building environmental management systems, SCADA and information technology systems and it therefore demands that cyber security is considered at the forefront of any planning and delivery. This presentation explored the convergence, cyber security risks and what Queensland Health is doing to address this issue.

The QLD Branch Committee of Management meets monthly and has a busy 2018 calendar planned. The focus is to provide members with networking opportunities through social events, Professional Development opportunities and relevant learning at our conferences and seminars. We welcome any members interested to be involved with the committee as all hands are needed to meet the objectives of the IHEA within QLD throughout 2018.

In lieu of our annual trip to Toowoomba, traditionally held around this time of the year the committee decided to reschedule this activity as a planned Country Meeting Seminar on 21st June 2018 at allocation to be confirmed on the Sunshine Coast.

We look forward to your support and attendance and will advise further details as planning progresses.

A reminder that the National Conference will also be the International Congress of IFHE and will be held in Brisbane from October 6th- 10th. We look forward to turning on a great "Brissie welcome" to all of the visiting delegates and their partners.

Scott Wells
President, QLD Branch

NSW/ACT REPORT

Activities

Planning for the 2018 NSW State Special Meeting to be held in Wollongong on the 23rd and 24th March 2018 at the Sage Hotel is almost complete. An exciting event program is now finalised together with an interesting mix of vendors providing a trade display of new technologies and equipment for our members and other attendees.

Sage Hotel Wollongong, venue for upcoming NSW/ACT Branch Special Meeting

Membership

Membership interest from both industry groups and health facility management practitioners is increasing and it has been great to see some new corporate members joining recently. The NSW Branch Committee of Management will be discussing strategies on an ongoing basis how to ensure that this growth continues.

Listing of the NSW State Branch Committee of Management

Name	Position	Phone	Email
Jon Gowdy	President	0411 040 834	Jon.Gowdy@health.nsw.gov.au
Robin Arian	Vice President	0423 170 114	Rob.arian@sswahs.nsw.gov.au
Mal Allen	Treasurer	0467 761 867	mal.allen@hnehealth.nsw.gov.au
Darren Green	Secretary	0418 238 062	darren.green@health.nsw.gov.au
John Miles	CoM	0408 403 025	John.miles@health.nsw.gov.au
Peter Allen	CoM	0408 869 953	peter.allen@hnehealth.nsw.gov.au
Jason Swingler	CoM	0423 299 221	Jason.swingler@health.nsw.gov.au
Marcus Stalker	CoM	0409 157 870	Marcus.stalker@health.nsw.gov.au
Brett Petherbridge	CoM	0418 683 559	brett.petherbridge@act.gov.au
Peter Lloyd	CoM	0428 699 112	peter.lloyd2@health.nsw.gov.au
Greg Allen	CoM	0467 711 715	Greg.allen@swsahs.nsw.gov.au
Ashwin Singh	CoM	0459 896 171	Ashwin.singh@swsahs.nsw.gov.au
Chris Tarbuck	CoM	02 6244 3186	Chris.tarbuck@act.gov.au

Actions

The NSW/ACT Branch congratulates Brett Evans on his 30th anniversary as an IHEA member, Brett is currently the Capital Works Manager at Hunter New England Local Health District and is very well respected within this demanding role.

Brett Evans receiving his 30 year certificate from Hunter New England Health Chief Executive, Michael DiRienzo

Brett joined as a Member on the 28th August 1986. The following year Brett was nominated by the National Board to represent IHEA under the Australian/New Zealand Exchange program (ANZEX) as a Delegate to the 1987 Conference of the New Zealand Institute of Healthcare Engineering Conference held in Auckland.

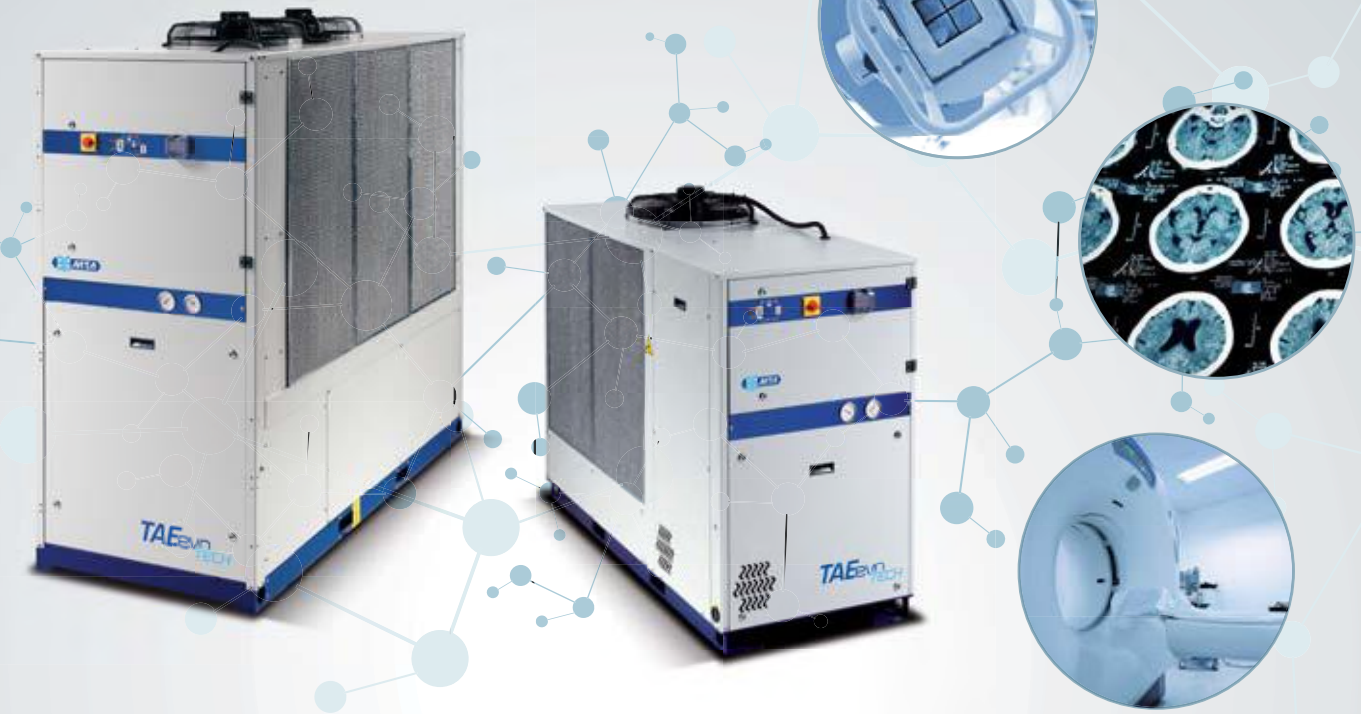
As an active member of the IHEA, Brett has held a variety of leadership positions including serving as NSW/ACT Branch Secretary and President as well as being appointed to the IHEA National Board of for several years.

Jon Gowdy – NSW State President

Director Engineering Services SLHD MIHEA

TAEevo TECH HE

MTA's high-efficiency cooling solution for medical technology.



Precision cooling systems developed by MTA have become well known within modern medical facilities. Applications typically involve cooling MRI, LINAC and PET machines.

Advantages such as consistent operating safety and optimal chilled temperature precision make our units highly suitable for equipment that require constant and precise low internal temperatures, in order to ensure optimal image quality and for safety reasons. This applies, for example, to computed and magnetic resonance tomography, as well as lithotripsy, medical laser and X-ray technology applications.

TAEevo Tech air-cooled chillers range perfectly fits these types of applications, ensuring high operation levels and offering a tried and tested solution that has received worldwide acclaim. The innovative evaporator-intank configuration guarantees reduced ambient heat gain and a steady temperature of the process fluids. The use of components sourced from premium manufacturers and extensive factory testing of all units make for highest reliability levels, minimizing the risks of unplanned stoppages. Also available in the **High Efficiency version**, TAEevo Tech HE ensures EER energy efficiency levels at the top of the **class A category**.

MTA Australasia Pty Ltd
4 / 12–14 Apollo Drive | Hallam, VIC 3804
Tel. +61 1300 304 177 | E-mail: sales@mta-au.com
www.mta-au.com

MTA®

Cooling, conditioning, purifying.

SA BRANCH REPORT

Activities

Since my last report, the Branch has hosted a Christmas networking function for members and their partners. The event was held at the Goodwood Park Hotel on December 15th and was well attended and enjoyed by all. In addition to SA Branch Committee of Management and members, it was particularly pleasing to see a number of new members (Zita Pelling, Michael Scerri and Ross Jones) attend and mix with their fellow members.

Professional Development (PD) and other events were on hold during the quieter Christmas – New Year period but planning has continued towards a number of future events. This includes a planned visit to the new Rescue Retrieval Aviation Service (RRAS, formerly known as Medstar) base at the Adelaide Airport - scheduled for May this year. It is hoped that a concurrent visit to the adjacent Royal Flying Doctor Service base can be included in the event. This should be an interesting event, exposing members to yet another part of the healthcare infrastructure in South Australia.

A number of PD events are under consideration for later in the year. Given the topicality of power outages in SA, and particularly impacts within healthcare organisations, a presentation on back-up power generation and diesel fuel management practices is expected to be of interest to many members. It is hoped that further visits to major hospital sites who have been involved in significant capital / redevelopment projects can be arranged for later in the year.

Joint planning with CIBSE and affiliated membership groups operating within the engineering services field has continued. Events promoted to SA members have included:

- Presentation on the changing electricity supply infrastructure within SA and the impact of the Finkel Plan on the electricity market.
- Planning for Emergency Response in a high rise environment.
- Energy efficiency in a student accommodation building.
- An upcoming visit in March to the University of SA's new Health Innovation Building should be of particular interest to IHEA members.

We have provided members the opportunity to participate in a number of useful seminars and other developmental events provided by others from outside the IHEA / CIBSE sphere such as a webinar on "Healthcare Facility Water Safety Plans".

As part of our efforts to create relationships with the SA branches of similar membership organisations, in November, I attended a business networking event arranged by the SA State Committee of FMA. This was a useful opportunity to make contacts with FMA, FM practioners and suppliers to the FM industry and I am hopeful that this will create membership and professional development opportunities for IHEA locally.

Membership

After gaining a number of new SA members over the course of 2017, new membership enquiries slowed down in recent months. Membership activities at both the local and national level have focussed on following up past members who have not renewed for 2017/18. I am pleased to welcome back SA Health Infrastructure, Hieu Pham from Lyell McEwin Hospital and the Building Management Facilities Services group. Action is continuing to follow up a number of other lapsed memberships.

Administration

The current SA Committee of Management is outlined below:

State President:	Peter Footner
Vice President:	John Jenner
Secretary:	John Jenner
Treasurer:	Peter Footner
National Board Nominee:	Peter Footner
National Board Proxy:	John Jenner
Committee Members:	Darryl Pitcher
	Tony Edmunds
	Vince Russo

SA members are encouraged to contact CoM members with any questions about branch activities, suggestions about any membership or professional development initiatives or any other IHEA matter. Anyone who wishes to more actively contribute to Branch activities is welcome to support the SA Branch Committee. The State Special Meeting to finalise the committee structure is likely to be held in June but contributions are welcome at any time.

The Committee continues to meet on a monthly basis to plan PD and other events, to review/ pursue membership matters, to take briefings on developments / activities at the national level, to review the finances of the Branch and to support the SA Branch. As President, I participate in regular monthly meetings with our CIBSE allies to jointly plan PD events across all participating organisations.

Peter Footner
President, SA Branch

THE IMPLICATIONS OF THE CLIMATE CHANGE ACT 2017 ON THE HEALTH SECTOR

By Tiernan Humphrys, Manager Environmental Sustainability,
Victorian Health and Human Services Building Authority[1,2]

The Victorian Department of Health and Human Services aspires for all Victorians to be healthy, safe and able to lead a life they value by delivering policies, programs and services that support and enhance the health and wellbeing of all Victorians. Science points to significant adverse public health impacts caused, or exacerbated, by climate change. Direct impacts include changed distribution of water and vector-borne disease, heat stress and other impacts of extreme weather. Indirect impacts are increased unemployment, increased demand for health services, degradation of the urban environment, and other impacts on the social determinants of health and wellbeing.

Climate change therefore is not only affecting the health system but the health system is also a contributor to climate change through the delivery of health services through hospitals and ambulance stations. In late 2016, the Victorian Government delivered the Victorian Climate Change Framework, which details the legislative, policy and program agenda for climate change mitigation and adaptation. This paper is primarily concerned with the mitigation of carbon emissions from stationary energy from health infrastructure and services.

The *Climate Change Act 2017* (the Act) is the principal legislation addressing the government response to climate change. Under the Act, starting from 2020, the department is required to prepare an adaptation action plan and emissions reduction plan for the health and human services system every five years. The plans will detail how the department will address climate change risks to the health and human services system.

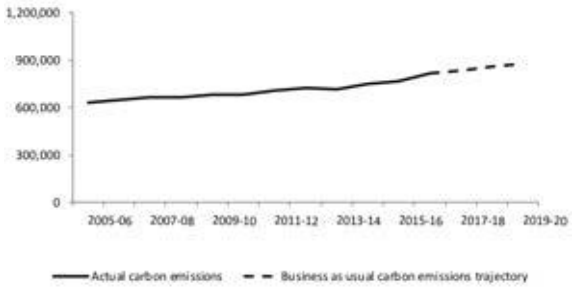
The Act sets a long term emissions reduction target for Victoria to have net zero carbon emissions by 2050 and the Government has adopted interim targets of a reduction in carbon emission of 15 to 20 per cent by 2020 based on 2005 levels. The Act requires the Minister for Environment and Climate Change to make a pledge no later than 1 August 2020 on how government operations will contribute to the State's emission reduction targets.

The pledge must include a description of actions to be undertaken over the next 5 years that are reasonably expected to contribute to the reduction of greenhouse gas emissions caused by government operations and activities and a reasonable estimate of the total level of greenhouse gas emissions reductions. Similarly, sector emission reduction pledges are also required, including the health and human services sector.

The Victorian public health sector, due to the services it provides, is both resource and carbon intensive. In 2016-17 Victoria's public hospitals reported carbon emissions of 854,722 tonnes; 818,454 tonnes from energy use, 20,772 tonnes from emergency transport and 15,496 tonnes from the use of nitrous oxide. On average every square metre of hospital space emits 240 kilograms of carbon from stationary energy, while

every occupied bed-day emits some 120 kilograms. Under business as usual scenarios the health system is forecast to generate close to 875,000 tonnes of carbon from stationary energy by 2020; some 38 per cent above 2005 levels.

Figure 1: Victorian public hospital emission profile from stationary energy



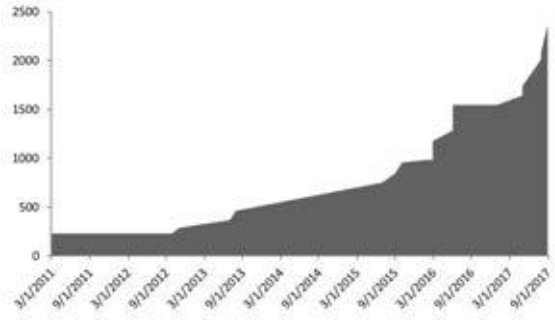
It is often said that the cheapest form of energy is that which is not used. Energy efficiency can deliver perhaps the most opportunity to reduce carbon emissions. However, the barrier is not necessarily the understanding of what to do but the funding available to implement the scale of potential initiatives. To date the department has secured over $32 million of no interest loans through the Greener Government Buildings program to deliver energy efficiency and solar initiatives within public hospitals (see Table 1).

Table 1: Greener Government Buildings program health projects

Year	$ million	Health service(s)	Project scope
2014-15	$0.427	Austin Health	Lighting and variable speed drives
2014-15	$5.800	West Gippsland Healthcare Group	Energy performance contract
2017-18	$7.000	Peninsula Health	Energy performance contract
2017-18	$0.462	Central Gippsland Health Service	Solar
2017-18	$3.500	Gippsland health services	Solar and low risk energy efficiency
2017-18	$10.000	Regional health services	Solar
2018-19	$5.000	Northern Health	Energy performance contract

In the last six years the solar capacity of public hospitals has grown to 2.5 megawatts. Over 2011 to 2013 it largely comprised the solar thermal cooling plant at Echuca Regional Hospital. Growth from 2014 to 2015 comprised two projects over 200 kilowatts at Bendigo and Warragul hospitals and five installations less than 100 kilowatts. In the last eighteen months – 2016 and 2017 – an additional 1.1 megawatts was installed over 12 individual projects. Projects have been funded directly by health services, capital redevelopment and through the Greener Government Building program. As the price of solar reduces and the efficiency of panels improve the cost benefit, and installed capacity, of solar is forecast to significantly increase.

Figure 2: Installed kilowatts solar in Victorian public hospitals

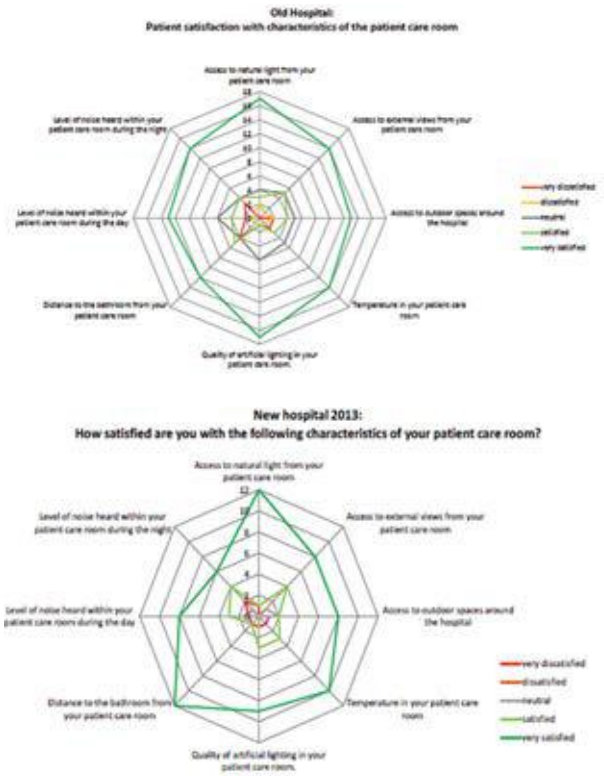


The Act is likely to result in the department taking a more holistic view of emission reduction opportunities through the analysis of system-wide data and making investment decisions at the system level. An example of this approach is the rating by the department of all public hospitals carbon performance through the National Australian Built Environment Rating Scheme (NABERS). This provides a nationally recognised assessment of the relative carbon performance of hospitals and can be used to inform where available investment can be optimally targeted. This enables the department to direct investment to where system-wide returns can be optimised and where centralised procurement can deliver best value to the system. The department is using this approach to investigate where solar can deliver the best returns and is working with Health Purchasing Victoria to secure economies of scale and consistency in quality through the system-wide procurement of solar panels.

In 2017-18 the Victorian Health and Human Services Building Authority is managing approximately $3 billion of health care capital projects. Since 2010 the department has required 80 standard practice sustainability items on all projects and the allocation of 2.5 per cent of the total construction cost to sustainability items above standard practice. With continued growth in health service demand, greater focus needs to be invested in the design of hospitals so they can actively contribute to Victoria being net carbon zero by 2050.

A longitudinal study in 2015 confirmed that indoor environment quality should be an integral aspect of hospital design and that there is benefit in investing in the indoor environment. However, it is difficult to accurately quantify the benefits of investing in issues such as thermal comfort, lighting and acoustics due to the complexity of linking specific outcomes to the investment, as well as the range of factors that influence patient outcomes and staff productivity. There may also be instances where improved indoor environment quality, such as 100 per cent outside air, can increase energy use and related carbon emissions.

Figure 3: Patient satisfaction with care room in an old (top) and new (bottom) hospital



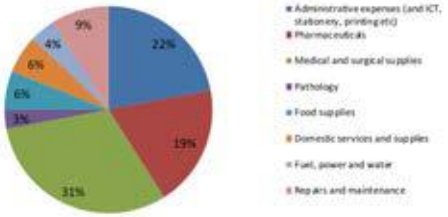
The long-term emissions target of being net carbon zero by 2050 includes indirect (Scope 3) emissions. In a hospital these include emissions from waste and sustainable procurement, so it is inevitable the department's focus on these emission sources will increase in coming years.

It is estimated that up to 40,000 tonnes of waste is generated by public hospitals per annum. From 1 July 2017 Victorian public health services are required to report waste data to the department. This will enable system-wide analysis of waste data to identify opportunities for reducing waste generation and waste to landfill. A key focus is likely to be opportunities within specific recycling streams, such as organics, or where the bulk delivery of recycling for a group of health services within a defined geographic area could make service delivery viable.

The potential value of using sustainable procurement to address environmental sustainability is demonstrated by studies of the organisational carbon footprint of healthcare services. These have consistently shown that approximately 65 per cent of the total impact occurs in the upstream supply chains required to supply goods and services, and downstream after disposal of wastes. Using this metric carbon emissions from procurement within Victorian public health services could be in the order of 1.5 million tonnes.

Whereas goods and services can be the largest contributor to a health services carbon footprint, they generate emissions that health services have least influence over as they occur in the operational control of suppliers in Australia and internationally. In 2011 the Victorian Auditor-General's Office estimated that the Victorian public healthcare system spends more than $1.6 billion per annum on procurement activities and while this equates to about 20 per cent of Australia's total public healthcare spend, it is less than 0.5 per cent of the global healthcare spend.

