CirculAire

VitalAire® Healthcare

Quarterly Newsletter Summer 2005

Medical Gas Services

On behalf of VitalAire, I would like to welcome you to the Summer 2005 issue of CirculAire!

We hope everyone is enjoying a fantastic and safe summer, and thank all for the positive feedback we have received on past issues of CirculAire. If you missed them, they are available for download on our new website **www.vitalaire.com**. As always, we encourage and thank you for your feedback. We welcome your story ideas, and look forward to being of service to you and your healthcare facility for all its medical gas needs.

Best regards,

Paul Edwards
Product & Marketing Manager

CSA Z7396-1

In the last edition of CirculAire we provided an overview of the development of CSA Z7396-1, a new Standard set to replace CSA Z305.1, the medical gas systems "Code" since 1975.

The PUBLIC REVIEW period closed March 14th. 120 comments were submitted to CSA; 47 of an editorial nature and the balance being technical. All submissions were vetted by CSA against the minutes and votes from prior technical sub-committee (TSC) meetings. Through that process, a list of 9 new items was put before the TSC for consideration. All feedback from the TSC was in place by May 23rd, and the Standard is now being prepared for a 30 day Technical Committee ballot, tentatively scheduled for October 2005.

If all goes well we can expect to see CSA Z7396-1 published in March 2006.

The Standard will become effective six (6) months following publication. As CSA Z305.1-92 will be withdrawn, it is expected the National Building Code Centre and Provincial Building Code Authorities will adopt the new Standard without delay during this 6 month period.

We'll keep you posted on new developments through CirculAire and with updates on our new website, **www.vitalaire.com**.

THE TECHNOLOGY FILE

In collaboration with Air Liquide's international R&D centres and our North American business partners, VitalAire continually strives to bring leading edge technologies to Canadian healthcare facilities.

Is your medical air line clean? Mould is one of the hottest topics today, and yes, the discussion has even found its way to medical pipelines!

The key ingredient to mould growth is moisture, so it should come as no surprise that on-site medical air plants, and especially those employing water-sealed pumps, have become a target for research in the *Bio-Burden* field.

Air Liquide has taken a leadership role world-wide in the analysis of pressure gas streams for biological contamination, or Bio-Burden. In response to a growing demand for Bio-Burden monitoring Air Liquide developed a new device designed to expose standard Petri dishes to high pressure gas streams without damaging the dish or its growth media.

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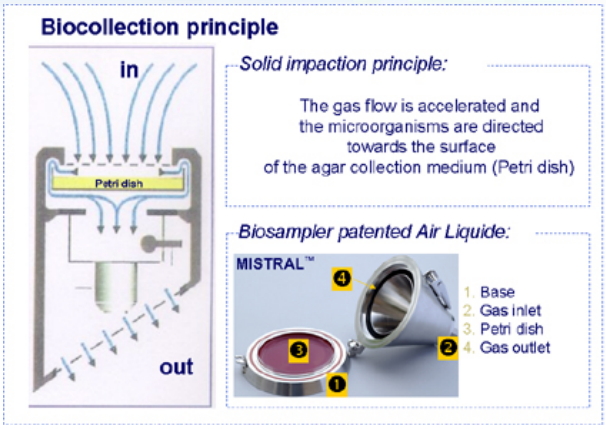
VitalAire has taken an active role in bringing this new testing protocol to Canada, and is planning to commence a collaborative medical air pipeline testing campaign with a major Canadian acute care facility this Fall.

For more information on this topic, or if you would be interested in having your facility's medical air pipeline tested for Bio-Burden, please contact Paul Edwards at 1.800.999.3491.



Medical Air Dryers – What about Membranes?

With an emerging concern over medical air Bio-Burden, and considering its root cause, moisture, it is only natural that healthcare facility managers are starting to take a hard look at their medical air dryers.

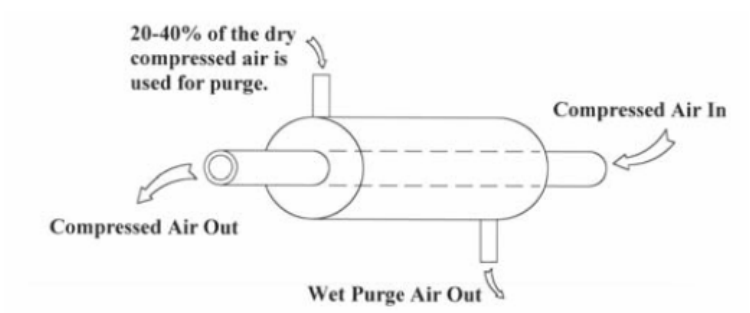
Today's market is characterized by two dryer technologies; refrigerant and desiccant. Desiccant dryers are generally considered the pre-eminent technology as they achieve a medical grade dewpoint that refrigerant dryers cannot. Due in part to this, the new CSA Z7396-1 Standard will prohibit the use of refrigerant dryers.