Figure 4: Victorian public healthcare spend categories (VAGO, 2011)



Undoubtedly carbon emissions from health service procurement is a significant contributor but the health system's ability to influence and measure change is significantly less than other emissions sources. For this reason, work in this space would need to be targeted to products and services where activities can be reasonably expected to contribute to the reduction of emissions.

It was estimated in 2010 that 11 per cent of the Victorian hospital and public health environmental impact is linked to transport. Similar studies by the National Health System in the United Kingdom found that transport was responsible for 18 per cent of their carbon footprint. With reporting and mitigation requirements under the Act, it is likely that the department will need to expand health service

reporting requirements to include transport, as well as encouraging health services to reduce their own fleet impacts. These could include more efficient vehicles, including hybrid, electric and those fit-for-purpose, and reducing trips by encouraging alternative transport and videoconferencing.

The increased range of activities underway and increasing climate risks and opportunities requires a more systemic approach. It is for this reason the department is developing an environmental sustainability strategy for the health care system to direct and prioritise effort over the next five years. It is anticipated that this strategy will align with existing governance requirements such as Victorian public health services Statement of Priorities and the requirement to have an environmental management plan.

The health sector is one part of the health and human services portfolio. The department has established a Climate Change Reference Committee to provide direction, and support engagement across the health and human services on climate change. Strengthening the understanding of climate risk and providing clarity on what it means for assets, service delivery and the health and wellbeing of communities is essential if the system is to be able to effectively respond.

REFERENCES

1. The views in this article are those of the author and not necessarily those of the Victorian Health and Human Services Authority. The author recognises the contribution of Daniel Voronoff, Senior Project Officer – Environment, Department of Health and Human Services.

2. Tiernan Humphrys, Manager Environmental Sustainability, Victorian Health and Human Services Building Authority, 50 Lonsdale Street, Melbourne Victoria 3000. +61 (03) 9096 2057 tiernan.humphrys@dhhs.vic.gov.au.

NON-COMPLIANCE AND HOSPITAL ACQUIRED INFECTION:

USING DESIGN METHODOLOGIES TO IMPROVE HAND HYGIENE PRACTICES

By John, K.J., Campbell, D., Armstrong, M.C., Degnan, A., Hinds, J.
Health Collab, Monash University

How can we improve hand hygiene in hospitals through enhanced products, systems and processes that reduce bacterial transmission?

Since Ignaz Semmelweis discovered a direct correlation between high mortality rates and poor hand hygiene 170 years ago (Best & Neuhauser, 2004), resistance to intervention has endured and thus persists as a perennially complex problem. Evidence indicates the global cost of hospital acquired infection (HAI) is between $35.7-45B (Scott, 2009) and the WHO estimates that in the United States alone there are 80,000 deaths per year attributable to HAI (WHO, 2017). To better understand the scale of the problem, in developed countries, HAI accounts for 5-10% of admission complications, while in developing countries this number is increased between two and twenty times, with some countries experiencing an HAI child death rate of 4,000 per day (WHO, 2017). Despite numerous approaches to addressing the issue of hand hygiene compliance such as; education and awareness, monitoring, product and system improvements, as well as environmental initiatives and infrastructure (Pantle, Fitzpatrick, McLaws, & Hughes, 2009), the introduction of basic hand disinfection procedures in 1847 - to tackle puerperal fever mortality - has remained the gold standard. Recently, technological advances and trends towards cloud computing and machine learning have transcended these existing approaches; becoming exemplars within the field (Pantle et al., 2009). Yet, even with these improvements, the problem is yet to show signs of abating (Pincock, Bernstein, Warthman, & Holst, 2012) and the socio-economic burden of HAI persists. This paper lays out and challenges what the real problem is and the efficacy of several existing solutions; furthering the hypothesis that they address issues that are symptomatic of a bigger problem. Further, this paper documents a design-led research study to identify and discuss a deeper problem that is thought to be a barrier to the success of existing interventions. It is difficult to trace the transmission of micro-organisms back to poor hand hygiene practices by specific individuals and therefore this lack of direct risk relationship makes enforcing hand hygiene an acute compliance issue. While causation for sub-optimal hand hygiene is complex, a foundational problem is mindset and how it directs human behaviour. This research introduces the findings of a non-conventional, collaborative research project using design to improve mindsets and human behaviour to facilitate compliance, including forthcoming interventions and testing. Through this, the paper highlights the opportunities for design methodologies to create interventions to improve hand hygiene compliance.

BACKGROUND:

The project is a collaboration between Monash University, a leading Australian hospital, and Enware Australia. Enware Australia is a leading manufacturer and supplier of plumbing and personal safety equipment with strong establishments in tapware design for healthcare. The project is supported by an innovations connections grant that is co-funded by Enware Australia. The design team based at Monash Art Design & Architecture (MADA) are part of the Health Collab; a practice based design laboratory with a research focus on medical technology and health and wellbeing. Building empathy using design thinking and co-design techniques in combination with sound product and experience design aims to meet with needs of end-users.

PURPOSE:

The purpose of this research is to identify and articulate the problem and then elicit new thinking around hand hygiene and infection control by using co-design to identify design performance.

AIM:

The aim of this paper is to compare existing literature to data generated via a qualitative interview and observation study at a major Australian hospital. Conclusions will be drawn about the problem to direct the ensuing design phase.

METHODS:

Ethics statement:

Ethics approval was received on 24 January, 2017 from the hospital HREC (Ref: XXX-XX-XXXXX013L). Ward managers and senior management provided written approval, and individual participant consent was sought at the time of the study.

Study Design:

The co-design process adopted by the Health Collab at Monash University is highly collaborative bringing all project stakeholders into the design process with an emphasis on end-users. The method is predominantly qualitative that opts to analyse a smaller sample of first hand experiences rather than a large sample of targeted quantitative metrics. This paper will discuss some of the potential flaws of quantitative data use in this space – such as audit data – including how it is harvested and the complications with relying on this to inform solution generation. This project's method is reliant on storytelling, experience and candour. Engaging with end-users at the start of any project is a key strategy to better understand the problem and where or what the opportunity is. The study involves identifying key stakeholders in the area of interest and then interviewing and observing them. Since the research required the gathering of personal data, it required low risk ethics approval from the hospital human research ethics committee (HREC).

Participants and setting:

The research was conducted at a major Australian hospital. The study consisted of 20 or more interviews, following several ward round teams, and general observations of the ward environment including traffic flows, products, systems, procedures and how health care workers (HCW) managed the simultaneous demands of patient care and infection control.
The activities were spread across four days and split between three general medicine wards and the intensive care unit (ICU). The interviewee's consisted of a range of hospital stakeholders including doctors, ward nurses, allied health (AH) (physiotherapy, occupational therapy, podiatry, dieticians, pharmacy, and social work), patient services assistants (PSA), administrative ward clerks, infection control liaisons and cleaners.
The interview team were assisted by the nurse unit manager (NUM) on each of the wards who acted as a facilitator. The NUM's (Nurse Unit Managers) on each ward were briefed prior to the interview day and were provided patient information and consent forms (PCIF) to brief staff and distribute to potential participants.
The interview team was introduced to ward staff at the morning meeting on the day of the interviews.

Process:

The interviews utilised a generalised discussion guide aimed to elicit story-telling from the interviewee about their experiences; (1) on the job in general; (2) of hand hygiene and infection control and (3) the relative interdependency of the two.

Day 1 (General Medicine):

Predominantly interviews including three ward nurses (ranging between 20-30 minutes each), an infection control liaison (20 minutes), PSA (15 minutes), pharmacist (25 minutes) and the ward clerk (15 minutes).

Although staff on the ward were aware of our presence, the observations attempted to remain discreet and were conducted during time between interviews.

Day 2 (General Medicine):

Interviewed a junior physiotherapist (25 minutes), a multi-disciplined AH Assistant and infection control liaison (45 minutes) including a review of the online hand hygiene training systems, PSA (15 minutes), ward clerk (40 minutes) that later detailed a journey analysis, NUM (25 minutes), and a junior doctor (15 minutes).

Observations were conducted in between interviews.

Day 3 (General Medicine):

Interviewed a ward clerk (10 minutes), pharmacist (20 minutes), physiotherapist (40 minutes), NUM (30 minutes) and resident doctor (15 minutes).

A ward round was followed for more than one hour, visiting several patients.

Observations were conducted in between interviews and ward rounds.

Day 4 (ICU):

Interviewed the ICU NUM (25 minutes), physiotherapist (35 minutes), and two ICU ward nurses (approximately 25 minutes each).

Smart Flow™ Intelligent Water Management

REAL-TIME VISIBILITY OF WATER SYSTEMS TO EMPOWER YOUR WATER RISK MANAGEMENT

What if... you had the tools to minimise microbial growth risk in your facilities water systems?

During the last 20 years Enware has focused on the research and development of plumbing systems that increase long term water health. The result of this work is Smart Flow™ Intelligent Water Management, a series of software based tools that provide greater visibility and certainty to help identify and manage water health risks. It provides real time data to provide intelligent insight into the operational usage and functionality of your water system.

Prevention is the best medicine... a key principle of a good Water Risk Management Plan is prevention. Smart Flow™ allows you to demonstrate you're managing water system risks to world's best practice and help drive maintenance quality and efficiency.
Better water health in care environments means a better future for hospitals, health and aged care.

Benefits of Smart Flow™ implementation

- Supports and optimises Water Risk Management Plans
- Aids water quality compliance to Australian Standards, regulations and guideline
- Concise data reports to maintain best practice of TMV fleet and water system operational efficiency
- System reliability to maintain data quality, provide alerts for potential risk and due maintenance
- BMS integration

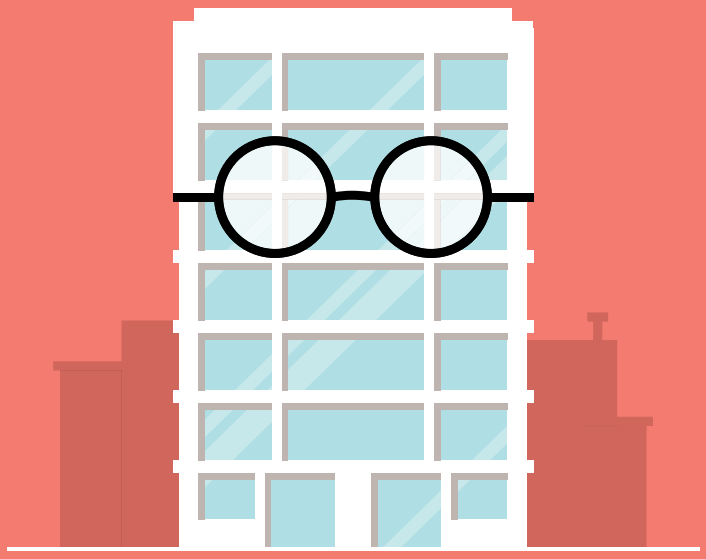
ENWARE

www.enware.com.au

To discuss your project requirements please call us on **1300 639 273** or email **info@enware.com.au**

TOTAL FACILITIES

CHAMPIONING HIGH PERFORMING ENVIRONMENTS



Making a building smarter can be simple.

Raising your building's IQ isn't just about technology. Don't miss 2018's most important facilities management event.

18-19 April 2018
Melbourne Convention & Exhibition Centre

Register online for free entry
totalfacilities.com.au

Facilities Management 2018 smarter in every way.

totalfacilities.com.au

Supporters & partners

Initial The Experts in Hygiene · KÄRCHER makes a difference · Rentokil Initial · KONE · Honeywell THE POWER OF CONNECTED · Norman Disney & Young · Colliers INTERNATIONAL · SIEMENS Ingenuity for life

CoreNet Global Australia Chapter · City Switch Green Office · FMClarity · SmartCitiesCouncil Australia New Zealand · SPOTLESS Integrated Facilities Services · Life is On Schneider Electric

A ward round was followed for more than two hours led by the chief ICU physician, visiting several patients.

Observations were conducted in between interviews and ward rounds.

OUTCOMES:

The study was conducted between 01 March and 30 April, 2017. Since the study was experience based, the data was qualitative. Narratives on hand-hygiene differed only marginally amongst the three general medicine wards yet significantly variance was observed when comparing any general medicine ward to ICU. The data collected from the general medicine wards detailed why hand hygiene can breakdown, or why it is difficult. Insights were more aligned with well-established barriers to hand hygiene such as heavy workloads, distractions, time pressure, poor accessibility to alcohol based hand rub (ABHR) dispensers and wash stations, problems with prolonged use, poor training and education, and broken perception of need. Further analysis of existing systems, products and procedures and review of our hospital study identified clear shortcomings and gave further insight into behavioural issues contributing to poor compliance.

The findings in ICU were vastly different. ICU staff in general already understood weak points in hand hygiene but had progressed to soliciting solutions and practical means to improve. Most staff had a greater interest in hand hygiene, understood the visibility-risk relationship, and had begun to conceptualise interventional ideas. Some of this included review of the 5 Moments of Hand Hygiene, disciplinary measures for poor compliance performance and ways to force compliance or minimise the ability to resist compliance. While these are not necessarily developed, they highlight a collective interest and understanding and desire to improve.

BACKGROUND, LITERATURE REVIEW AND DISCUSSION

This section explores existing literature on HAI in order to situate our study within the field. A number of key observations from the literature were identified. These observations can be categorised into; misleading compliance data, mental models, behaviour and habitual change, and the redundancy of the gold standard. Each category is closely aligned with and in parts challenged by findings and insights generated from the hospital study conducted for this research project.

Some of the most prominent hospital acquired infections (HAI) including methicillin-resistant staphylococcus aureus (STAPH), vancomycin-resistant enterococci bloodstream infections (VRE), and clostridium difficile (CD) (Riggs et al., 2007) can be carried on people's skin without the carrier showing any signs or symptoms and is therefore very easily transmitted and near impossible to trace (Tuazon, 1984). Others such as central line-associated bloodstream infections (CLABSI), and surgical site infections (SSI) are mostly acquired when microorganisms enter the body through an incision made by a surgeon during a procedure (Astagneau, Rioux, Golliot, & Brücker, 2001). These micro-organisms generally live on the skin and without meticulous preoperative hygiene procedures, there is a susceptibility to infection. It has been shown that SSI is a major contributor to increased mortality, readmission rates, length of stay, treatment costs and overall morbidity (Astagneau et al., 2001).

MISLEADING COMPLIANCE DATA:

Hygiene audits are a major component of infection control in most healthcare systems around the world providing an indication of a hospital's compliance to hand hygiene procedures. More developed audit systems go much further than hand hygiene compliance and begin to focus on addressing some of the issues associated with reducing instances of HAI such as behaviour and the notion of forced and unforced compliance. Nevertheless, while many audit and compliance systems show potential the data suggests they are poorly integrated, financially burdensome and deliver low hand hygiene improvement returns (McInnes, Phillips, Middleton, & Gould, 2014). Compliance can be treated as a cursory and superficial exercise, and performed with abdication to serve a bureaucratic expediency rather than any higher purpose – much the same as a box ticking exercise.

An Australian national survey released in June 2016 (HHA, 2016) covering 902 hospitals showed an overall compliance rate of 83.9% - 459,619 moments out of a possible 547,575 moments (HHA, 2016). While just a snapshot, this indicates that predominantly healthcare workers (HCW's) across the nation are performing well in hand hygiene. Yet, when compared to the aforementioned WHO data we can draw an inconsistency between compliance data and the real and rising cost of HAI. The clear disparity may be explained in part by insights gained in our hospital study that allude to significant resentment and fear associated with the practice of auditing. While the aim of the audit process was to directly observe if HCW's were following procedures, many felt that the process was carried out in clear view of staff members. They knew that their ward was being audited, sometimes in

advance. They could tell immediately who the auditor was – they stood out carrying a clipboard, writing notes and quietly watched person to person – they made no effort to make themselves invisible, and staff knew they were being watched. The Hawthorne effect shows a natural reactivity by individuals to change their behaviour due to being watched (Eckmanns, Bessert, Behnke, Gastmeier, & Rüden, 2006) and in this instance has artificially raised the level of accountability and compliance due to the fear of negative consequences. Naturally, most staff focused on compliance while the auditor was present to negate any chance of reprimand. Conversely, the distraction was a hindrance to primary patient care highlighting that in an auditor's absence, compliance is susceptibly impractical and often ignored. This temporary change in behaviour is contrary to good practice and is amplified by the negative nature of the audit process. The audit process can serve a positive purpose in the fight against HAI, however it is suggested that the audit process be re-designed to reduce short-term behavioural change and existing disposition to distraction.

This theorised that for many, being watched is a counterproductive distraction that requires the energy intensive conscious and deliberate mind to complete a task that should be triggered and performed autonomously. However, it has been suggested that the feeling of being watched could be utilised in a more positive way, whereby you could trigger a similar reaction without the burden of impending reprimand. This was investigated by a 2016 study published in the Health Psychology journal (American Psychological Association) that sought to test the potential use of visual primers to improve hand hygiene by HCW's (King et al., 2016). The method was simple, establish a baseline compliance rate – which was recorded at 15%. They then placed a set of male eyes printed on stickers on all ABHR dispensers in a particular ward. The aim was to give staff the same impression that they were being watched as they experience when the auditor is present. The results were very interesting, with the male eyes showing an 18.3% improvement in compliance above the baseline of 15% (King et al., 2016). Later, the test was repeated using a set of female eyes with varied results. "Psychological priming is the process by which the exposure to certain cues (e.g. words, smells, or images) alters behaviour without the

person being aware of the impact of the cue on their behaviour" (Bargh, 1992). This process causes a certain reaction in memory immediately before carrying out a task or action. Therefore, in this study the aim was to elicit a behavioural response by generating a reaction to visual material related to memories of being watched. This study was extended to the olfactory system using a citrus smell emanating from ABHR dispensers. The theory was that the citrus smell was associated with cleanliness; the results were greater than for the visual sense as suggested by a 31.9% improvement in use above the baseline of 15%.

Consequently we might hypothesise that auditing temporarily changes staff behaviour leading to greater compliance compared with normal operating conditions therefore generating a false positive. As suggested by the data, there is a great divide between what we want to know and what reality is. Society appears satiated by compliance analytics and yet an underlying perennial problem persists. This research project discovered numerous examples of automated compliance monitoring systems such as RFID enabled wearables – badges, watches and ABHR enabled dispensers. Depending on several factors – design, system and human integration, environment and context – such a system can positively or negatively impact the behaviour of staff. In one sense this technology recognises the cognitive issue but can work retrospectively and rely on reactive outcomes – for example, alerting the HCW to a moment after it has been missed. The need for a tracker, alert or prompt means the person is not acting autonomously, and are then distracted by this relatively simple task that they now must perform consciously. This needs to shift to the unconscious mind where tasks can be performed quickly and simply or as a 'rule of thumb' (Kahneman, 2011). Rather, outcomes should work proactively to minimise the resistance to hand hygiene by providing motivation and rebuilding of human mental models. This is possible by generating rapid feedback loops between a staff member and a gap in hand hygiene practices. The repetitive nature of the feedback loop is it can develop a mental model that reduces the long-term reliance on any intervention. The aim should be un-forced compliance, and while these systems make it possible to achieve some incremental behavioural improvements, it is unlikely to be as successful as a multi-faceted approach.

Zenith 9000 APS

Slide-W-I-D-E

Advanced Positioning System

Comfort . Versatility . Aging in Place

• **Built in expandable King Single sleep deck**
89cm, 99cm and 106cm

• Warm-to-the-touch half-length assist device (tool less)

• Full and reverse trendelenburg

• Intuitive two-pedal locking system

• Height travel range: 178mm to 762mm

3-in-1 bed. Single bed. King single. Bariatric bed.

Expandable/retractable deck with quick adjustment.

SOULARCH

Aged Care Supplies Australia Pty Ltd

www.soularchagedcare.com.au . soularch@bigpond.com . National: 0418 634 534 John Markarian

MENTAL MODELS – AN INTENTION TO ACT, DOES NOT LEAD TO AN ACT:

An intriguing 2015 study conducted by a senior infection control physician working undercover in a Zurich based hospital revealed the inability of some to translate knowledge in to action. While undercover at University Hospital Zurich, the physician spoke intently with a ward nurse about hand hygiene that indicated a strong understanding of the 5 Moments, yet when the nurse returned their focus back to the patient, almost no hand hygiene actions were taken, missing several consecutive moments. There are many possible explanations for this, yet the most likely is notwithstanding routine training and education, there appears to be a broken mental model that controls hand hygiene habits. This leads to the belief that an intention to act, does not lead to an act (Sax & Clack, 2015). Everyone has a slightly differing model for solving problems or performing tasks whether mundane or complex. Within a nurse's model for performing various patient care duties there is a missing or incomplete model for hand hygiene. With a complete and functional mental model, one would do something that triggers a subconscious alert to do another thing – for example the nurse entering the patient room should trigger an automatic response to wash their hands. However in the absence of any often sighted pressure, it is likely in this study that the staff member's mental model is incomplete or was never properly formed to begin with. Just because someone understands what, why, when, and how to do it, doesn't mean that it has been learnt as a habitual process and therefore still may not be performed correctly. It has been suggested that a rule of seven applies for most things to become memorised, yet in this instance it must be more than memorised, it must become ingrained in procedural – or muscle – memory (Farrington, 2011). Despite the correlation between repetition and motor task memory, it should be considered that repetition does not motivate and that there must be reasoning and understanding for why the task needs to be remembered. The repetitive task could still be resisted and therefore there must be other means for altering behaviour and mindset. The other side to this argument relates to trade-off theory showing that real-time prioritisation can lessen the need to perform one task as the criticality of another task becomes greater. In many circumstances the mental model may be intact but fundamentally flawed in that it is too easily overridden by other tasks of perceived greater importance. Again this highlights that any intention to act remains susceptible to failure due to individual discernment and a lack of personal urgency to follow hand hygiene.

MENTAL MODELS – INVISIBILITY OF RISK:

As alluded to earlier in this paper, one of the major barriers to strong infection control is the invisibility of the risk. Most infectious diseases are able to live on people's skin acting as carriers, others are transmitted via blood or other bodily fluid, all of which are invisible to the human eye. There is no traceability; it is near impossible to track who missed a moment, who contracted a disease and how that person passed it to the person who is now sick with an HAI. Invisibility leads to the notion that if it can't be seen, then it doesn't exist. This falls in to knowledge, education, communication and linking behaviour and habits. Mental models are at the core of building routines, they are cognitive strategies used to solve problems or tasks autonomously and in this instance are related to the subconscious mind that relies on habitual routine. It is possible that one's mental models could be compromised via negative attitude, poor perception and naivety and therefore it is possible that one's habits can become bad habits if the invisibility leads to complacency and assumed cleanliness?

Certainly if the risk is out of sight, it is easily forgotten. However, could this be designed for in such a way that the invisibility is reduced, or that the risk is materialised in some capacity as an alert or constant visual reminder?

BEHAVIOUR AND HABITUAL CHANGE:

Visual priming has been utilised extensively by infection control via advertising that promotes hand washing and the impact unclean hands can have in healthcare. Every autumn, visual material is distributed and featured prominently within Australian hospitals to alert staff to the flu vaccine, often illustrated using playful cartoons depicting germs and pathogens. Infection control staff don similarly styled t-shirts as leaders of the campaign. Hospitals become saturated in the effort and yet the message doesn't resonate nor stick long-term. As observed, the message and visual material can easily get lost amongst the visual clutter and chaos of a large, busy and ageing metropolitan hospital. Notwithstanding the ageing infrastructure, poor layout and lack of storage; perhaps the visual material itself is insufficiently impactful to impart the necessary shock to elicit any lasting change.

A 2016 study tested the change in compliance of several groups of HCW's as a result of being shown a book of graphic example images highlighting the impact of HAI. After establishing a baseline compliance rate (expressed as a percentage) across four separate wards, they showed participants a book of bacterial culture images over a 10 day period and continued to observe the compliance rate. The results

showed that the participants in each ward were quite influenced by the visual stimuli depicted in the book. At the end of the 10 day period the wards had average improvements between 8.3% - 38.9%. The third phase of testing observed any lasting change in compliance habits. While the highest performing Ward 4 at the conclusion of the 10 days (+38.9%) showed a reasonable decline in compliance (-20.1% to 68.8%), wards one to three remained steady (Ward 1) or showed modest improvement (Ward 2 and 3). Ward 3 initially improved 16.7%, however the post-test showed the most significant sustained improvement, rising by a further 30.9%. It is likely that the visual imagery has had a memorable impact on habitual learning (see Figure 1) and led to a longer-term improvement trend in hand washing behaviour (Gregory, Chami, & Pietsch, 2016).

Figure 1:

	Ward 1	Ward 2	**Ward 3**	Ward 4
Pre-Test (Baseline)	47.4%	50.0%	**33.3%**	50.0%
Progress Test (After 10 Days)	58.3%	58.3%	**50.0%**	88.9%
Post-Test	58.3%	68.4%	**80.9%**	68.8%

(Gregory et al., 2016)

What we can suggest from this is that most people are influenced to some degree by visual stimuli that can alter their mental models changing behaviour, habits and routines. Yet, the notion of selective perception theorises how "individuals select, organise and evaluate visual stimuli from their environment to provide meaningful experiences for him or herself" (De Mooij, 2013). This might indicate that people consciously notice visual stimuli that is most impactful to them; and by extension what is impactful to one may not be to another. Exploring this further, if you have a universal problem that is not isolated to any person or group then there are strategies aimed to elicit a collective reaction. Notorious examples where government advocacy groups have leveraged disgust using shock factor in advertising mediums including the Transport Accident Commission (TAC), Drinkwise, Worksafe Victoria and Quit Victoria. This strategy has been colloquially termed 'shockvertising'. The method uses violent, repulsive, confronting, lewd, terrifying, controversial, offensive, or politically incorrect images, scenes or videos to illustrate a negative outcome or a worst case scenario brought on by dangerous habits or antisocial behaviour (Parry, Jones, Stern, & Robinson, 2013).

The example discussed in Figure 1 – while leading to a significant result – is not a practical means to change behaviour across a mass population. The confronting imagery is the key interest in this study and could be designed in such a way to be used in the healthcare environment as part of a broader behavioural intervention. Although it may not be appropriate to graphically advertise the adverse effects of HAI in a healthcare setting, there are more recent learnings from TAC advertisements that are distanced from the once violent imagery associated with road fatality. TAC drink driving campaigns have re-focused the attention on shared responsibility, preventive messaging and education on the effects of alcohol – for example, how to prevent friends from getting behind the wheel through positivity, mateship and association to appealing mediums such as sport.

5 MOMENTS OF HAND HYGIENE – REDUNDANCY OF THE GOLD STANDARD:

The hospital interviews covered four wards, three of which belonged to general medicine, and the other the ICU. The experience between one to one nursing in ICU and one to four nursing general medicine was starkly different. Quickly, it became clear that interviewees at ICU discussed infection control matters with a deeper level of analysis and sophistication. Several staff spoke in depth about the 5 Moments of Hand Hygiene, figuratively detailing their experience in real-time, the fundamental flaws of what is widely regarded as the present day gold standard for infection control. Observing one of the ICU patient areas showed a highly complex array of instruments designed to maintain life, yet what was more obvious was the struggle the bedside nurse had with maintaining the balance between compliance and concentration on the patient's needs.

The margin for error is extremely high and in many circumstances impossible to follow these guidelines correctly. Yet, in many scenarios excessive and unnecessary hand washing was observed – for example hand washing when moving directly from one patient area to the next without any touch points in-between, one is required to hand wash when leaving the first patient area and then again when entering the second patient area. In many cases the HCW's hands would still be drying before having to re-wash. If this was not adhered to, an auditor would mark this as a failed moment. Other examples demonstrated the simple impracticalities and the potential danger posed to the patient's safety when a HCW is made to make a decision to either obey the 5 moments or help an unstable or confused patient who has gotten out of bed and is susceptible to a fall. Of course, all HCW's prioritise the needs of the patient, yet audit results do not discriminate extenuating circumstance from

normality. Hence, it became clear from several staff that the 5 Moments in their present form could not be considered fair and reasonable. Could it be that five moments become three or even two that better align with the realities and demands of a HCW?

On the surface the ICU environment was newer, cleaner, slower, more coordinated, methodical, precise and deliberate. The often touted phrase `clean environment, clean mind' is perhaps pertinent in that the level of distraction and chaos in the general medicine wards appeared intensified by visual and physical clutter, a lack of dedicated or coordinated space for ward round teams, and a significant lack of storage space resulted in many items stored in corridors and thoroughfares. A 2004 paper discussed the role of the physical environment and the impact of good design on improving the overall healthcare experience with particular emphasis on quality and safety. Through this research, there were direct links between the physical environment and patient and staff outcomes across four major areas; (1) reducing stress and fatigue and increasing effectiveness; (2) improving patient safety; (3) reducing stress and improving outcomes; (4) improving overall healthcare quality (Zimring, Joseph, & Choudhary, 2004). While improvements or re-design of the infrastructure is neither practical nor the highest hanging problem, we draw the conclusion that it represents one of the many causes for adverse behaviour and may be a contributor to poor hand hygiene in healthcare. Incremental improvements to the environment may be part of a broader intervention. Whereas designing a building to elicit certain actions or to mould behaviour should become a major talking point in any re-developments or overall hospital design.

DESIGNING FOR BEHAVIOURAL CHANGE:

The literature review detailed in this paper has sought to delineate the causes from the problems. Whereas environment, time and education are contributing factors, they are not the problem. Behaviour and mindset consistently emerge as a barrier to success; and it is suggested that if an intervention is not based on some degree of behavioural theory then it is susceptible to resistance and failure. A 2012 study looked at control and goal theory as a basis for a behavioural intervention. The method involved a repeatable loop of activities and actions; (1) observation and recording of performance over a 20 minute period; (2) immediate feedback; (3) action plan co-developed to address compliance failures and ultimately improve behaviour; (4) repeat process to develop and reinforce behaviour over time (Fuller et al., 2012). While it is noted that there is no randomised controlled trial (RCT) evidence to compare existing hand hygiene campaigns or to analyse whether they improve compliance, systematic reviews "suggest that feedback may be the most successful intervention" (Fuller et al., 2012).

CONCLUSION:

Understanding the problem is the first stage in this research project, the second is to design interventions using co-design and design-thinking practices. This design phase will not be limited by any suggestions in this paper, yet it will influenced by the need for behavioural change and how we can design outcomes that link behaviour to outcomes.

Many systems discussed in the literature were better understood during the time spent at the

hospital including compliance monitoring, auditing, education, leadership, products and advertising. The experience provided clarity on the difficulties and pressures of the environment that cause intervention breakdown and failure. More importantly, it identified problems that couldn't be found in the literature. Speaking to staff unearthed how a long-term leading approach is showing signs of redundancy. While the literature has detailed many innovative interventions with varying impact, the 5 Moments of Hand Hygiene remains the gold standard approach, yet the results of this study now challenges the fairness and rationality of this method. Whether the approach is justifiably fair and reasonable or not, in its current form it is being questioned by on-the-ground personnel who juggle the demands of primary care and infection control.

The reality is, that we need to want to change, we need to desire to improve things for ourselves and others, we need to be motivated to act, and ultimately we can only create change through unforced actions. I have suggested throughout this project that any intervention is susceptible to resistance and failure if it addresses the cause and not the problem. Any intervention – whether it is product or system based – must have an aim to addresses the fundamental issues of behaviour and mindset and enable unforced and unconscious action.

BIBLIOGRAPHY

Astagneau, P., Rioux, C., Golliot, F., & Brücker, G. (2001). Morbidity and mortality associated with surgical site infections: results from the 1997–1999 INCISO surveillance. Journal of Hospital Infection, 48(4), 267-274.

Bargh, J. A. (1992). The ecology of automaticity: Toward establishing the conditions needed to produce automatic processing effects. The American journal of psychology, 181-199.

Best, M., & Neuhauser, D. (2004). Ignaz Semmelweis and the birth of infection control. Quality and Safety in Health Care, 13(3), 233-234.

De Mooij, M. (2013). Global marketing and advertising: Understanding cultural paradoxes: Sage Publications.

Eckmanns, T., Bessert, J., Behnke, M., Gastmeier, P., & Rüden, H. (2006). Compliance with antiseptic hand rub use in intensive care units the Hawthorne effect. Infection Control & Hospital Epidemiology, 27(9), 931-934.

Farrington, J. (2011). Seven plus or minus two. Performance Improvement Quarterly, 23(4), 113-116.

Fuller, C., Michie, S., Savage, J., McAteer, J., Besser, S., Charlett, A., . . . Duckworth, G. (2012). The Feedback Intervention Trial (FIT)—improving hand-hygiene compliance in UK healthcare workers: a stepped wedge cluster randomised controlled trial. PLoS One, 7(10), e41617.

Gregory, A., Chami, E., & Pietsch, J. (2016). Emotional Motivators: Using Visual Triggers as an Infection Control Intervention to Increase Hand Hygiene Compliance throughout the Hospital. American journal of infection control, 44(6), S3.

HHA, H. H. A. (2016). Nation Data Period One 2016. http://www.hha.org.au/LatestNationalData/national-data-for-2016.aspx

Kahneman, D. (2011). Thinking, fast andslow. New York: Farrar, Straus, and Giroux.

King, D., Vlaev, I., Everett-Thomas, R., Fitzpatrick, M., Darzi, A., & Birnbach, D. J. (2016). "Priming" hand hygiene compliance in clinical environments. Health Psychology, 35(1), 96.

McInnes, E., Phillips, R., Middleton, S., & Gould, D. (2014). A qualitative study of senior hospital managers' views on current and innovative strategies to improve hand hygiene. BMC infectious diseases, 14(1), 611.

Pantle, A. C., Fitzpatrick, K. R., McLaws, M.-L., & Hughes, C. F. (2009). A statewide approach to systematising hand hygiene behaviour in hospitals: clean hands save lives, part I. Medical Journal of Australia, 191(8), S8.

Parry, S., Jones, R., Stern, P., & Robinson, M. (2013). 'Shockvertising': An exploratory investigation into attitudinal variations and emotional reactions to shock advertising. Journal of Consumer Behaviour, 12(2), 112-121.

Pincock, T., Bernstein, P., Warthman, S., & Holst, E. (2012). Bundling hand hygiene interventions and measurement to decrease health care–associated infections. American journal of infection control, 40(4), S18-S27.

Riggs, M. M., Sethi, A. K., Zabarsky, T. F., Eckstein, E. C., Jump, R. L., & Donskey, C. J. (2007). Asymptomatic carriers are a potential source for transmission of epidemic and nonepidemic Clostridium difficile strains among long-term care facility residents. Clinical infectious diseases, 45(8), 992-998.

Sax, H., & Clack, L. (2015). Mental models: a basic concept for human factors design in infection prevention. Journal of Hospital Infection, 89(4), 335-339.

Scott, R. (2009). The direct medical costs of healthcare-associated infections in US hospitals and the benefits of prevention. Atlanta, GA: Centers for Disease Control and Prevention; 2009.

Tuazon, C. U. (1984). Skin and skin structure infections in the patient at risk: carrier state of Staphylococcus aureus. The American journal of medicine, 76(5), 166-171.

WHO. (2017). Evidence for Hand Hygiene Guidelines. http://www.who.int/gpsc/tools/faqs/evidence_hand_hygiene/en/

Zimring, C., Joseph, A., & Choudhary, R. (2004). The role of the physical environment in the hospital of the 21st century: A once-in-a-lifetime opportunity. Concord, CA: The Center for Health Design.

WATER QUALITY MANAGEMENT PLANS FOR HEALTHCARE PREMISES

By Sarah Bailey

Legionnaires disease is a disease of increasing importance worldwide. The Center for Disease Control (CDC) in the USA estimated in 2016 that the incidence of Legionnaires disease has increased by 400% over the last 15 years. In Australia, there have been several high profile outbreaks both in hospitals and in the community. Recent issues have been found in several hospitals all over Australia, with the most well known recent outbreak taking place in the Wesley Hospital in Brisbane. The most common species discovered in outbreak situations in health care is Legionella pneumophila, although there are many other species of Legionella that cause illness in humans.

In the mind of the public, most of these are associated with the cooling towers for air conditioning systems. However, many more outbreaks are actually traced back to the drinking and other water systems within buildings. Another name for pathogens that are contracted from the water within buildings is OPPP (Opportunistic Premise Plumbing Pathogens), and as well as legionnaires disease, these include microorganisms such as Pseudomonas aeruginosa, Mycobacterium chimera, Stenotrophomonas maltophila, Enterobacter species, Cryptosporidium parvum and Serratia marcescens.

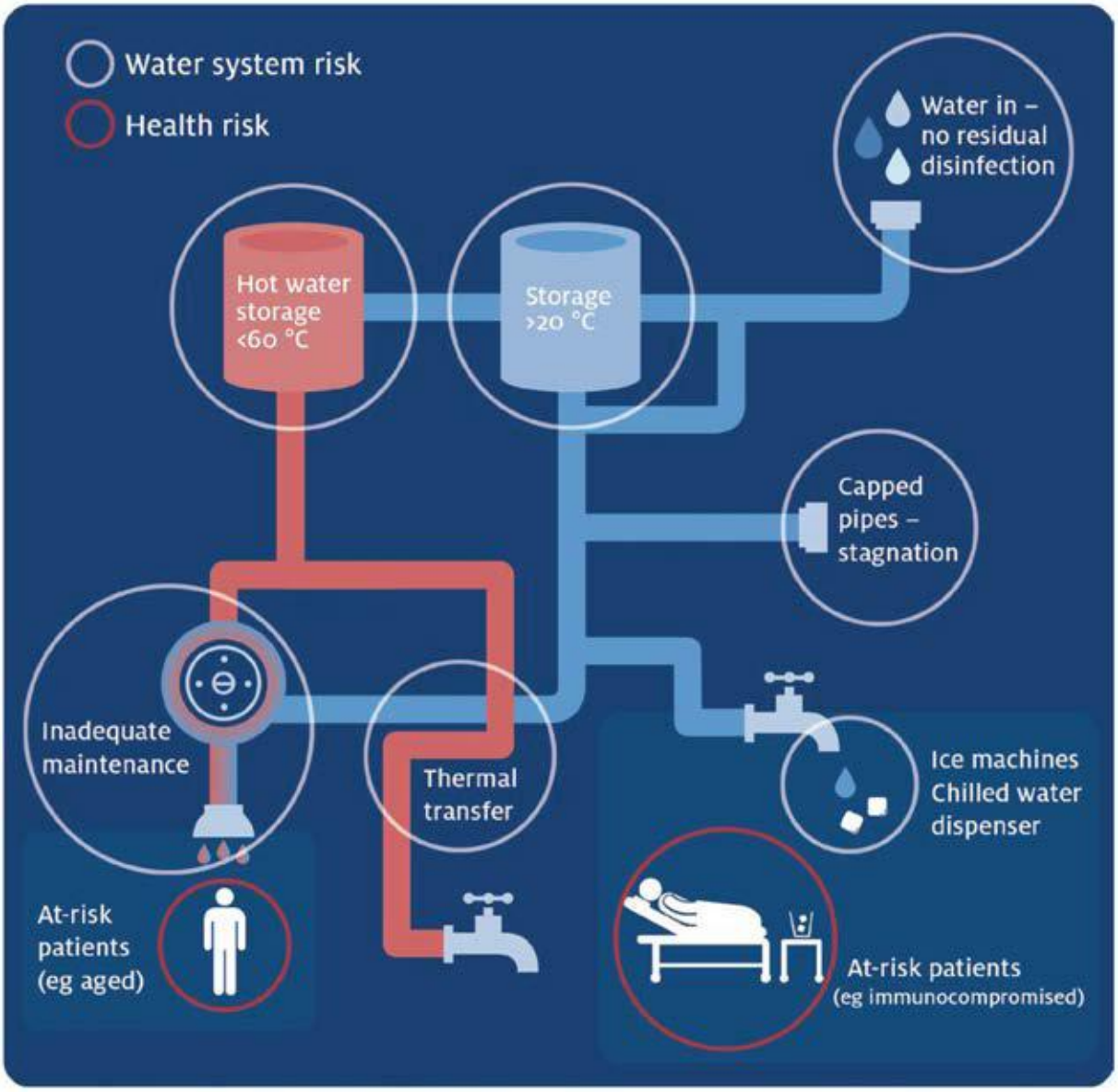
Legionnaires disease is a very serious respiratory condition, which can result in a fatality rate of up to 40% in a healthcare or aged care setting. Symptoms include coughing, shortness of breath fevers and muscle aches, headaches and sometimes gastrointestinal symptoms such as nausea and diarrhoea. Symptoms develop between 2-10 days after exposure. Legionella also has a high rate of admission to intensive care and a high mortality rate. There is also the risk of ongoing complications after an infection. Risk factors for contracting legionnaires disease include middle to advanced age, male, smoking, chronic heart or lung disease, immunocompromised hosts or those with diabetes, those with haematological cancers such as leukaemia, end stage renal disease patients and alcoholics. Within a healthcare facility or aged care home, patients with several of these risk factors are often present, which makes control of the organism vital for the safety of the residents and patients.

Due to lack of recording of data, figures for the impact of OPPPs in Australia other than Legionella are not available – but the burden of disease from Pseudomonas is very high in hospital settings. Infection with Pseudomonas spp. Is especially important in patients with respiratory disease, those with compromised immune systems and burns patients. Recent data from the European Union shows that 6% of patients in intensive care for 2 days or more will develop pneumonia, and that Pseudomonas aeruginosa is the most commonly isolated organism.

In Australia, the enHealth guidelines for Legionella Controls in the operation and maintenance of water distribution systems in health and aged care facilities were published in 2015. These guidelines state that all healthcare and aged care facilities should have a Legionella management system in place, and the guidelines sit over the top of each states' regulatory framework. The guidelines apply to all water systems except for cooling towers. In Queensland, this has been the subject of legislation whereby all healthcare facilities have to carry out testing for legionella, and publish the results on line for the public to see. This is not yet the case in other states, but as the guidelines exist, and are reasonable best practice it would be hard to defend a facility that did not have a risk management plan in place if an outbreak occurred.

Having a risk management plan in place, rather than reacting to outbreaks is vital, as Legionella outbreaks are very difficult to trace when they first start. Legionnaires disease has two forms – Pontiac fever, a usually self limiting and non fatal fever, and legionnaires disease, which Is a pneumonia like presentation. As the symptoms are similar to other pneumonias, and laboratory diagnosis is a specialized test, it can take a long time for a clinician to realise that legionnaires disease may be a cause of the disease, and to request the specialise tests required for a diagnosis. This can lead to delays in realising that a problem with legionella may be a problem. Finding the source of the legionella can then take several days. Culture of the organism is the gold standard and can take 7 to 10 days to gain a positive culture. During this time, patients, staff and visitors to the facility are all at risk of contracting legionnaires disease.

Having a robust management and control plan in place, with relevant and targeted interventions and testing can reduce the chances of the system becoming colonised, and help to control colonisation if it occurs. This reduces the chances of having a problem with water borne disease and increases safety of the patients and residents of the facility. Producing the management plan should be a joint venture between the maintenance, plumbing and engineering departments, along with the Infection control teams and clinical staff, as many layers of controls and interventions from all of the above disciplines may be necessary. As training in legionella and water management awareness is not commonly part of the training for infection control staff or estates management staff, it may also be necessary to bring in outside expertise in the form of an external specialist consultant if the skills and experience are not available in house.



Although the enHealth guidelines only refer specifically to legionella, it would be wise, due to the considerable disease burden from other pathogens, to increase the scope of any management plan produced to include other OPPPs, especially Pseudomonas. The health and cost burden from these other diseases is large, and reducing it will have a large impact on improved patient outcomes and reduce length of stay. It would be a great lost opportunity to produce only a Legionella management plan, when for minimal extra cost and effort, a more comprehensive microbiological water management plan can be produced. The benefits to patients of controlling more of the major water borne risks are many, and can also reduce the burden of hospital acquired infections and reduce extra bed days and drug prescribing due to these. Many of the organisms associated with water also harbour the genes for antibiotic resistance, which are easily transferred among bacteria, and can make treatment of diseases more difficult.

The enHealth guidelines concentrate on managing the risks, rather than responding to positive results. If a robust and well thought out management plan is in place, then hopefully any problems with the system will be noted and rectified before the system reaches a stage where legionella can proliferate.

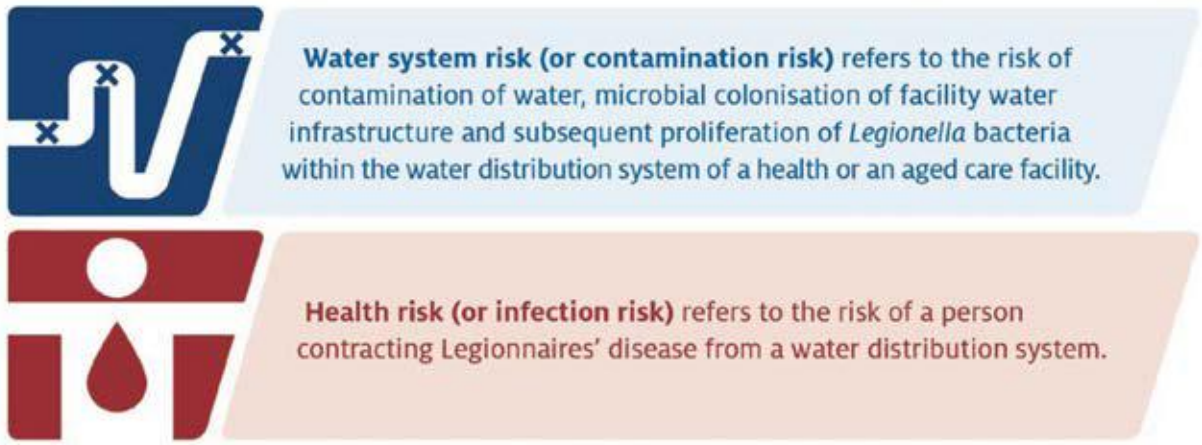
The first step of creating the plan is to establish a Legionella risk management system, the first step

of which is assembling a risk management team to produce the document. A team may include engineering staff, external consultants, infection control practitioners, clinical staff and executive level members. It should be ensured that the persons producing the plan have the relevant expertise to do so, and extra training or the consultation of external experts may be required to produce an effective plan. The team should then produce suitable and effective written procedures for Legionella risk management within the facility.

A full analysis of the water systems within the facility should be undertaken – a task which will require both trades and clinical staff to be effective. At this stage, the vulnerability of the patients to acquiring waterborne disease should also be assessed – for example areas such as oncology will have higher risk patients than a mental health outpatient clinic, and a greater degree of control will be required in these areas. A list of uses and users of water should also be prepared – this list will be extensive, and should include input from as many sources as possible to capture as many uses as possible. This will include everything from showers and dental chairs to humidifiers and steam mops.

Identifying the hazards and risks is the next stage, followed by implementing controls and monitoring – managing the risks. The hazards and risks from the water system will be many and varied, and some will require urgent action, this may be an engineering intervention, or a change in clinical practice. All risks should be ranked, and the highest risk actions remediated first. Examples of this include ensuring that the hot water is circulating at the correct temperatures throughout the hospital water system, ensuring that shower heads are not affected by limescale, that water in the cold water tanks is circulating properly and that chlorine residuals in the tap outlets are at the proper concentrations.

A suitable operational and verification monitoring programme should then be set up for the facility.



Operational monitoring is the tests that can be carried out day to day – often with instant results to determine if the controls implemented are working. Common operational monitoring includes testing for chlorine residuals in the water supply, testing temperatures from the taps and from the water heaters, the pH of the water and the turbidity of the water. Verification monitoring tests are those for Legionella species and, often, for heterotrophic colony counts (sometimes also referred to as total viable counts or total plate counts). As these verification tests take many days to get results, they should not be relied upon as the primary form of monitoring. Operational monitoring can provide on the spot information as to how a system is performing, and if the conditions for Legionella proliferation are prevalent in the system. This can allow a fast response to deteriorating conditions, and reduce the chances of patients becoming exposed to Legionella species and other waterborne pathogens.

A critical part of any plan is the input from all staff, not just those directly involved in the risk management team. Effective awareness training for all staff, along with an easy system for reporting any risks noted within the building, will improve the plan.

Finally, the document, once produced, is a living document. It should be reviewed at regular intervals, and additionally it should be reviewed if a case is detected, if the results of testing indicate the plan is not working effectively, or if there are any changes to the water distribution system.

An effective programme, put together by staff who have adequate training and resources will increase patient safety within the facility.

REFERENCES:

Australian Government (2015) enHealth Guidelines for Legionella Control in the operation and maintenance of water distribution in the health and aged care facilities.

http://www.qed.com.au/sites/default/files/39_104_Legionella_Risk_Management_Whitepaper.pdf

HOSPITAL TRACKING & CURTAINS

BED SCREEN TRACKING

for
- Hospitals
- Medical centres
- Nursing homes
- Clinics
- Physiotherapy suites

also available

DISPOSABLE CURTAINS

an economical and hygienic alternative to conventional cubical curtains, offering high quality anti-bacterial treatment, flame retardant and recyclable bed screen privacy

TRACKING FEATURES

- Attach to ceiling or drop rods
- High grade aluminium profile, strong and durable
- Curtain removal point for quick and easy removal of curtains
- Low maintenance
- Optional anti-microbial surface coating

+61 2 9725 5277
info@oslonsw.com.au
www.curtainhardware.com.au

the Curtain Hardware company

oslo

SMARDT

High Efficiency Oil-Free Chillers

Water Cooled Chillers

200-8150 kWR
Largest Oil-Free Range
Stainless Steel Condenser Options:

- Tubesheets
- Waterboxes

Air Cooled Chillers

200-1800 kWR
10 Base Models, 116 Configurations
Standard Anti-Corrosive Materials
Highest Efficiency Available

Purpose-Built Evaporative Chillers

200-1300 kWR
Unique Purpose-Built Range
Standard Anti-Corrosive Materials
Highest Efficiency Available

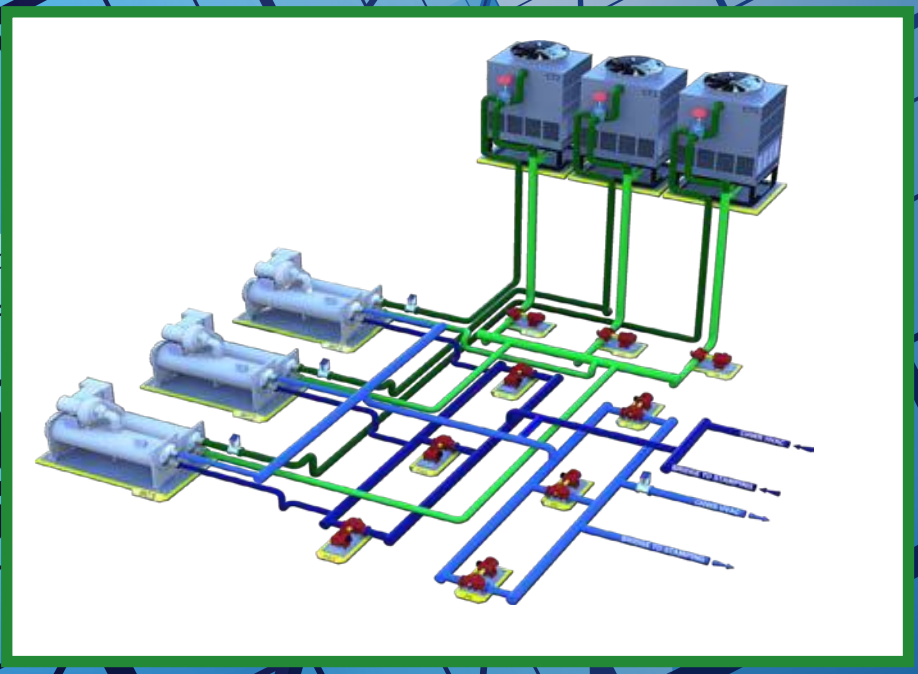
Proudly Australian Built

Smardt Chillers Pty Ltd
148 Colchester Road
Bayswater North, Vic., 3153
p: (03) 9761 5010
e: sales.au@smardt.com

SMARDT CHILLER GROUP
GUANGZHOU MELBOURNE MONTREAL PLATTSBURGH SINGAPORE STUTTGART

SMARDT

Chilled Water Plant Optimisation



Simulation Based Chilled Water Plant Optimisation

- Typical savings of between 10-30% on chilled water plant operating cost
- Open protocol, brand agnostic automation and optimisation solutions
- Scaleable to any application, plant configuration or size
- Integrate with any Building Management System
- Increase asset value and facility net operating income
- Simplify the complex process of optimising a chilled water plant
- Risk free project planning, implement optimisation without comprimising cooling
- Flexible implementation cost options available
- More than 95 optimisation projects delivered and operating
- Tune and manage your plant via the Smardt Remote Monitoring network
- Intuitive and adaptable Graphical User Interface

Delivered by Smardt Solutions

Smardt Chillers Pty Ltd
148 Colchester Road
Bayswater North, Vic., 3153
p: (03) 9761 5010
e: sales@smardtsolutions.com

SMARDT CHILLER GROUP
GUANGZHOU MELBOURNE MONTREAL PLATTSBURGH SINGAPORE STUTTGART

W.A.S: WORK – ADVENTURE – SECURITY

By John Clynes

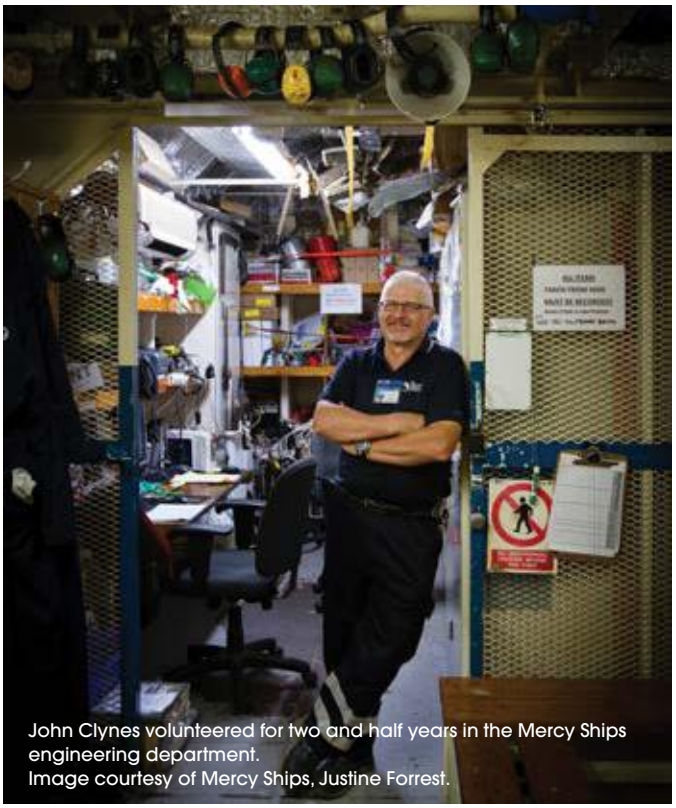
If ever there W.A.S a perfect lifestyle of work and play, this is it. Whether working full time, retired or semi-retired volunteering with Mercy Ships is a rewarding experience.

Take a 150 metre ship and turn it into a fully equipped "first world", state of the art surgical hospital. Fill it with accommodation for 450 crew from around the world and berth it against a wharf to serve the poorest of the poor in sub Saharan West African countries to provide free, life-giving surgical procedures and you have this amazing Mercy Ships vessel, the *Africa Mercy*.

The Lancet Commission on Global Surgery found that five billion people in the world do not have direct access to safe, affordable and timely surgery. The lowest ranked countries for poverty in the world are generally found just above the African equator and down the west coast of Africa. Hidden behind such people groups living there are those suffering even poorer health still. Marginalised, there are hidden faces, kept away in hiding, ashamed, cursed and die miserable lives with no chance at all for essential life giving surgery.

The international charity Mercy Ships (check out www.mercyships.org.au) is the organisation dedicated to bring hope and healing to the poorest of the poor and it takes on board volunteer crew from around the world to utilise their skills dedicated to the cause. Kiwis punch above their weight per capita for crew on the *Africa Mercy* in various positions throughout the vessel. To keep the ship running smoothly there is a 50 strong team of deck and engineering to keep the whole operation afloat. The Mercy Ship stays in field service against a government approved secure berth in one country for 10 months of a year, then sails away for maintenance (usually undertaken in the Canary Islands) and returns to another country for her next season.

My wife Sue, an operating theatre nurse, and myself an engineer joined the crew for two and a half years full time, but volunteers can go for as little as a month depending on the position filled. There are numerous positions from any of the 150 strong surgical / hospital team, lab technicians, physiotherapists etc, to hotel,



John Clynes volunteered for two and half years in the Mercy Ships engineering department.
Image courtesy of Mercy Ships, Justine Forrest.

housekeeping, stores, galley, dining room, teaching (yes, there are families on ship who go to the school academy on board). So a husband and wife team, with your own cabin is very rewarding, or you could bunk in as an individual with other shipmates from around the world. You a sure to find that this volunteer work and adventure and lifestyle is one of the most rewarding experiences you will ever find in your life.

It was also very humbling to see the depravity of humanity and how some of the people from developing nations live a life of subsistence, and to have a medical condition requiring surgery is virtually a death sentence. Bringing hope and healing to some of these people is truly an amazing thing to

John and Sue Clynes volunteered engineering and operating theatre skills to bring essential surgery to Africa's forgotten poor.

see from both their perspective and ours. Instead of pouring in misdirected monetary aid we need to be hands on, sleeves rolled up, engineering a better way fighting the inequality of life. We cannot right all the wrongs, but we can do something to restore their dignity as fellow human beings. Life on ship was great, belonging to a community with purpose.

Mercy Ships is bringing another purpose-built hospital ship into service within the next few years. There is a need for more volunteers to fill the additional positions with professional people. Volunteer crew are the glue to provide the passion and love in what they do and if you are contemplating an overseas experience of Work and Adventure with Security W.A.S, the richness and reward is multiplied back on you in countless ways. Don't hesitate to volunteer your skills and talent.

For more information go to www.mercyships.org.au

What is Mercy Ships? See an explanatory video at https://vimeo.com/237315598

ABOUT MERCY SHIPS

Mercy Ships is a faith-based charity which delivers free, world-class healthcare services, capacity-building and sustainable development aid to those without access in the developing world. Founded in 1978, Mercy Ships has performed more than 84,477 life-changing or life-saving operations such as cleft lip and palate repairs, cataract removal, orthopaedic procedures, facial reconstruction and obstetric fistula repairs. Services valued at more than NZ$1.25 billion have directly benefitted more than 2.56 million people in 70 nations. Each year, around 1,000 volunteers from up to 40 nations, including Australia, serve with Mercy Ships. Professionals like surgeons, dentists, nurses, healthcare trainers, teachers, cooks, seamen, engineers and teachers donate their time and skills to the effort. Mercy Ships Australia, one of 16 international support offices, is based in Caloundra, Queensland. For more information go to www.mercyships.org.au

At 16,000 tonnes, *Africa Mercy* is the world's largest civilian hospital ship. Image courtesy of Mercy Ships.

HOW AEC PROFESSIONALS
CAN BETTER UNDERSTAND AND ASSIST A BUILDING OWNER'S REQUIREMENTS USING REVIT FOR FACILITIES MANAGEMENT

By Don Hitchcock, Director ASt

As my company continues with the concept of the BIMFM model which I believe is the best approach to providing a Revit model to a facilities team in a way that has been purpose-built for their success. The BIMFM model is a flow on from models that came before it, in the process of designing, engineering and construction of a building. The primary reason for this approach to modelling is to pass information from the AEC design and construct process for use in FM. This approach also recognises that an operational model has different requirements and priorities and will have a much longer life than the original AEC model. This means that Revit models you are handing over to facility teams not only have to be useful, but also need to be maintainable thoroughly the potentially long operational life of a facility from acquisition, through operations and finally ending with disposition.

A GROWING AUDIENCE FOR YOUR REVIT MODELS

Attending a number of international and ANZ conferences over the course of the year including Autodesk University, IFMA World workplace, FMA Ideaction, IHEA, RTC BILT, Total Facilities, and smaller conferences such as the BIM Workshops and regional events; Every one of these conferences now have a considerable number of classes and presentations that are emphasising the potential use of a Revit model for operations. BIMFM is now also become a course in universities such as at UWA. This points to the fact that Lifecycle BIM has now moved from theory to practice and building owners are looking for modelling guidance for their operations, as they begin to explore the integration of Revit models into their facilities processes.

UNDERSTAND YOUR CLIENTS' NEEDS

Revit models constructed for the purposes of fabrication, coordination and as-built conditions are typically not going to function well in a facilities environment if they are used "as is." It's important for AEC service providers and consultants to understand their customer needs. You should be best asking these following questions of the building owner who intends to use a Revit model for facilities management:

1. Who in the organisation and facilities team is going to use the data?
2. What data is going to be collected?
3. How will the BIM data be QA'd for completeness and accuracy, before handing to the Facilities Team for use in operations?

4. How will the data be maintained once operations begin?

By asking these questions and engaging a building owner, you can have greater confidence that a quality Revit model handed over for operations and FM use will be more successful and actually used during operations. I also recommend that you ask your customer to really think about what data is critical and who in their facilities team will be responsible for maintaining the information once the model is handed over. This will ensure that you don't over model or provide excessive detail especially in your equipment families that is not critical and will be difficult for a facilities team to maintain.

KNOW YOUR CLIENT'S STANDARDS

Re-work is never fun and can be costly for whoever needs to perform the work a second or third time. Before modelling begins, check with your client to see if they have internally developed 'data' standards for their Revit models before you go too far in developing a new one. If they are migrating from an AutoCAD based FM process to Revit, ask them for their existing AutoCAD guidelines as this will at least give you a starting point in understanding what is important to the owner from a facilities perspective. Even something as basic as understanding their room numbering standards as well as how they classify space types, asset types and data etc. will help you ensure that the information you put into their Revit model will translate more easily into facilities operations which can really help to reduce re-work and smooth the transition of the model through the Design, Construct phases and finally to the operations team.

Use a cloud base model checker such as BIM Assure, where multiple accounts across Design, Construct and the building owners team can review and check the model and the data, through each phase and before handing over to the operations team.

CONCLUSION

In conclusion, I strongly believe that the transition to a BIM based building lifecycle is well underway in a number of large owner companies and organisations. This creates a tremendous opportunity for AEC professionals to provide better Revit modelling services to building owners especially if you understand your clients' needs and standards which will help you to better serve their needs and will help you to also strengthen your trusted advisor status.

REGULATORY COMPLIANCE OF HEALTHCARE FACILITIES

By Cameron Milne, Amec Foster Wheeler

The design, construction and licencing of healthcare facilities is governed by the Department of Health and Human Services building design requirements and the National Construction Code/ Building Code of Australia requirements that are enforced by the Department of Health and the Building Surveyor respectively. The Australasian Health Facility Guidelines provide guidance on the acceptable standards for the design of healthcare facilities.

In addition to the above regulators there can be specific areas and facilities within healthcare facilities, often support or research functions, that are subject to further scrutiny by other regulators. Who are these regulators and why do they have an interest in the areas? What are healthcare facilities required to provide as part of the application process for licencing and what is the timeframe required for inspections and licencing?

WHO ARE THE RELEVANT REGULATORS?

State Pharmacy Authority

State pharmacy authorities are responsible for the licencing of hospital pharmacy departments and retail/community pharmacy premises to dispense pharmaceuticals to the public. The Pharmacy Board of Australia is responsible for the licencing of pharmacists who operate a pharmacy. Each state and territory of Australia has a state pharmacy authority that publishes a guideline/code of practice/ standard regarding the requirements of pharmacy premises and how they should be operated.

Within a healthcare facility, if an area is used for the production (compounding) of pharmaceuticals (such as radiopharmaceuticals, cytotoxic drugs, etc.) and these are not sold to other healthcare facilities or pharmacies, then there is a requirement for licencing of the area where the pharmaceuticals are manufactured by the state pharmacy authority. Due to the fact that each state and territory produces its own guideline regarding the licencing of pharmacy facilities requirements vary. Some state pharmacy authorities have adopted the PIC/S Guide to Good Practices for the Preparation of Medicinal Products in Healthcare Establishments as the document to provide guidance on the construction of premises and operation of premises used for the preparation of medicinal products within healthcare facilities that are directly supplied to patients.

The state pharmacy authorities conduct an initial inspection of the manufacturing area and periodic inspections thereafter (at least every 3 years).

Therapeutic Goods Administration

The Therapeutic Goods Administration (TGA) is responsible for the licencing of premises that manufacture therapeutic goods offered for commercial sale in Australia. Within a healthcare facility if an area used for the production

(compounding) of pharmaceuticals (such as radiopharmaceuticals, cytotoxic drugs, cellular therapy products, etc.) and these are sold to other healthcare facilities or pharmacies then there is a requirement for licencing of the area where the pharmaceuticals are manufactured as well as areas where materials used in the manufacturing process are stored.

The TGA adopts the PIC/S Guide to Good Manufacturing Practice (GMP) for Medicinal Products, PE 009-8 to be the code of GMP used to provide guidance on the construction and operation of pharmaceutical manufacturing facilities. The TGA publishes the Australian Code of Good Manufacturing Practice for human blood and blood components, human tissues and human cellular therapy products to be the code of GMP used to provide guidance on the construction and operation of manufacturing facilities for blood products, human tissue and human cell therapy products.

The TGA conducts an initial inspection of the manufacturing area and periodic inspections thereafter.

Office of the Gene Technology Regulator

The Office of the Gene Technology Regulator (OGTR) is responsible for the licencing of facilities where activities using Genetically Modified Organisms (GMOs) are undertaken. Facilities are categorised by the type of GMO (microbiological, animal, invertebrate, aquatic) and by the risk posed by the GMO to human health and the environment using Physical Containment terminology PC1 to PC4 levels. Physical Containment Level 1 (PC1) poses the lowest risk to people and the environment while Physical Containment Level 4 (PC4) poses the highest risk.

The OGTR publishes guidelines that describe the requirements for the construction and operation of facilities relevant to each of the categories above. The OGTR also publishes a separate guideline relating to the transport, storage and disposal of waste from OGTR licenced containment facilities.

Areas within a healthcare facility that may require OGTR licencing include:

- pathology, histology, tissue banks or siRNA laboratories (microbiological PC2 or PC3)
- animal houses for research purposes (animal PC2)
- insectaries for research purposes (invertebrate PC2)
- aquariums for research purposes (aquatic PC2)

An initial inspection of PC1/2/3/4 areas is required and an annual inspection thereafter is conducted.

Department of Agriculture and Water Resources

The Department of Agriculture and Water Resources (DAWR) is responsible for licencing approved arrangements that allow operators to manage biosecurity (quarantine of material from overseas) utilising their own facilities, equipment and personnel. Facilities are categorised by the type of quarantine material (microbiological, indoor animal, plant, insect, fish) and the risk posed to animals, plants and humans if disease is spread to the community or environment using BC1 to BC4 levels. Biocontainment Level1 (BC1) poses the lowest risk to animals, plants and humans, Biocontainment Level 4 (BC4) poses the highest risk to animals, plants and humans.

The DAWR publishes requirements documents that describe the criteria for facilities and their operation for each of the categories above.

Areas within a healthcare facility that may require DAWR licencing include:

- laboratories (microbiological BC2 or BC3)
- animal houses (animal BC2)
- insectaries (invertebrate PC2)
- aquariums (aquatic BC2)

DAWR does not conduct facility compliance inspections themselves, DAWR licenced third party assessors conduct facility compliance inspections on the behalf of DAWR. Upon a successful facility compliance inspection DAWR then review documentation required for the operation of the approved arrangement (such as standard operating procedures - SOPs) to ensure operational containment can be maintained. Following the initial inspection that involves both a DAWR licenced third party assessor and DAWR periodic inspections and audits thereafter are by DAWR alone.

Department of Health or Environment Protection Authority / ARPANSA

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) publishes codes, standards and guides that are designed to promote practices which protect human health and the environment from the effects of radiation. Within this range of documents are Radiation Protection Series No. 14.2 Safety Guide, Radiation Protection in Nuclear Medicine that gives guidance on the requirements of facilities for the manufacture of therapeutic radiopharmaceuticals and Radiation Protection Series No. 16 Safety Guide, Predisposal Management of Radioactive Waste that gives guidance on radioactive waste storage facility requirements.

ELGAS

OUR ENERGY YOUR CARE THEIR COMFORT

WE MAKE IT OUR BUSINESS TO MAKE THE SUPPLY OF LPG AS SIMPLE AS POSSIBLE FOR OUR CUSTOMERS.

- Cost effective - pay only for the LPG you use
- It's like having reticulated gas without the line connection costs
- No peak and off peak rates
- No manual handling
- We monitor usage so you never run out
- Local customer service centres

CALL FOR A FREE ENERGY REVIEW OR REQUEST AN INFORMATION PACK TODAY.

1300 362 389

www.elgas.com.au/careLPG

LEADERS IN LPG SUPPLY•SERVICE•SAFETY

ARPANSA publishes codes, standards and guides relating to protecting against the effects of radiation but does not enforce them. The enforcement of the ARPANSA documents is undertaken by the Department of Health or Environment Protection Authority in each state and territory. The Department of Health or Environment Protection Authority conduct an initial inspection and periodic inspections thereafter.

National Pathology Accreditation Advisory Council (NPAAC)

The National Pathology Accreditation Advisory Council (NPAAC) is responsible for the publication of standards and guidelines for pathology laboratories, these include:

- Requirements for Medical Pathology Services
- Requirements for Medical Testing of Human Nucleic Acids
- Requirements for Procedures Related to the Collection, Processing, Storage and Issue of Human Haemopoietic Progenitor Cells

The above publications include requirements that relate to the construction and operation of pathology laboratories. Audits against NPAAC standards and guidelines are undertaken by the National Association of Testing Authorities (NATA) initially and periodically thereafter.

Animal Welfare Requirements

The National Health and Medical Research Council (NHMRC) publishes the following documents relating to animal welfare:

- Guidelines to promote the wellbeing of animals used for scientific purposes
- Australian code for the care and use of animals for scientific purposes

Facility animal ethics committees (AEC) are responsible for the application of the above codes and guidelines for aspects relating to the care of animals for research including those aspects relating to the facility construction and operation.

Each state and territory has a government body that licences areas used for housing animals for research, in Victoria it is the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), Agriculture Victoria and in NSW it is the Department of Primary Industries, Animal Welfare Unit. The DEDJTR conducts audits of licences and AECs initially and on a three years basis following the initial inspection.

WHAT IS REQUIRED TO SATISFY THE REGULATORS?

The regulators of areas within healthcare facilities with special licencing requirements all differ in what they require for licencing. Some regulators merely require an application to be submitted and physical inspection undertaken of the constructed area to be licenced, other regulators require evidence that the facility operator has been in control of the design and construction throughout the process for the area to be licenced to provide assurance that the licenced area will operate as the facility operator intended at the outset of the project.

State Pharmacy Authority

Facility licencing requires:

- Submission of an application form and associated application fee.
- Physical inspection of the pharmacy areas.

Office of the Gene Technology Regulator

Facility licencing requires:

- Submission of an application form
- Establish or have access to an institutional biosafety committee (IBC). The IBC consists of a range of experts and an independent person and exists to ensure compliance of OGTR licenced facility legislative requirements. The application for licencing to the OGTR is supported/reviewed by the IBC.
- PC 1 and PC2 level inspections of the areas to be licenced are completed by the IBC, PC3 and PC4 level inspections are conducted by the OGTR. At the time of inspection all equipment and furniture required for an operational facility is to be in place.
- Provide records of:
  - > Training of personnel in dealings with GMOs
  - > Validation and calibration of heat based decontamination equipment
  - > Water supply backflow prevention device testing
  - > Class II biosafety cabinet testing
  - > Holding, transport and destruction of GMOs.
  - > Approval for use of operational SOPs
- Upon submission of an application for licencing of an area the OGTR allows itself 90 days to reach a decision to issue a licence, refuse to issue a licence or request further information.

Department of Agriculture and Water Resources

Licencing requires:

- Submission of an application form and associated application fee.

- Engagement of DAWR approved third party assessor to assess compliance of area to be licenced against AS/NZS 2982 and AS/NZS 2243.3 requirements by site inspection and issue of certificate upon successful assessment. At the time of inspection all equipment and furniture required for an operational facility is to be in place. Floor plans and area flood and earthquake zoning are required to be provided as part of the assessment.
- Provide records of:
  - > Training of personnel in handling quarantine material
  - > Validation and calibration of heat based decontamination equipment
  - > Water supply backflow prevention device testing
  - > Class II biosafety cabinet testing
  - > Facility leakage testing (applicable only to BC3 and BC4)
  - > Holding, transport and destruction of quarantine material.
  - > Approval for use of operational SOPs
- Upon submission of an application for approved arrangement licencing of an area DAWR will make a decision to approve or refuse the application within 90 days.

Department of Health or Environment Protection Authority / ARPANSA

Licencing requires:

- Submission of an application form and associated application fee.
- Physical inspection of the areas where radiation will be present.
- Provide records of shielding assessment of the area where radiation will be present.
- Provide a floor plan and identify occupancy and purpose of surrounding rooms.
- Provide information on facility construction:
  - > Surface finishes within the area
  - > Ventilation within the area
  - > Liquid waste collection within the area
- Historical information provided by the Victorian Department of Health suggests a licence application processing time of 2 to 3 weeks.

National Pathology Accreditation Advisory Council (NPAAC)

Licencing requires:

- Submit laboratory enquiry.
- Provide proposed operations in written form.
- NATA advisory visit to laboratory (equipment and staff to be in place).
- Submission of application form and associated application fee.

Animal Welfare Requirements

Licencing requires:

- Submission of an application form and associated application fee.
- Physical inspection of the animal house (animal holding rooms and experimental rooms).
- Audit of the animal ethics committee.

Therapeutic Goods Administration

- Submission of an application form and associated application fee.
- Physical inspection of pharmaceutical manufacturing areas including areas where raw materials and components used in the manufacturing process are stored.
- Evidence of validated/qualified systems associated with the pharmaceutical manufacturing process such as:
  - > Manufacturing area building fabric and finishes
  - > Manufacturing area air conditioning
  - > Manufacturing equipment
  - > Process utilities used to serve manufacturing equipment (water, steam, compressed air, gases, etc.)
  - > Manufacturing area environmental monitoring (manufacturing room temperature, relative humidity, room pressure and air particle counts)
- Evidence of validated/qualified systems is demonstrated by providing records of:
  - > Facility operator approved validation masterplan (VMP) document, this describes the qualification process and defines what areas and systems are to be qualified.
  - > Facility operator approved user requirements specification (URS) document, this describes the performance of the system or area.
  - > Facility operator approved functional specification (FS) document, this describes the operation of the system or area.
  - > Facility operator approved user design specification (DS) document, this describes the installation of the system or area.
  - > Facility operator pre-approved and successfully completed installation, operational and performance qualifications (IQ, OQ and PQ) for the aforementioned systems.
- According to the TGA website the organisation has a target timeframe of less than 3 months between submission of a compliant application and issue of an inspection report (for a manufacturing area that satisfies GMP requirements). Timeframes for application processing can exceed this target timeframe. The TGA nominate the inspection date at the time of application submission. It is advisable to communicate with the TGA in advance of licence application to understand the likely timeframe for inspection upon licence application.

CONCLUSIONS

For licencing of areas where the regulator is different from state to state it is necessary to engage with the regulator in the state where the facility is to be located as there can be differing expectations from regulators in different states particularly if the codes/standards/guidelines enforced for licencing are also state based.

For licencing by some regulators there are significant timeframes required for licence application processing and inspections. In order to deliver a licenced facility to an operator these timeframes must be considered when programming the delivery of these areas. Early engagement with regulators to understand licence application timeframes is desirable.

While all regulators have specific requirements and require the provision of documentation to prove licencing aspects have been addressed, the TGA is the most onerous. Beyond the requirement for the constructed manufacturing area to meet GMP requirements, there is a requirement to demonstrate that the licence applicant has:

- Approved the facility design prior to construction (this is achieved by the approval of qualification documentation – VMP, URS, FS and DS)
- Approved any changes to the design during construction.
- Confirmed that the design requirements are borne out in the constructed facility and that it operates as intended (this is achieved by testing and completion of pre-approved qualification documentation – IQ, OQ and PQ) with the end result of consistent product quality.

AGGREKO'S HEALTHCARE RENTAL EQUIPMENT SOLUTION

Failure of power, heating and cooling systems to support the critical functions that hospital facilities deliver can have disastrous consequences. Unavailability of power could mean that the hospital cannot provide critical life support functions and failure of heating and cooling systems could increase the risk of the spread of infectious diseases.

If power is unavailable to the facility a range of services provided by clinical activities, emergency surgery, medical and building equipment are affected compromising the healthcare of patients. Even if emergency power is available after mains supply power has failed, it may still not be enough to satisfy the present load requirements of the facility.

The healthcare of patients is also compromised if cooling and heating systems fail. This could result from incapacity to meet demand perhaps due to infrastructure changes or even because extreme weather conditions encountered in winter and summer months have overloaded these systems. Consequently air conditioning and domestic hot water will not be available creating unhealthy ambient conditions to prevail.

Using their expertise in the supply of backup and emergency power, heating and cooling systems from around the globe Aggreko offers practical cost effective solutions. For hospital facilities the speed of response is critical and Aggreko's extensive footprint in Australia means that these systems can be deployed very quickly. Aggreko's engineers visit the site to define system capacity and the interface with the existing facility infrastructure. The systems are installed, interfaces are tested, proven to the satisfaction of the facility, continuously monitored and maintained.

Both diesel or natural gas emergency generators can be provided. If preferred, natural gas powered generators can be connected to the permanent supply line of the gas provider thus alleviating the need for diesel fuel storage. When diesel generators are deployed Aggreko provide a fuel management plan to ensure the continuous supply of fuel. It includes

on board fuel tank level monitoring, storage tank monitoring and in the event that the generator has to run for longer than the fuel available on site, tanker availability and access to the facility to replenish supplies is also considered.

Once running Aggreko remotely monitor and maintain these systems. To maximise uptime there are significant trouble shooting features. Each system is remotely monitored via the Remote Monitoring (ARM) system which transmits real time data back to the Aggreko Remote Operations Centre (ROC) staffed by technical experts 24/7. The real time data monitored includes run status, plant number, fuel level, battery level, telemetry status, estimated fuel expiry, fuel consumption rate, fuel responsibility, run hours, internal and external fuel status, output frequency, output voltage, active power and power factor.

The ARM monitoring system is used on diesel generators and chillers and in 2016 there were 6100 assets fitted with ARM Australia wide. The real time data gathered at the ROC is used to analyse, diagnose and solve problems faster and with greater accuracy and is also used to proactively prevent potential issues. Responses tailored to fix the specific problem are relayed to technicians in the field through the ARM app on a mobile phone or tablet. If on site presence is required Aggreko coordinates with the local service centres to rapidly dispatch a technician to resolve problems.

The potential issues that healthcare facilities may face in emergencies can be countered by Aggreko's technological knowhow, it's extensive presence and its speed of response. The Aggreko solution not only provides these advantages but the solution is offered under a commercial rental arrangement with significant cost benefits. With the rental agreement the customer does not have to buy and maintain systems and has the option of returning it when it is no longer needed. Aggreko delivers, installs and proactively maintains the unit for the customer, with costs associated with routine and preventive maintenance included in the rental fee. Supplied on an as need basis the units can be deployed and re-located as required.

aggreko

Power, cooling and heating for hospital facilities

In situations that involve the health of patients, you need the global leader in rental power and temperature control behind you. Our fleet of generators, chillers, heaters and de-humidifiers is backed by the support of a team of expert technicians who will ensure that your facility is running efficiently, all the time.

INFECTION PREVENTION AND WORKPLACE SAFETY IN OPERATING THEATRES –

AIRBORNE PARTICLES AND BACTERIA NEED A RE-EVALUATION IN EXISTING STANDARDS

By Rupert Mack

Worldwide patients are suffering from an increasing number of antibiotic resistance bacteria. Numerous studies show the health threats related to surgical smoke. The issues related to particles in high risk areas historically are taken into account in the industrial cleanroom business represented by ISO EN 14644. In clean rooms as in critical areas in hospitals, particularly in operating rooms, it is always about protecting people and material. The focus is to protect people from hazardous substances as well as surgical instruments from contaminants. There is no doubt air is a transmitter of particles and bacteria. Worldwide we differentiate two types of airflow: Laminar Airflow and Mixed Flow. In contrast to Mixed Flow Laminar Airflow can assure a significant reduction of airborne bacteria in the so called "protection zone". It is a major advantage in keeping surgical instruments sterile. Clean instruments prevent infections. Furthermore, Laminar Airflow systems prevent the inhalation of surgical smoke by the surgeons. That's why new standards need to take the following aspects into account.

REDUCTION OF MICROBIAL SURGERY FIELD LOAD AS WELL AS PROTECTION OF PATIENTS FROM GRANULOMAS/ ADHESIONS

Basically, in accordance with the international standards for clean room technology (ISO 14644), a clean room class ≤ ISO-5 can only be guaranteed by Unidirectional Airflow (UDF) systems. This is derived from the recovery times of less than 2 min according to ISO 14644, which can be achieved with Laminar Airflow systems, whereas Mixed Flow systems need 20 - 25 minutes recovery time.

This was the reason for the introduction of Laminar Airflow systems, which began around 1995, also in operating theatres, although it is scientifically proven by current publications that with these air supply systems, in comparison to the Mixed Flow ventilation (HEPA filter diffusers), the sedimented germ count in the protection area (surgery field, instrument tables) is reduced by 20-fold (95%). For this purpose, vertical flow (< 0,30 m/s) of sterile air from the surgical ceiling to the floor is necessary. Especially all the instrument tables have to be located in the so-called "protection zone" that requires a size of about 3 x 3 m, as the risk of microbial contamination being transferred into the surgical wound through (possibly several) instrument tables, due to their significantly larger areas, is a multiple of the risk of contamination. Finally, the effectiveness of the Laminar Airflow system must be approved by means of a standardized acceptance test on site.

Sterile particles are emitted from sterile cover material such as f. ex. wipes, swabs and gauze, which, due to their size, are partly capable of sedimentation

(≥ 10 µm). These particles are known to indicate granulomas from which adhesions can develop, which, for example, may lead to pain symptoms or restrictions, so that subsequent surgeries may be necessary.

In order to remove these intraoperatively released particles immediately from the protection area only Laminar Airflow systems are suitable while Mixed Flow systems are transporting the particles in the operating theatres for an extended period of time and there is therefore an increased risk that these particles can be re-inserted into the wound area or on the instruments and secondarily to the wound.

In order to protect patients and surgical staff Weiss Klimatechnik invented Continuous Particle Monitoring (CPM). The air is sucked in through a vacuum pump via a tube right in the critical area above the surgical instruments or the instrument table and the air is conducted through a particle counter that continually measures the air quality. If the air pollution increases, e.g. through the vigorous movement of the surgical staff, then the clean air supply is also automatically increased for the period of the increased burden. A screen or a light shows the current status of the air quality at all times.

BENEFITS:

- Prevention of infection through the continual monitoring of the air quality
- Light-screen display to show the current air quality
- Increasing awareness among the surgical staff and protection of the sterile chain
- Clean air supply adapted to suit requirements
- Quality management possible for every operation thanks to documentation

Experience our CPM system live in our showroom!

https://www.youtube.com/watch?v=9T5NkfdzIMA

WORKPLACE SAFETY

In operating theatres the occupational health and safety of the surgical team are essential requirements. In addition to alcoholic disinfectants as a fire load and narcotic gases with partially carcinogenic potential numerous recent studies prove a further relevant potential risk for the surgical teams by "surgical smoke". This is released intraoperatively by electrosurgical (high frequency), laser and ultrasound procedures and the frequency of use has increased considerably in the last 10 years so that the median for example in the intraoperative high frequency application is between 24 % and 82 % and allows a reduction of the total operating time by up to 30 %.

Surgical smoke is primarily inhaled by the surgeon, but also by the entire surgical team, and is a combination of carcinogenic gases and ultrafine particles, proving that the gaseous pollutants will be adsorbed from the particles, which will result in a 96-fold higher risk, so that the total particle number released by a high frequency application (70 watts) of < 30 seconds corresponds to that of an inhaled cigarette.

In order to remove these short-time massive particle emissions immediately from the inhalation area of the surgical team only Laminar Airflow systems are suitable, as they reach a recovery time of < 2 min as those with Mixed Flow systems accumulate to significantly higher room air concentrations.

In combination with Laminar Airflow systems Weiss Klimatechnik developed a surgical smoke evacuation system.

The evacuated air is sucked into a tube and is transported though a vacuum pump or a fan directly to the exhaust air. The process significantly reduces smoke particles and unpleasant smells. Furthermore, regular filter changes are not necessary unlike with mobile devices. The placement of the pump or fan outside of the operating theatre avoids noise pollution. In combination with a low-turbulence displacement flow ceiling, the innovative smoke extractor offers the best efficiency and therefore optimum protection in addition to comfortable working conditions for the surgical staff. As an option, the extractor can be coupled to the surgical instruments and can be automatically switched on and off.

BENEFITS:

- Optimum protection of workers against surgical smoke, aerosols, nanoparticles and other hazardous substances
- Clear view thanks to direct extraction and possibility to work independently without additional staff
- No noise pollution thanks to the connection to the exhaust air (no recirculating air)
- No noise generation since the pump is outside the operating theatre
- Easy to maintain, no filter change necessary

Modern technology and electronics allows the BAXX to achieve the aim of eliminating airborne pathogens by using cold plasma to strip a hydrogen atom from some of the natural water molecules (H20) contained in the air around us, leaving them as unbalanced hydroxyl clusters (-OH). These clusters seek and attach to airborne bacteria and virus cells and recover their missing hydrogen atom from the cells wall to return to a natural water molecule again (H2O).

In that instant, the bacteria/virus metabolism and cell wall is disrupted and the cell dies. Thus nature's way of eliminating airborne pathogens has been reproduced.

Hydrogen Peroxide was the most effective airocell spray in dealing with the spread of the SARS outbreak on the turn of the century. It was in fact this finding that prompted Dr Allan Chua to investigate further and invent the cold plasma method of producing natures hydroxyls.

Hydroxyl knowledge had already been advanced earlier out of investigating methods of combating germ warfare by the British Ministry of Defence who had a remit to assess the risk of bacterial attack on the British Isles in the 60/70's. This in turn had been initiated by observations over a hundred years prior by Louis Pasteur who had documented that the atmosphere in high altitudes and sunny days reduced the incidence of infection and effectively killed bacteria and viruses.

He found the answer lay in the natural occurrence of airborne Hydroxyl Clusters.

The use of stripping away hydrogen atoms from airborne water molecules to form hydroxyl clusters by a cold plasma field is unique to the BAXX which naturally kills all airborne pathogens including MRSA, C.Diff(Spore Form), Norovirus and Bacteria.

BAXX introduces several technological breakthroughs and advantages –

- It doesn't require any consumables other than electricity. No filters to clean, no chemicals or liquids to replenish, no service required allows the Baxx to be mounted high in the room for the most effective circulation and coverage. Install it and leave it to do its work. Electrical consumption is a mere 120watts – the equivalent of two 60watt light-globes.
- The casing of the Baxx is in 316 stainless steel which makes it ideal for food manufacturing plants, health care facilities, retail outlets, and any other moist environments where a germ free environment is paramount.
- The only moving part is a resin-packed motor attached to a fan. These type motors can cope with dry & dusty conditions to wet and clammy environments and so the Baxx can be employed in steamy kitchens or cold wet chillers just as easily as dry powder mixing rooms and anything in-between.

Brackets on the Baxx unit also facilitate wall or ceiling mounting. It's usual to hard wire the Baxx unit to a continuous power circuit as the Baxx unit should never be turned off. Not overnight, not for weekends, not for holidays – it's always working for you to eliminate pathogen contamination in that room.

A single Baxx unit is capable of covering up to a 360 cubic metre room, although air losses such as exhaust fans, hoods, permanently open doorways etc may require additional units to compensate.

Applications encountered so far include –

- Hospital kitchens.
- Aged Care meal kitchens.
- Medical centres.
- Backpackers accommodation to remove smoking odours.
- Smallgoods manufacturing.
- Lettuce leaf washing & packing to remove Listeria.
- Export Game meat facility boning room.
- Yogurt cooking and rapid cooling rooms.
- Meat wholesalers.
- Chicken meat processing plants.
- Flour mill storage rooms to eliminate flour moulds.
- Seafood processing plants.
- Cold storage rooms.

Several large meat and other food industry users of BAXX have also noted a reduction in sick leave by staff working in the areas covered by the Baxx units. After all, BAXX is killing flu and cold virus just as efficiently and effectively as any other pathogen.

Destroys Bacteria

Fast facts.

Baxx is an environmental pathogen and air-borne pollutant removal system.

The Baxx cold plasma technology kills Bacteria, Virus, Moulds & Fungus spores by disrupting the metabolism of their cell walls – no toxins, no chemicals, no radiation.

There are neither filters to replace nor consumables – no servicing and requiring only an occasional clean. Install it and let it do the work. Ceiling or wall mounted. 220v -240v.

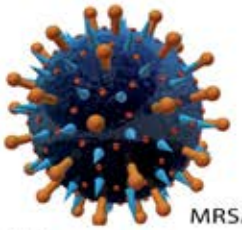
3 year 24/7 warranty - continuous running.

Unique cold plasma technology to create Hydroxyl Clusters which naturally kill all airborne pathogens. These groups also react with odour causing chemicals such as ammonia and methane gas to produce neutral compounds such as Co2, Nitrogen and Water. The harmless way to create a safer and cleaner environment.

Protection for Guests and Staff

Hydroxyls are the single most important cleansing agent in our environment.
* 33% more effective at oxidizing pollutants than ozone.
* 2.5 times more germicidal and fungicidal than liquid chlorine
* Perfectly safe to breathe and use in occupied spaces

In a room of 28m2 at 27°C the Baxx reduced bacteria levels by 99.9% within 90 minutes, and viral traces were reduced by 88.96%. Ammonia levels reduced from 100% saturation down to zero in 30 minutes - without Baxx intervention the levels are 48%. Decomposition and ethylene gases are also effectively reduced/eliminated by Hydroxyls produced by Baxx.



TESTS INDICATE EFFECTIVE ELIMINATION OF THE FOLLOWING -
ESCHERICHIA COLI (E COLI)
STAPHYLOCOCCUS AUREUS
LISTERIA MONOCYTOGENES
PSEUDOMONAS and ASPERGILLUS NIGER
CAMPYLOBACTER
BACILLUS SUBTILIS SPORE
SALMONELLA
SACCHAROMYCES CEREVISIAE
MRSA, C.DIFF(SPORE FORM) AND NOROVIRUS

BAXX™ Australia

AUSTRALIAN TECHNOLOGY PATENT NO.2006100345 AUS
SPECIALLY DESIGNED FOR BACTERIA ELIMINATION

www.baxx.com.au

www.baxx.biz (Singapore)

www.baxxuk.com

ST ANDREW'S HOSPITAL

A JOURNEY FROM A FAILED CO- GENERATION PLANT TO A NEW TRI- GENERATION PLANT

By Peter Cooper – Director Engineering & Support Services, St Andrew's Hospital INC.

The purpose of this document is to provide you with an appreciation of the facilities that comprise the physical assets for the St Andrew's Hospital (Adelaide, SA), & our journey from our existing co-generation plant to what will soon be our new tri-generation plant.

CURRENT FACILITY CHARACTERISTICS

1. Building Stock ranging from 1866–1990's

- Concrete Cancer
- Brick Growth
- Heritage Buildings
- Asbestos
- Box Gutters
- Salt Damp
- Termites
- Aging Infrastructure (including but not limited to)
  - > Hydraulics
  - > Mechanical Services
  - > Architecture
  - > Lift Services
  - > Electrical Services Upgraded 2011
  - > VOIP Infrastructure (ITC Platform) Commissioned 2012

2. Plant & Equipment

- 7 Chiller Sets
- 4 Boilers
- 3 Diesel Generator Sets
- 1 Cogenerator Set
- 5 Elevators
- Multiple AHU's
- Wide array of Medical Surgical devices including
  - > Da Vinci Robot
  - > Full Cardiac Thoracic Theatres
  - > Angiography Suite
  - > 11 Theatres (Total of 16 Procedural Rooms)
  - > Lasers

The site is constantly undergoing renovations, patient rooms, en-suites, car parking facilities & the like.

1990 -92

The site underwent a major development that provided the new Central Wing which accommodated the ICU, Kitchen, Angiography Suites, Organ Imaging/Nuclear Medicine/Cat Scan & new 35 Bed Wards on each of the 2nd, 3rd & 4th Floors.

2017 2018

Construction of a new Eastern Wing consisting of:

- 200 bay underground car parking facilities.
- 2 Theatres
- 2 Angiography Suites
- 3 Endoscopy/Procedure Rooms (1 of which is serviced to provide Emergency Theatre status)
- 28 Bed Cardio – Thoracic Ward

CAPITAL INJECTION FOR PLANT & EQUIPMENT

As a component of the 1991 development of the Central Wing of the Hospital a significant capital injection was also undertaken for new & upgraded plant & equipment for the site.

At around this time St Andrew's Hospital installed a Cogeneration Plant (The Cogen was commissioned in 1993).

(I was the Engineering Manager at the Adelaide Children's Hospital at this time and I can remember taking part in an IHEA Branch site tour, of the new co-generator plant at St Andrew's.)

Here in South Australia – back in 1993 – it was considered some of the leading technology available to Hospital Facility Managers.

DESCRIPTION OF THE CO-GENERATION PROCESS (OR COMBINED HEAT & POWER CHP)

Cogeneration is a thermodynamically efficient use of fuel. In separate production of electricity, some energy must be discarded as waste heat, but in cogeneration some of this thermal energy is put to use. All thermal power plants emit heat during electricity generation, which can be released into the natural environment through cooling towers, flue gas, or dump radiators. The CHP captures some or all of the by-product for heating either very close to the plant, to heat water for ablutions, pre heating for sterilization plant and heating water for the air conditioning utilization. Typically the hot water from the waste heat developed in co-generator plant will reach temperatures ranging from approximately 80 to 130°C. This is also called combined heat and power.

THE ST ANDREW'S CO- GENERATION PLANT

The Engine was:

- Caterpillar 3508 Spark Ignited Engine
- It was originally designed as a Diesel Engine converted to Gas Fuelled version
- It was Turbo Charged
- It was rated at 500kWe
- The synchronisation to ETSA was managed by a Woodward `easYgen-3000GenSet Control Platform
- It operated on a 24/7 basis 365 days per annum (excluding downtime for servicing).

Commissioned 1993

Decommissioned 2015

TOTAL OF 146,992 Run Hours.

UPTIME

- However July 2013 Equated to 96.7% (Less Programmed Servicing Downtime)
- September 2015 Equates to 83.5% (Less Programmed Servicing Downtime)

THEREFORE WE HAD LOST 13% of the previously achieved uptime in approximately 2 years.

To further exacerbate this matter, the final 20 months of the life of the engine we had de-tuned it in order to extend the run life.

During that final 20 months the engine & controls were clearly showing signs of fatigue congruent to it reaching the end of its economical life:

- There was a clear pattern of progressively failing components
- Parts were becoming increasingly difficult to source
- On the rare occasions that parts were sourced they proved to be extremely expensive.

THE PROPOSED ST ANDREW'S TRI-GENERATION PLANT

It was now time to commit to the planning for the successor to this Plant

It should include a Tri-Generation approach in lieu of Co-Generation, this would require the addition of an Absorption Chiller & Cooling Tower, to assist with the management of the Hospital's existing heat load plus the additional heat load of the new, (yet to be completed), Eastern Wing of the Hospital.

In addition to assisting with the air conditioning load, it should also be capable of managing the increased thermal requirement for:

- (Hot) Ablution Water
- Pre heated water for Sterilisation
- Heated Water for the Mechanical Systems.

All of this while at the same time generating the base load electrical energy requirement for the site

TRI-GENERATION PLANT

Mode of Operation for St Andrew's Hospital

Tri-generation is the production of:

1. electricity,
2. heat and
3. cooling in the one process.

For St Andrew's Hospital this means a gas fired engine driving a generator producing electricity for the Hospital site.

Due to the reciprocating technology of the engine, heat energy, developed in the engine's exhaust & water jacket systems is developed as a waste product of the process. This heat energy is then transferred to an absorption chiller which produces chilled water for the cooling cycle of the air conditioning plant and hot water for air conditioning or alternatively the heat is used to heat ablution water or pre heating for steriliser water feed.

The ratio of electricity produced and exhaust heat for the absorption chiller and then the ratio of cooling to heating can be varied to meet the specific site requirements.

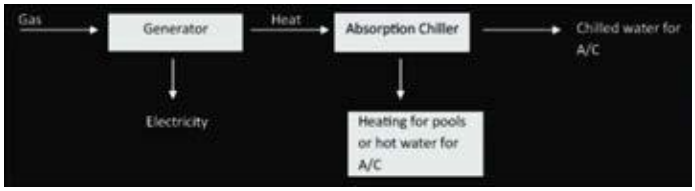


Figure 1. Heating for Pre heated Steriliser water feed, Ablution Water, Mechanical Systems occupied space

THE BENEFITS OF A TRI-GENERATION SYSTEM

1. Savings on energy costs;

Using tri-generation to produce electricity, and specifically when using gas to run the engine & generator and produce heat for the absorption chiller instead of power from the grid to run the air conditioning plant, savings on energy costs in the order of up to 30% can be achieved, depending on the relative price of gas and electricity to the site.

2. Savings on Greenhouse gases;

Producing electricity on site using gas produces approximately 30% less greenhouse gases then using power from the grid for an equal amount of power output.

3. Back-up power to the site;

A tri-generation plant can provide a substantial proportion of a site's power and in the case of a black-out can provide a proportion of the site's energy requirements.

4. Independence from the Grid;

Installing a tri-generation plant provides a site with a level of independence from the power grid. In some areas the capacity of the grid is constrained and in extreme conditions the grid may need to impose restrictions on use.

5. Constraints on the Grid;

At some sites the grid constraints may be limited or the cost to the user to upgrade the grid so high that the use of the site is constrained. A tri-generation plant can overcome this constraint.

6. Energy costs are rising;

Worldwide the cost of energy from the grid is rising and will continued to rise into the foreseeable future. A tri-generation plant can be a buffer against some of this increase in energy costs.

The Trigen plant is intended to operate 24/7 except when switched off for maintenance.

This unit produces:

- Steam for CSSD and other loads – variable loads available every day depending upon CSSD hours
- Hot water for air conditioning – load available at all hours where ambient is below 18 degrees
- Heating and domestic hot water heating – load available every day on variable demand
- Steam boosted hot water for the Absorption chiller – load available 24/7
- Electricity input in parallel with the SAPN grid – Load available 24/7

The total capacity of the electrical output is 635 kW

The minimum allowable engine load for continuous running is 40%, allowing 10% margin we have used 50% as the minimum = 317 kW.

The site minimum power input from SAPN is 10% of currently maximum demand =180 kW

- *Clarke Energy Supplied the Gas Engine*
- *Watson Fitzgerald installed the Plant*
- *Frostec are currently Commissioning the Plant.*
- *System Solutions are the Consulting Engineers.*

DO WATER LEAKS OCCUR IN HOSPITALS?

By Brad Prezant, MSPH, CIH, COH

Certified Occupational Hygienist

Do water leaks occur in hospitals? Oh yes. Can they go undetected for long enough that mould and bacteria will proliferate? Most definitely. Do massive sewage leaks occur in hospitals? Need I say more? These things routinely occur in world-class health care facilities, as you are probably well aware.

This article, the first of two, is about mould in hospitals - resulting from either water leaks and indoor fungal growth, or agitation of accumulated outdoor dusts containing mould spores. A second article will address sewage leaks in hospitals.

There are several very important things to keep in mind when considering airborne mould spores (fungal particulate) in hospitals, versus any other type of building.

Unlike most homes or public buildings, occupants are in hospitals specifically because of their compromised health status, and many do not have our natural and full ability to fight off infection. Severely immuno-compromised patients (patients unable to resist infection in the same way a normal person might) are present on transplant wards, cancer wards, and other specialty treatment centres in the hospital. While indoor moisture and visible mould growth results in irritation and allergies, such as asthma, among hospital patients these exposures can also result in fatal lung infections.

For well persons, inhaled spores result in respiratory system disturbances, and allergic reactions, such as asthma. Our immune system prevents these inhaled spores from growing in the warm moist conditions within the lungs. Persons with compromised immune systems have reduced or non-functional white blood cells (the main line of defence against fungal and other infection). Leukemia or other blood cancers, persons on high doses of steroids, persons who are medicated following organ transplants, and persons on certain chemotherapies are all particularly immune-deficient. They are at risk not just for the allergy and irritation described above, but also for lung colonisation with fungi, simply described, a fungal infection within the lungs.

The medical term for the fungal infection we are talking about is "aspergillosis", as the mould species causing such infections are from the Genus

Aspergillus. The most common pathogenic fungi associated with aspergillosis are Aspergillus fumigatus, Aspergillus niger, & Aspergillus flavus.

Hospital-acquired Aspergillus infections and other hospital-acquired infections are termed "nosocomial", to be distinguished from Aspergillus infections acquired from exposures in other indoor locations or outdoors, which are termed "community". It is sometimes difficult to determine if cases of aspergillosis occurred within the hospital, or whether the patients came to the hospital already infected. Hospital infection control personnel routinely monitor the occurrence of aspergillosis, and if the rate of infection goes up, further investigations are taken to determine if this "epidemic" could be due to an Aspergillus spore source within the facility. How did they get into the air patients breathe?

Aspergillus species are frequently found among the diverse filamentous fungi (mould) colonizing building materials, so any wet building materials within the hospital are likely supporting growth of Aspergillus as well as many other species of mould. Aspergillus spores are also ubiquitous outdoors, and frequently are among the top 5 species recovered from normal outdoor air. We could be talking hundreds of spores per cubic meter or more in typical outdoor air. Because Aspergillus spores are present in normal outdoor dust, any accumulation of dust or dirt from the outdoors can be a source of Aspergillus spores.

Hospitals, particularly under the supervision of infection control personnel, are vigilant about preventing exposures to dusts containing Aspergillus spores. High efficiency ventilation systems with prefilters and bag filters, such as are installed in all hospitals, routinely filter out almost all of the outdoor Aspergillus spores, so normal hospital air is usually low in infectious Aspergillus spores. Supplementary ventilation systems in areas of high risk can provide further filtration that removes Aspergillus spores and of course also removes other fine particulate.

Concerns can come during remodelling activities when deposits of outdoor dust that have accumulated over many years are disturbed, aerosolised, and spread throughout the interior of

the hospital. Concerns can come during excavation activities, where soil containing Aspergillus spores is being disturbed, and open windows or other pathways exist for that dust to enter the building. Concerns also come when fungal growth of Aspergillus species occurs on building materials exposed to moisture or condensation within the hospital. Aspergillus species routinely grow on wet building materials, but certain conditions, such as wet hot steam lines, can be perfect for Aspergillus fumigatus to grow, with the high heat providing ideal conditions for their growth, and suppressing other types of competing fungi. Preventing fungal growth within hospitals is therefore an important concept in infection control.

Many hospitals have in place infection control procedures to address work activities within the hospital that could aerosolise dusts, which are assumed to contain Aspergillus spores. These include vibration-causing activities such as drilling through concrete, and entry into suspended ceiling areas where dislodging a ceiling tile and running cabling will raise dust levels. When activities that could aerosolise dust are performed, a number of engineering controls can reduce the potential hazard. These include isolation, typically with temporary plastic walls, depressurisation with negative air machines to contain dusts produced, and filtration of the air within the work area. Walk-off mats with sticky surfaces can reduce the tracking of dusts outside of the work area. Usually a number of these control technologies are applied to minimise risk. Several listed references at the end of the article describe these control measures. Contractors should receive training in these mitigation strategies and the reasons why they are important to ensure proper compliance. There are also ways to test and verify the performance of these control technologies.

One way is to directly measure airborne Aspergillus spores, another is to measure airborne dusts given off by these activities, with the assumption that they contain Aspergillus spores.

There are several ways in which air can be monitored to identify airborne Aspergillus spores, and therefore, the risk of aspergillosis infection. Some institutions do

routine air monitoring, taking further investigative action when the levels increase as compared to historical monitoring. Others use air monitoring to help identify the source of Aspergillus spores after infection control personnel see an increase in aspergillosis cases.

Air monitoring for Aspergillus spores is typically done using agar-filled petri dishes and quantitative air sampling devices. The sampling device, using a powerful but small fan, impacts sampled air into a gelatine-like surface containing a growth medium with ideal moisture and nutrition. The spores germinate and grow into identifiable colonies on the petri dish. The growth process takes 3-7 days, while the petri dish or strip is incubated at either room temperature or body temperature. At the end of the incubation period, the colonies are identified based upon their visual characteristics, either with the naked eye or with the aid of a low power microscope. New technologies that identify Aspergillus species using high-tech molecular identification are emerging, but the majority of analyses look for the spores that are capable of germinating and growing inside the lungs, and the culture-based methods correlate well with this.

This method has one significant disadvantage – the time it takes from when the samples are taken until the results are available. This can be 5-7 days or more. This can be a big problem, as a positive finding in the test could mean that the undesirable conditions were maintained for a week, creating significant risk of infection during the time it took to get air monitoring results.

The alternative method often used to address these concerns is continuous electronic particle monitoring. Unlike the culture method of air sampling, particle monitoring is not a specific test for Aspergillus spores, or even fungal spores in general, because it measures all particles in the air. But it can very effectively be used in this context to identify conditions of dust release, assuming that spores are part of that dust. And the results are available in real time, with no delay, permitting corrective action to be taken immediately.

Particle monitoring can be used to verify that construction activities in one location are not generating particulate that is moving towards sensitive areas. For example, a continuously operating particle monitor located outside of a dusty, plastic-contained work area might indicate if a leak or tear or failure in a negative pressure control device has occurred, as evidenced by a sudden increase in total particles in the air. Immediate action can then be taken to address the breach.

Particle monitors have become more sophisticated and have come down in price over the last 20 years. Many contemporary monitors provide a particle count for 5 or 10 size ranges of particulate. When an occupational hygienist uses such a monitor during construction activities, the size of the released particle can provide clues as to the source, permitting a rapid fix of the situation.

Aspergillosis is a frequently fatal disease that can be caused by fungal growth within hospitals from wet building materials, or by aerosolization of accumulated outdoor dusts made airborne through vibration, agitation, or other construction activities. Infection control personnel and building maintenance personnel together form a powerful team to manage exposures to prevent infection in vulnerable patient populations. Occupational hygienists can supplement these efforts, by anticipating these problems before construction activities begin and designing control systems to prevent emissions, and by providing air and particle monitoring to manage this hazard during construction or other high-risk activities.

ABOUT THE AUTHOR

Mr. Prezant, Chief Scientific Officer, VA Sciences, is a public health scientist providing support to the health care industry on a wide range of indoor air quality issues, including Legionella, moisture and mould management, and infection control regarding invasive aspergillosis.

FURTHER REFERENCES:

Moon, Kevin, (2005) Infection Control Principles for the Management of Construction, Renovation, Repairs and Maintenance within Health Care Facilities, A Manual for Reducing the Risk of Health Care Associated Infection by Dust and Water Borne Micro-organisms, 2nd edition.

Alberti, et. al., (2001) Relationship between environmental fungal contamination and the incidence of invasive aspergillosis in haematology patients, Journal of Hospital Infection 48(3): 198-206

Iwen, et. al., (1994) Airborne Fungal Spore Monitoring in a Protective Environment During Hospital Construction, and Correlation with an Outbreak of Invasive Aspergillosis, Infection Control & Hospital Epidemiology 15:5, 303-306.

AIHA (American Industrial Hygiene Association) (2007) Recognition, Evaluation, and Control of Indoor Mold, Prezant, B., Weekes, D., and Miller, J.D., American Industrial Hygiene Association, Fairfax, VA USA.

ASTM D-7338-14, Standard Guide for Assessment of Fungal Growth in Buildings.

EXPLORE LEGIONELLA AT ARBS 2018

The future of the built environment, with a focus on innovative responses to existing and emerging trends, will be on show at ARBS 2018, Australia's only international air conditioning, refrigeration and building services trade exhibition which returns to Sydney on the 8-10 May 2018 at the International Convention Centre (ICC).

Alongside the exhibition, and of interest to the healthcare facilities industry, will be the Speaker Series – a full seminar program which will see industry leaders and experts present on an array of topics and management issues whilst facilitating discussions on how we can better design, control and innovate to sustainably and efficiently transform our built environment.

One such session will examine the recent outbreaks of Legionnaires' disease in Sydney and Melbourne CBD, which highlighted the need for interventions to firmly address building services design and maintenance practices. Relevant regulatory authorities are playing their part, most recently with the introduction of new rules in NSW covering cooling towers. Case numbers have recently escalated in the USA and again there has been a response from industry and regulators.

And it's not all about cooling towers says the ARBS Speaker Series presenter, Clive Broadbent, Clive Broadbent & Associates. 'The ageing population now presents challenges associated with potable water systems particularly at hospitals and aged care facilities. All such involvements need to start with an appreciation of bacterial growth factors and the fundamentals of control practices for Legionella, the causative agent for this disease.'

Welcome News on Control of Legionella, an Unwelcome Contaminant: *Don't miss this session which will describe those systems most at risk and outline control mechanisms proven to be effective. The changes to regulations – including the need to apply risk management principles.*

If you are involved in HVAC&R or building services, then you cannot miss this major industry event. Quick and easy pre-registration is available online which grants free entry across all three days – visit www.arbs.com.au.

ARBS 2018

8 - 10 May 2018
ICC Sydney, Darling Harbour

SPEAKER SERIES BOOKINGS NOW OPEN

SOURCE PRODUCT
SHARE SOLUTIONS
CONNECT @ARBS

Visit Australia's only international HVAC+R & building services trade exhibition featuring the highly anticipated Speaker Series and Industry Awards

sourceshareconnect

arbs.com.au

'WORLD-CLASS' URGENT CARE CENTRE FOR AINTREE

A £35 m project to create what the Aintree University Hospital NHS Foundation Trust says will be 'a new, world-class urgent care and trauma centre' at Aintree University Hospital just north of Liverpool is nearing completion, with the final phases due for completion by the year-end. As HEJ editor, Jonathan Baillie, discovered on meeting with construction manager – North West at BAM Construction, Rob Bailey, who is leading the construction scheme, and Paul Fitzpatrick, director of Estates and Facilities at the Trust, a complex scheme which has involved transferring some departments to temporary facilities, and ensuring that clinical activities continue uninterrupted throughout, has progressed on schedule thanks to effective multidisciplinary and multi-party collaboration.

Aintree University Hospital provides general acute services to some 330,000 people in North Liverpool, South Sefton, and Kirkby, and specialist services including major trauma and orthopaedics, stroke, cardiology, head and neck surgery, treatment for upper GI cancer, hepatobiliary, liver, and endocrine services, complex obesity care, respiratory medicine, rheumatology, ENT, ophthalmology, and alcohol services. The major teaching hospital employs around 4,500 staff, and, since the Trust became a Foundation Trust on 1 August 2006, has seen over £120 m invested at site.

When I met with Rob Bailey at the BAM Construction site offices at the hospital, he explained that, on its completion, the new Urgent Care and Trauma Centre, (or 'UCAT Centre'), would be the region's most modern Emergency Department, offering 'state-of-the-art' treatment facilities. One of the key drivers behind its construction was the hospital's recent designation as a major trauma centre for Cheshire and Merseyside. Set to be completed by the end of December this year, the new two-storey UCAT Centre will house the hospital's Trauma and Emergency Department, plus a new Critical Care and Cardiology Department, theatres, a CT scanner, and a Fracture Clinic, all co-located with a dedicated helipad.

AIMS KNOWN, BUT ROUTE UNCERTAIN

Rob Bailey explained that BAM Construction initially won the contract to build the new UCAT Centre via a traditional public procurement tender in July 2011. He said: "At the outset, when the Trust first discussed the project with us, it was clear that the personnel involved knew the sort of facility they wanted. What they didn't know, however, was how they would get there, and in fact the progression of this scheme, and our conversations with the various Trust staff involved, have allowed the Trust to rationalise its entire estates strategy."

Construction manager – North West, at BAM Construction, Rob Bailey: "At the outset, when the Trust first discussed the project with us, it was clear he personnel involved knew the sort of facility they wanted." Photo courtesy of BAM Construction.

The current Aintree University Hospital was built in the 1970s, but there has been a hospital on the site for over 100 years, initially operating as a fever and infectious diseases hospital. The project architects on the UCAT scheme are IBI Group, and the structural engineers, MDA Wirral, with Steven Hunt Associates undertaking mechanical and electrical design, and Turner & Townsend acting as the Trust's project manager.

"One of the major considerations in developing this scheme was a lack of potential space on what is a very busy site," Rob Bailey continued. "The new Urgent Care and Trauma Centre had to be constructed within a very tight footprint close to the existing A&E Department. Phase 1, which we completed in June last year, included demolishing part of the existing A&E facilities and constructing a newer, larger section within the resulting void, incorporating the Majors, Trauma, and Emergency Care departments." The second Phase, being completed this month, involves the creation of new 'See and Treat' and Observation Unit facilities, and an Acute Frailty Unit, on the ground floor, while Phase 3 will see the first floor – used temporarily during the first two Phases to house the Ambulatory and 'Minors' departments while work has progressed below – converted to a state-of-of-the-art 24-bedded Critical Care Unit.

REMAINING OPERATIONAL THROUGHOUT

Rob Bailey explained: "The existing single-storey A&E Department has remained in operation throughout, as have three associated operating theatres, and ARD Radiology, housed within an adjoining two-storey section. Ensuring that all these clinical areas could continue functioning throughout has been a real challenge. The plan has always been to build the 'Majors' part of the new Centre on the ground floor. To do this, we moved everybody from the existing A&E section of the ground floor where the new 'Majors' area will be, and split the clinical activities into the trauma centre on the ground floor, and the ambulatory care unit in the temporary first floor accommodation."

The biggest initial challenge for the BAM Construction team was creating the space for the new facility, since everywhere on the existing hospital campus that might have provided a suitable location was already occupied. Rob Bailey elaborated: "On our appointment in July 2011 we began developing an enabling strategy which would allow the new UCAT facility to fit into a space where the existing A&E Department was, but in extended form. We knew it would be challenging, and would entail temporary re-location of staff and departments. It was a bit like tackling a sliding tile puzzle; you have all the pieces,

Construction work in progress in July 2014. Photo courtesy of BAM Construction.

but must remove one segment at a time so you can move all the others around."

EARLY ENABLING WORKS

The enabling works commenced in late February 2012, and included relocating the existing trauma and orthopaedic offices; creating a new link road and main access route; alterations to the main 'B' operating theatre and recovery area to allow construction of a new 'ultraclean' theatre, and the addition of laminar flow capability to AED theatres, provision of a seminar room; creation of new vascular laboratories, and an outpatients' clinic. Also undertaken were refurbishments to the administration areas in Ward 12, the conversion of the former Patient Advice Liaison Service (PALS) unit to create a new Critical Care administration area, establishing a new temporary Outpatients' Department, and the subsequent re-location and refurbishment of the existing Outpatients' Department and Fracture Clinic.

Rob Bailey said: "We had to complete all this work before we could start on the new-build element of the scheme, which meant substantial re-location of both staff and facilities. All of these facilities were either within the space into which the new UCAT would fit, or closely associated with the Department. One of our key goals was to ensure that we could control the budget, while considering everybody's aspirations. This saw us plan the price, as opposed to pricing the plan; this was all about putting costed options in front of the Trust, and saying: 'If you want to do this, this is what it will cost.'

MEETING ASPIRATIONS

All the options were input to a large spreadsheet to enable the Trust to clearly identify, at the outset, whether the various personnel's aspirations for particular spaces and equipment were realistic. Rob Bailey added: "At this early stage, and indeed throughout, we have

worked with multi-disciplinary personnel – from members of the Trust's estates and facilities team, to nurses, doctors, consultants, and other users of the service." As a designated regional Trauma Centre the new facility will admit patients from across its catchment area – Merseyside, Cheshire, and South Lancashire – following a wide range of trauma incidents.

One of the reasons for the scheme's excellent progress, Rob Bailey acknowledged, was that much of the project team had been together throughout. He said: "I have been involved right from interview in 2011 to the current day, and key people such as my surveyor, and support staff, have remained the same. On-site site managers, engineers, planners, and design managers, come and go, but we have kept the nucleus of the team the same, which really helps, because everyone understands my objectives and expectations."

Another contributor to the smooth progress, he said, had been 'staying in control of the budget and design'. Rob Bailey said: "Paul Fitzpatrick, director of Estates and Facilities at the Trust, is demanding in terms of expectations – he likes to ensure that he has looked at every potential possibility before agreeing on a solution – but we have an excellent relationship." BAM Construction has used local labour wherever possible. Rob Bailey said: "Currently 72 per cent of the workforce on site live within the hospital's locality, which has some considerable benefits. For instance, when you need that extra push, you have people who are happy to stay on site a little longer to get things completed."

KEEPING A BALANCE BETWEEN QUALITY AND COST

Keeping a balance between quality and cost, and future-proofing, were also essential elements. For example, it had originally been planned that the new second floor, 24-bedded critical care unit would comprise 16 open plan beds – in four four-bedded bays, and eight isolation/individual rooms, seven with positive and negative airflow in the lobby spaces.

Rob Bailey said: "However, Paul Fitzpatrick asked us how the facility would look, and how much it would cost, if we went 100 per cent single bed. With the architects, we thus put together some potential options, illustrated by rendered images. One potential room design incorporated a glass screen at the front of the room running up to a door height of some 2.1 metres, with 'legs' running up above the ceiling void, and the structure going into it. This option also envisaged solid partitions between the rooms, but the rooms not being fully isolated, with screens in the wall partitions allowing a view from one room to the other.

The hospital's Elective Care Centre. The major teaching hospital employs around 4,500 staff, and, since the Trust became a Foundation Trust on 1 August 2006, has seen over £120 m invested at site. Photo courtesy of the Aintree University Hospital NHS Foundation Trust.

VARIOUS ITERATIONS

"Having looked at this option, and fully costed it, the next iteration was to incorporate a larger section of glazing at the front of the room, but to leave the structure open above the ceiling void, and have solid walls in between. The next option was to build the rooms so that you had complete acoustic isolation and the whole structure constructed right up the soffit. We costed all these options, and let the Trust look at these, and ended up with a hybrid." In the end the deliberations culminated in the new 24-bed Critical Care Department (CCD) comprising seven full isolation rooms, five single rooms, and 12 open plan rooms, but future-proofed to allow other single rooms to be added later with minimum disruption.

Rob Bailey explained that, following this iterative process, the new CCD's single rooms will feature plasterboard walls taken up to a bulkhead design, with glazed 'Blink' glass sections (from specialist in 'intelligent' glass, Blink) incorporated in the upper 'half' of each side wall. He said: "Prior to specifying these 'window walls', we had visited critical care units in several other hospitals with some of the Trust's project team, and seen floor-to-ceiling glazing. This had its benefits, but in our view left nowhere on the walls for cupboards, or for people to sit etc. This led us to question what benefit this full-height glazing afforded. We thus value-engineered the glazing to run to about 1.1 m high in the upper section of the room's side walls, which also helped us keep the scheme on budget.

"Throughout the design process we involved patient groups, but the key was to ensure that functionally everything would work, and that the clinical leads and matrons for the departments knew exactly what they would be getting." The front of the CCD's single rooms are also glazed.

SAVE $1000's on pool heating!

with Rheem IQ® Intelligent Tariff Controller

"Set and forget" tariff intelligent controller can save $1000's on pool heating costs.

Rheem Heat Pumps

Australia's #1 Commercial Brand

Proudly designed and manufactured in Australia

RHEEM THERMAL SYSTEMS GROUP

INSTALL A Rheem®

*Saving shown is indicative only, please contact Rheem Thermal Systems Group for more information.

Call us today for technical sales advice and the location of your nearest distributor, or visit **www.rheemthermal.com.au**

ACCENT HEAT PUMPS
A RHEEM COMPANY

Rheem Pool Heating Advisory 1300 132 950

www.rheemthermal.com.au

EXTENSIVE USE OF BIM

The scheme saw the BAM team make extensive use of BIM. Rob Bailey elaborated: "We used Navisworks and Revit software; one of BIM's major advantages is that it gives you visualisation, which speeds sign-off by all concerned." He went on to show 3D BIM images of the various single room options considered for the critical care unit, adding: "These give everyone different things – from a construction standpoint, the BIM plans communicate to our works team how the various elements will co-ordinate, and also, when combined – as we did here – with the use of point cloud surveys, helped to avoid clashes that could occur before we actually started on site. CAD software is traditionally in two dimensions. While having been in construction for 28 years, I find it fairly easy to visualise things in two dimensions, it is different if I am explaining how part of a new facility will look to, say, a nurse or clinician. Put the plans into 3D `walkthrough images, however, and these personnel can then clearly see how a space will look. This also greatly reduced the number of user group meetings we needed.

Aintree University Hospital provides general acute services to some 330,000 people in North Liverpool, South Sefton, and Kirkby.
Photo courtesy of the Aintree University Hospital NHS Foundation Trust.

MODELLING AND INFORMATION COME TOGETHER

"Our use of BIM on this project really allowed the modelling and the information streams to come together," Rob Bailey continued. "The BIM visualisations of the CCD's single rooms enabled us to arrive at a solution that gives pretty much the same visibility as the original full screens proposed, but with more flexibility on the walls."

The `wall windows' incorporate Blink glass to ensure patient privacy. The glass changes from transparent to opaque at the touch of a button. Rob Bailey explained: "We undertook detailed costings, and the use of the Blink glass offered the best overall solution in terms of balance between cost and usage. Hospital requirements are generally for one-to-one nursing in a CCD, but staff will, at some stage, need a break, or to visit the toilet. The glazed sections in the walls enable staff to monitor the patient in the adjoining room should there not be a nurse or clinician with them."

All CCD single rooms will also incorporate fully serviced pendants. Rob Bailey said: "We designed these rooms with the full involvement of the infection prevention control team and the staff that will be using them. Once we have moved the Interim Minors Department onto the ground floor, we will remodel what we have already constructed on the first floor into the new CCD."

Alongside extensively using BIM for visualisation, the BAM team created `mocked-up' areas so Trust personnel could see the models to clearly identify what the contractor was looking to construct. Rob Bailey said: "This enabled them to almost touch and feel what they were getting.

INCLUSIVE DESIGN STRATEGY

He added: "We also employed an inclusive design strategy, to ensure that all the relevant personnel had input into department and room layouts, and relied on collaborative team-working between the various Trust `clients', the project manager, architects, engineers, and external contractors."

Moving to discuss the new Centre's ground floor facilities, Rob Bailey explained that among the key design priorities were: staff, patient, and visitor health and safety; patient privacy and dignity; reducing waiting times, reducing aggression and violence, clinical functionality, ease of access and wayfinding, environmental sustainability, and building maintenance and operation.

Once completed, the whole ground floor facilities will include Trauma and `majors' areas, and an emergency care step-down area, as well as a counselling suite. There will be three trauma bays, plus a CT scanner, and four step-down and Emergency Care beds. The

ground floor will also incorporate 12 'See and treat' rooms; three primary assessment areas, an Acute Frailty Unit, Majors See and Treat, and observation wards. Rob Bailey showed me a rendered image of one of the 'Trauma' bays. He said: "When we build up these images, you can really get a feel for what the bays will look like." On the first floor, alongside the new 24-bedded Critical Care Unit, will be three existing associated Emergency Department theatres.

EXISTING 'SHELL' MAINTAINED

Rob Bailey added: "To create the new UCAT Centre, we have maintained the existing shell, demolished everything inside it, and re-constructed it while both the adjoining 'sides' of the hospital remained 'live'. The existing A&E Department has been able to continue operating with minimal disruption, which necessitated flexibility from everybody. Phase 1, which saw us create the Trauma area and the temporary first floor ambulatory emergency department, took about 14 months to complete."

Also located on the ground floor will be a new reception area incorporating a café and children's entertainment area, and a separate reception for the urgent care and acute frailty unit. Work on Phase 3, the creation of the new first floor CCD, will start this month (September).

As part of the planning process, Rob Bailey explained, BAM employed a 'Zero Harm' ethos for all the construction staff and contractor personnel on site. He said: "For instance, we have designed and constructed intrinsic handrails to the parapets of the structural steel frame for the benefit of the construction staff now, and maintenance personnel in the future. We embedded collective safety and fall protection measures right through construction and then through to maintenance. We constructed the parapets to be higher than you would actually need, but this satisfies all the Building Regulations, and should ensure that when maintenance teams need to go onto the roof they will not be at risk of falling off.

REDUCING THE RISK OF FALLING

"We also harnessed Chemgrid over service risers – a GRP grating which provides collective fall protection for site staff in the construction period ahead of mechanical and electrical services being installed through floor slabs. This very much accords with BAM's Zero Harm culture of designing, procuring, and constructing our buildings with the intention not to cause harm. In place of the traditional theodolite, we used point cloud surveys to take real-time images of millions of points, so that when we input the steel frame into the model, we could see any clash points, for example to prevent a vertical column running right the way through an overhang."

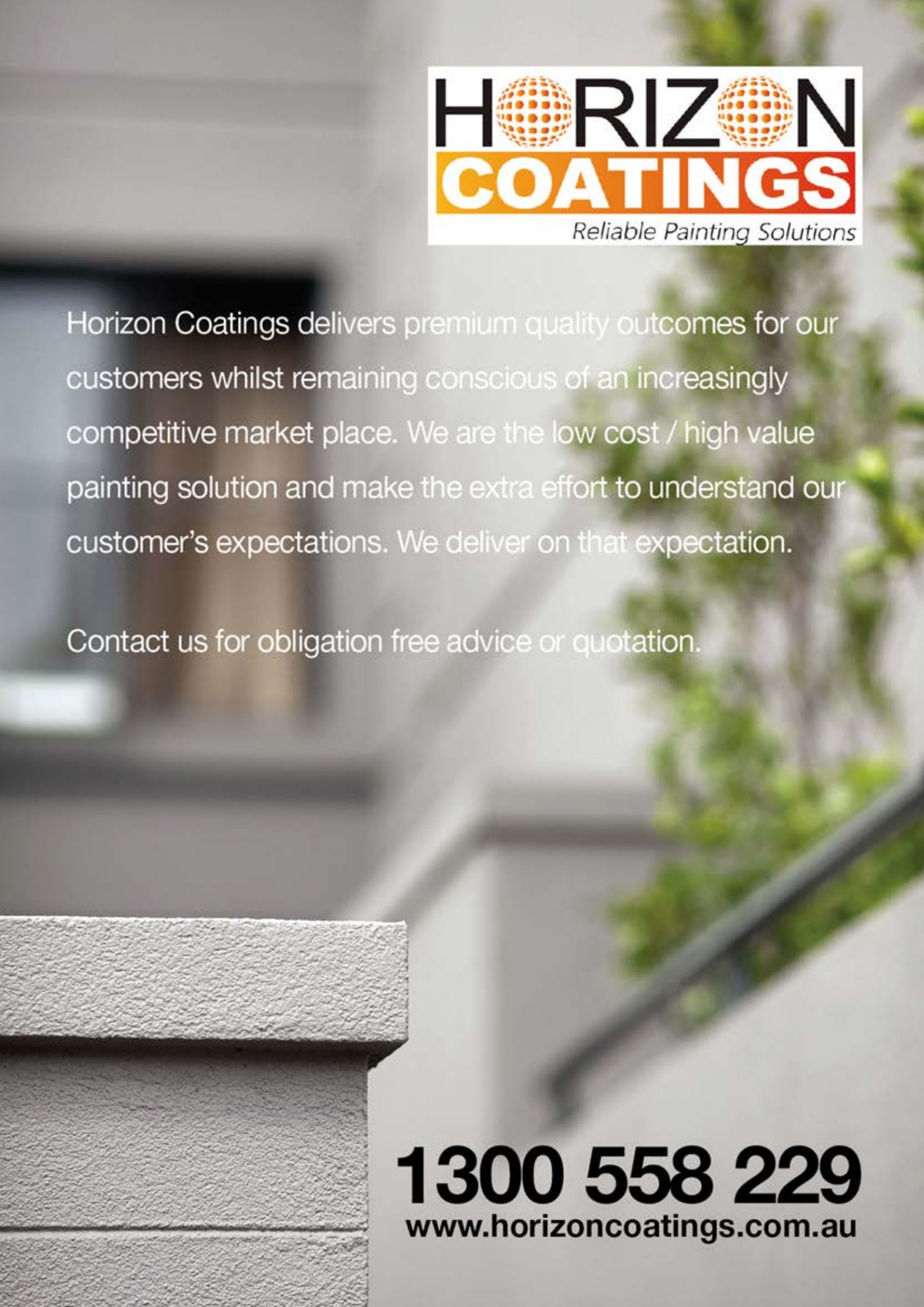
The BAM Construction team had also re-used much of the existing structure. Rob Bailey said: "We also used modular construction for the new seminar building, the Outpatient Department, and a section of the Trauma and Orthopaedic areas. We undertook a huge amount of engagement and consultation – from consultation with different users, through all the focus groups. We also engaged with well over a dozen different clinical departments. It's a tremendous achievement to construct a facility like this without losing time, or having to close down services to any of the departments, and a tremendous challenge."

Having discussed the project from a construction standpoint, Rob Bailey took me to see Paul Fitzpatrick, who began by emphasising that, had space been available, the obvious way to reconfigure and refurbish the hospital's A&E department – while increasing its footprint, and keeping the facilities open throughout – would have been 'to start again somewhere else' on the site. However, such space 'simply didn't exist'. He said: "We were thus forced to look at how we could refurbish and reconfigure the existing facility and grow it, while keeping it live and open in situ."

ACUITY OF PATIENTS

Although the hospital's A&E attendances had not especially risen, Paul Fitzpatrick explained that the acuity of the patients had significantly increased. He added: "The desire to create a new A&E and Critical Care Unit also coincided with our designation as the single trauma receiving site for Cheshire and Merseyside." Recognising that it had 'a complex problem' to solve, and that its solution would require completion of a series of enabling schemes, the Trust acknowledged the need to work with an experienced healthcare construction partner. Paul Fitzpatrick said: "The progression of the various schemes effectively became our estates strategy implementation plan for three years."

I asked about the deficiencies of the existing A&E and critical care facilities. He said: "The main issues were the age of some of the buildings, which were no longer fit-for-purpose, space constraints, non-compliance with HBNs and HTMs, and a series of backlog maintenance issues, as well as some non-ideal adjacencies, in particular involving the critical care and A&E and trauma services, which were


HORIZON
COATINGS
Reliable Painting Solutions
Horizon Coatings delivers premium quality outcomes for our customers whilst remaining conscious of an increasingly competitive market place. We are the low cost / high value painting solution and make the extra effort to understand our customer's expectations. We deliver on that expectation.
Contact us for obligation free advice or quotation.
1300 558 229
www.horizoncoatings.com.au

dispersed around the hospital and not optimally positioned. Our aim, as far as possible, was to bring all the key services associated with dealing with major trauma together in one area."

TWO PROJECTS 'INHERITED'

Paul Fitzpatrick explained that when he started in his current role as director of Estates and Facilities in 2008, he 'inherited' two projects that were 'very much the embryos of the UCAT scheme' – one a £250,000 refurbishment of A&E, and the other a £900,000 reconfiguration of critical care. He said: "Two schemes have effectively become one scheme. It simply wasn't possible to deliver the user and service requirements by simply refurbishing the existing A&E, or reconfiguring the existing critical care unit."

He added: "The early enabling schemes we worked on with BAM very much helped us establish and build upon the relationship with the company and, in turn, enabled it to build its team around our needs to be at its peak to deliver the main scheme."

I asked Paul Fitzpatrick about the extensive liaison there had been on what Rob Bailey had dubbed 'optioneering' on the project. He said: "I think just about every potential option has been explored, and the best options – given the available budget – chosen. We could probably have constructed the new UCAT from scratch for less given the required space on site, but we were constrained by both location and adjacencies, and the continued operation of the department in situ. As you would anticipate, that has caused us some problems, and some compromises have had to be made. For example, we have had to retain existing structural columns, and to work the design around these. We have also had to keep existing building services operational, necessitating us putting in parallel services in. In fact, all the infrastructure has been replaced in parallel to keeping the building running on the old infrastructure."

CHANGEOVERS FACILITATED

Rob Bailey interjected: "The building services have been designed by Steven Hunt & Associates, and we have worked very closely with the company and the Trust's maintenance team to gauge how this building operates, and stays 'live'. Gaining this knowledge has, for example, helped us determine how and when to carry out changeovers for electrical supplies, and what we put in place to enable us to maintain essential services and have essential back-up. In a lot of senses, although some people have seen us around, nobody has known we are here – in that we haven't, for example, had the huge impact of all the electricity going off, or the water supply being interrupted."

Paul Fitzpatrick added: "In fact, as part of our estates strategy, we have delivered a £1m electrical infrastructure reinforcement scheme as part of the project. Due to the time such a complex project takes to complete, and with the current pressures on urgent and emergency care centres nationally, a lot of new guidance and advice has been published on how A&E departments should be configured, for instance by ECIST (the NHS Emergency Care Intensive Support Team). Thus, while we set off and produced a design based on user requirements, their existing department, and thinking, over the intervening two years thinking has changed, and we have thus had to look at redesigning some parts of the building, even to the extent that we were completing Phase 1 while still designing Phase 2. This has not just happened once, but has been an iterative process.

"Returning to the to the sort of company we wanted to work with," Paul Fitzpatrick explained, "we looked at using ProCure21+. However we wanted to market test more widely than that framework then allowed, and there was no time pressure to start on site. We thus went out to using an ECC form of contract which 'borrowed' many of ProCure21+'s benefits, and then went through an OJEU to market-test. From that route we saw interest from many of the ProCure21 and ProCure21+ contractors. As a result of that process, we selected BAM as our preferred partner."

I asked the pair how well they felt the project had progressed? Paul Fitzpatrick answered: "Extremely well. While we have had issues to contend with – for instance re-redesigning some sections of the building, and some complexity around maintaining existing services – the team has worked closely together to minimise the impact. Importantly, also, to cater for changing demands and service delivery models in the future, there are a variety of examples of parts of the building being future-proofed. "

Rob Bailey said: "We have already talked about the critical care unit. Here, the bulkheads we have used will make it much simpler when we go back in to create the single beds. We have effectively future-proofed the whole of the CCD so it can be 100 per cent single bedded." "Another example," Paul Fitzpatrick added, "is the ground floor Acute Frailty Unit, which has drainage and a wall structure that will allow its adaptation to create either single beds or ward areas."

THE PATIENT BENEFITS

What, I asked Paul Fitzpatrick, would be the biggest patient benefits of the new UCAT facility? "On the 'majors' and trauma side," he explained, "much better space and fitness-for-purpose of the accommodation, allowing the clinical teams to ensure that both patients and their families are comfortable, and that the staff can do their best for patients encountering extremely stressful and clinically challenging situations. On the Ambulatory and 'minors' side, we will have a more welcoming environment that reduces the stress levels of patients and staff, and gets the patients seen in an efficient way, and sent home in the shortest possible time, but after the best possible experience."

Rob Bailey said: "Not long after we handed over Phase 1, I spoke to Angie Slade, the matron in A&E, and she told me violent outbreaks caused by the 'pressure pot' situation in the existing A&E area has almost disappeared in the now much bigger, brighter, and cleaner-looking space provided. Paul Fitzpatrick added: "Indeed in the months following the completion of the Phase 1 scheme our Friends and Family test results for A&E were significantly improved."

OPEN PLAN 'MAJORS'

Rob Bailey explained that the 'majors' bays will be open plan at the front, but with solid walls in between, affording good observation, but also privacy and dignity. They will also be arranged around central nurse stations to optimise observation.

Paul Fitzpatrick went on to say: "We have set out to create a sort of flagship focal point for the hospital. We have tried to create that visually, as well as clinically. The existing A&E didn't particularly stand out."

STRIKING 'COPPERY' LOOK

Rob Bailey explained that UCAT Centre's front façade and much of the perimeter would incorporate Renelux steel rainscreen panelling, giving the exterior a 'striking coppery look'. He added: "We also increased the height of the covered canopy at the ambulance entry point, and, with the building located on a fairly gentle incline from the road, and the incorporation of LED lighting into the front façade, the new centre should have considerable visual appeal when you approach it. We hope it will be local landmark."

The exterior also incorporates a granite finish to the inner rounds of the feature doorways and feature entrances, a black Inca brick from Weinerburger, and curtain walling facades and glazing. Rob Bailey added: "There are also very modern coloured window surrounds in bold colours; much of this is attributable to the flair of the architects, IBI.

Paul Fitzpatrick said: "As part of the scheme we have redesigned the main hospital entrance and the access routes around A&E, which were previously regularly congested with buses, cars and ambulances. The main hospital entrance is now to one side of that area. Having a dedicated ambulance entrance to A&E improves flow and access for ambulances entering and leaving the site.

ELEVATED HELIPAD

He continued: "We are also about to commission a helipad directly opposite the new building, which will enable us to take patients on trolleys straight in. We believe it will be one of the most accessible ground-level helipads in the NHS."

As our discussions closed, Paul Fitzpatrick added: "Turner & Townsend has done an exemplary job in maintaining staff engagement and working with the contractor and the Trust's various user departments to ensure that everyone has stayed fully engaged, right up to arranging staff open days. Prior to Phase 1 opening last June, we had 800 staff attend an open day. Our aim will be to do similarly with Phase 2 and Phase 3. Eight hundred staff is 20 per cent of our staff population, so to get that number of personnel together on one afternoon was quite an achievement." Rob Bailey concurred. "It was great to get that level of staff engagement; it means a lot to users to ensure that we deliver the facility in the right way, and that we can all walk away proud on the completion of the job."

Paul Fitzpatrick added: "At the peak of Phase 1, BAM had up to 150 people on site at any one time, and lots of good relationships have been built up and tested. It's also really rewarding when you can get the level of positive feedback we have had from staff. Many of the staff involved have never done this before and probably never will again. They valued our input and help with taking them on a journey, and we in turn value their commitment to getting the new building right."

PRS Australia

function & form meets Comfort and Style

Is it time for an upgrade to your existing furnishings, fittings or finishes?

Do you require custom made furniture, carpets, vinyl, bathrooms or more?

Our services include:

- Design
- Procurement
- Refurbishment
- Project Management
- Custom Made Furniture
- Commercial Kitchens
- Public Amenities
- Bathrooms
- Window Furnishings
- Carpets, Vinyl & Tiles
- Lighting & More

"Serving the needs of the medical & allied health industry Australia-wide."

Procurement & Refurbishment Solutions Australia

1300 777 287 or admin@prsaustralia.com.au I www.prsaustralia.com.au

WATERLINK SPIN TOUCH NOW TESTS ALL TYPES OF WATER: POOL, SPA, POTABLE AND INDUSTRIAL WATER

The photometric-based WaterLink Spin Touch™ allows the user to test water anywhere in the field, without the need of computer or mobile device. All the user has to do is fill a sealed reagent disc which contains the precise amount of reagent need to run a complete series of tests. The user places the disc in the meter, taps "start" and all tests are done automatically via the touch screen. All that is needed is less than 3 ml of water and the vital tests are done automatically – in just one minute!

With a built in lithium ion battery, there's no need for a power connection, either, with tests unaffected by power or computer outages.

Test results are displayed on the touch screen, which can also be transferred to DataMate Web software for instant analysis, with step-by-step treatment instructions supplied. Test history is then stored via Cloud technology. The use of the latest Bluetooth technology allows better connectivity and provides better interface.

According to Jason Leach, managing director of Lamotte Pacific Pty Ltd, "this is the most advanced system for precise use of wet chemistry ever produced. Water analysis no longer has to rely on time consuming tests and clean-up procedures. It's almost idiot-proof, with no vials to fill, no prep time or guessing involved. And, the test results are available quickly. And, with the release of the DW version, testing of potable water and industrial water is now made just as easily as with pool water."

Reagent discs have up to 11 test parameters per disc. Parameters cover Chlorine/Bromine, Chlorine/Bromine plus Phosphate, Chlorine/Bromine plus Borate and Biguanide plus Borate, as well as pH, total alkalinity, total hardness, Cyanuric Acid, Copper and Iron. Some discs also test for total iron, ferrous and ferric iron.

50 YEARS STRONG: ARMSTRONG FLOORING AUSTRALIA

2018 marks 50 years since the foundation of Armstrong Flooring as a manufacturer in Australia. This year as the company celebrates its 50th anniversary, we remember the origins of a company that is today a leader in the flooring market and a significant Australian manufacturer of flooring products.

In 1968, an agreement between Australian plastics manufacturer Nylex and USA based flooring manufacturer Armstrong World Industries created Armstrong-Nylex Pty Ltd, a joint venture partnership to manufacture, market and sell Australian Made resilient vinyl flooring products. When Armstrong-Nylex commenced operations in 1968, 32 people were employed to manage the business and oversee the building and commissioning the factory at Mills Road, Braeside Victoria.

Today, still headquartered at the original Braeside site and employing over 110 people, Armstrong Flooring is the only Australian remaining manufacturer of resilient vinyl flooring and although manufacturing began in the boom time of the 60's, the company has not only endured when many other Australian manufacturing enterprises are now just a memory, but has thrived, supplying world class products to not only our domestic market but also exporting to over 20 countries including China and the USA.

Leading through exceptional customer service, technical support and responsible environmental practices, Armstrong Flooring's extensive Australian distribution network offers a diverse range of sourced and locally manufactured products that are stocked in Australia. These include our Fitnice Woven Vinyl Textile Flooring, along with Natural Creations Luxury Vinyl Plank and Tile, Timberline and Translations Heterogeneous Vinyl sheet and our Australian manufactured ranges of Accolade Plus, Accolade Safe, Wallflex, Australis and Quantum Homogeneous Vinyl Sheet products.

Should you require information please contact us 1800 632 624 or Customer_Services@ArmstrongFlooring.com or visit us www.armstrongflooring.com.au

TELECHNICS

Telechnics has grown to become one of Australia's primary two-way radio specialists. Our experienced technical team and multi-vendor partnerships enable us to offer a wider variety than most two-way radio suppliers. We are able to provide the best solutions rather than just the best option in a narrow field.

Telechnics specialises in integrating two-way radio product into third party software applications and other communication and building systems. With campus-based and in-building solutions ranging from task management to incident management and asset tracking, the Telechnics team have the design and implementation experience to develop integrated solutions.

As technology improves so too must the 2-way radio/ communications system within your building or campus. 2-way radios have evolved to do much more now than

even 2 years ago. In-building locating, software enhanced messaging, job ticketing and voice recording and even radio on your smartphone are all features/capabilities that can be accessed. Integration into hospitality-aligned packages like HotSOS is also possible.

STEAM VAPOUR CLEANING HELPS TO REDUCE HOSPITAL ACQUIRED INFECTION RATES

Steam vapour is seen as one of the leading methods of disinfecting healthcare facilities, including patient rooms, bathrooms and operating theatres. Steam vapour is used to kill healthcare grade bacteria including C.diff, MRSA and VRE.

Duplex Healthcare is a leading supplier of Duplex steam vapour machines that clean hospitals in conjunction with microfibre. Director of Duplex Healthcare, Murray McDonald, says using the old "spray and wipe" method is no longer a healthcare standard of cleaning. "Low grade chemicals and regular cloths can move bacteria around a surface, rather than disinfect," Mr McDonald said.

"Our steam vapour machines produce high-temperature, dry steam vapour, which is renowned in Australia and overseas for its bacteria killing abilities and to safeguard against healthcare acquired infections. It is most commonly used for touch point, regular, outbreak and discharge cleaning. Our latest machine, the Jetsteam Maxi Inox is one of our most popular models, due to its compact size, its manoeuvrability and ease of use."

"Its state-of-the-art features include a robust, stainless steel build, improved digital control panel and waterproof LED hose control system."

For more information on the Jetsteam Maxi Inox, visit www.duplexhealthcare.com.au or call 1800 622 770.

CLEAN STEAM BY SPIRAX SARCO

As the world leader in steam and thermal energy solutions, Spirax Sarco is constantly striving to ensure our customers receive the support and technology they require to stay ahead of their challenges.

Our commitment to new product development to offer total customer solutions and our capability to design engineer solutions sets us apart from our competitors adding unique value to our customers.

This is particularly so when it comes to the Healthcare sector, where Spirax Sarco has a long standing presence providing equipment, service and expertise to hospitals and clinics throughout Australia.

When looking to develop a clean steam generator to meet the needs of AS/NZS 4187:2014, Spirax Sarco was able to draw on their wealth of steam expertise, along with a great deal of experience gained from steam quality testing, and an in-depth working knowledge of the standard. This resulted in the design of a clean steam generator which delivers clean steam to meet the purity requirements of the standard, while still maintaining the steam quality also required by the standard.

Spirax Sarco has ticked all the boxes with the release of the Australian Healthcare Clean Steam Generator (AH-CSG). The unit provides clean steam to meet the requirements of AS/NZS 4187:2014. It incorporates an integral feedwater tank and degassing system, and all wetted parts on the clean steam side are stainless steel. The efficient compact design, with minimal footprint, means it is well disposed to installation in an existing plant room, where access and space may be limited, or to minimise the space required in new installations.

> *"The Spirax Sarco AH-CSG is designed and built in Australia, and is proven in service to deliver high quality clean steam that meets both the steam purity and steam quality needs of AS/NZS 4187:2014, ensuring there are no issues when it comes to the steam supply to the sterilisers"*

The AH-CSG provides the core of the clean steam generation system, with clean steam operational pressure of up to 500 kPag and output of up to 300kg/hr* of clean steam, typically supplying up to 3 large sterilisers. For existing installations there is no need to change or upgrade sterlisers, as the AH-CSG uses the already available plant steam to generate clean steam which can be supplied directly to existing sterilisers. *The AH-CSG output is determined by the plant steam supply pressure and the clean steam output pressure required – consult Spirax Sarco for your application.

Control is via local process controllers using On-Off valves that provide simple, but effective and reliable operation of the unit. Designed and built in Australia, it is well supported with service contracts able to be provided by our nation-wide service team, who can also carry out steam quality and purity testing to AS/NZS 4187:2014. The AH-CSG is supplied as a fully assembled and tested package, requiring minimal installation and commissioning.

We work with our customers to deliver sustainable steam and thermal energy solutions, shared expertise and knowledge, auditing and advice to achieve process productivity improvements.

Spirax Sarco is also able to assess and advise on the overall installation requirements and provide the additional equipment for a full installation including blowdown vessel, plant and clean steam ancillary equipment, sampling and testing points and equipment, and more. Installation of the unit can also be handled by Spirax Sarco.

For more details please contact 1300 774 729 or email enquiries@au.spiraxsarco.com

spirax sarco

First for Steam Solutions

EXPERTISE | SOLUTIONS | SUSTAINABILITY

AH-CSG Clean Steam Generator

- Clean Steam to AS/NZS 4187:2014
- Clean Steam operational pressure of 3 to 5 barg
- Delivers up to 300kg/hr of clean steam
- Typically supplying up to 3 sterilisers
- Efficient compact design
- On-board water degassing and heating
- **Designed and built in Australia**

Spirax Sarco offers installation and turnkey solutions available for clean steam generation including clean steam distribution systems, plant steam modifications and steam quality testing to AS/NZS 4187:2014. Providing tailored maintenance and service agreements for your business. Contact us for more information on the AH-CSG.

☎ 1300 774729 (SPIRAX) ✉ info@au.spiraxsarco.com spiraxsarco.com/global/au

First for Steam Solutions

EXPERTISE | SOLUTIONS | SUSTAINABILITY

South Pacific Laundry (SPL) has been a provider of commercial laundry and linen services to the hospitality and healthcare industries in Melbourne for the last 20 years.

Currently, the South Pacific Group is establishing a strong network of modern laundry across Victoria, New South Wales, Queensland, Western Australia and South Australia with plans for several more facilities up the East Coast of Australia in 2017.

The relocation of our Sydney operations to a new larger facility in Bankstown together with the relocation of our Brunswick plant to Broadmeadows will establish South Pacific Laundry as the single largest privately owned laundry in Australia and in the Southern Hemisphere.

South Pacific Laundry specialises in the provision of quality linen and supplies for the customer service, hospitality and healthcare industries

SPL provides:

- A 365 day service to all its clientele with a 24 hour turnaround.
- A leading edge technology in RFID to assist housekeeping and managerial staff in time reduction and efficiency.
- Dedicated account managers and experienced support staff who are available 7 days a week.
- A dedicated software design package and centralised billing system enables seamless transactions, paperless and customised reports.
- Delivery rationalisation systems, providing and streamlining efficient delivery routes which will reduce the company's carbon footprint.
- Building of partnerships and sharing benefits with the customers from savings made through its constant laundry process innovations and group purchasing power of linen products.
- Dry cleaning, Uniform cleaning services, Housekeeping services, Dust mat hire and Cleaning services.
- Provision and supplying of Corporate uniforms/work wears and customised hotel room Amenities.

Contact
Robert Teoh
National PR & Marketing
P: (03) 9388 5300
M: 0421 716 888

Coverage
Australia wide

Pricing Information
Contact supplier direct

Delivery
Free daily delivery within 25km city metropolitan areas

Minimum Order
Contact supplier direct

Full Contact Information
South Pacific Laundry
9-23 King William St
Broadmeadows VIC 3047
P: (03) 9388 5300
F: (03) 9387 2399
E: customerservice@southpacificlaundry.com.au
robert.teoh@southpacificlaundry.com.au

Certified System Health & Safety AS 4801 SAI GLOBAL
Certified System Environment ISO 14001 SAI GLOBAL
Certified System Quality ISO 9001 SAI GLOBAL

Melbourne, Albury only