The new Standard does not, however, dictate the use of desiccant dryers, and today our customers are asking what, if any, the options are.

At VitalAire we are always in search of new and leading edge technologies. One such technology we have been watching very closely is **membrane dryers**. We took our first look at membranes for medical air in the mid 1990's; a time when only one manufacturer's product dried air without scrubbing oxygen. Their capacity range was extremely limited and the purge rates were in excess of 35%, so their membranes really were not a viable option.

But over the last eight years membrane technologies have advanced considerably. There are multiple manufacturers making non-O_2 scrubbing membranes, the purge rates have improved, so we are re-assessing their potential. To keep you in the loop on our latest examinations, here is a brief description of how they work and our ***BIO+sum*** *comparative analysis with desiccant dryers*:

How Membrane Dryers Work



Modern membrane dryers use microscopic tubes bundled together inside another much larger tube.
The sketch shows a simplified system with just one membrane tube contained within the outer tube. The ends are sealed so that the larger outer tube becomes a small hermetically sealed pressure vessel. The compressed air passes down the centre of the smaller tube(s) and molecules of moisture pass through the tube walls into the "pressure vessel". The result is that the water vapour is taken into the larger 'pressure vessel' in an attempt to create an equilibrium. To prevent this happening, purge air is introduced from the outlet of the dryer (the dry side). On average this purge air represents about **20%** of the inlet compressed air in order to achieve a pressure dewpoint of -6.7°C, and about **40%** of the inlet air flow is purged when a -40°C pressure dewpoint is required. The purge air takes away the water molecules, thus destroying the equilibrium and resulting in a permanent flow of water molecules from the wet side of the tube to the dry side.

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***BIO+sum* Comparative Analysis**

Whenever contemplating a new technology for our product portfolio, VitalAire runs several analyses, including one we call the *BIO+sum* comparative analysis. BIO is an acronym where B=cost to buy, I=cost to install/implement, and O=cost to own/operate. The analysis looks at the sum of these elements relative to a current product or products, revealing if the new technology offers true "net positive" value for our customers.

Here is a synopsis of our latest *BIO+sum* analysis for membrane dryers. We have limited the comparison to VitalAire/Busch medical desiccant systems as the new CSA Z7396-1 Standard will not permit refrigerants in the future:

On the surface membrane dryers appear less expensive to buy, however, when looking to achieve a minimum dewpoint of -5° C at 50 psi (*as required by the new CSA Z7396-1 Standard*), most non-oxygen scrubbing membrane lines max out at capacities around 10 cfm. Since the majority of healthcare facilities have calculated demands greater than 10 cfm, implementing membrane dryers normally involves one of two design formats; A) duplex stand-alone membrane dryer packages each consisting of numerous dryers (4-12) piped in parallel; B) multiple low flow compressors each having a dedicated membrane dryer (i.e 6x 3Hp compressors each with one 10 cfm dryer v. a duplex 10 Hp system and stand-alone dryers). Both options represent a real cost equal to or greater than today's best duplex desiccant dryer systems.

It must also be noted that both CSA Z305.1-92 and the soon to be released CSA Z7396-1 Medical Gas Pipeline Standards require redundancy of the compressors ***and*** dryers to ensure supply reliability. If design format B) is implemented [*one dryer per compressor*], true redundancy can only be achieved by having two extra compressor-dryer combos: one combo for the extra compressor required and one combo for the extra dryer required (ie. the 6-plex noted above becomes an 8-plex!).

We must also account for the continuous purge of membranes. Meeting calculated facility demand will likely require upsizing both the compressors and dryers; a requirement generally not associated with purge-controlled desiccant dryers.

Considering all this, membrane dryers are not quite the bargain they first appear to be on the acquisition side, so today we rate them on the **B=cost to buy** scale as negative (-) compared to our medical desiccant system.

Next we look at installation costs. Compared to our medical desiccant packages, the cost to install membranes is basically a wash if a stand-alone duplex dryer package is implemented. Going with the co-dependent design, however, the pendulum quickly swings in favour of the duplex desiccant dryers. First one must consider the extra floor space and pipe-work required to achieve a system design with true redundancy. Additionally to ensure the pipeline is protected from moisture spikes this configuration requires more expensive multi-signal hygrometers and compressor controls. When the dryer package is distinct from the compressors, we can monitor dewpoint at the output side, and if a problem is detected, automatically activate the back-up dryer without affecting compressor operation. With membranes serving in isolation (i.e. compressor dedicated), controlling dewpoint in the pipeline requires humidity monitoring at each dryer outlet and system controls designed to shut-down individual compressors in the event of high humidity.

So on the **I=install/implement** scale, depending on system design, membranes rate either a wash or negative (-) when compared to our VitalAire/Busch medical desiccant package.

Finally we look at the ownership costs. By design, membranes purge continuously while drying the air-stream. At minimum, 20% of a membrane dryer's rated capacity will be lost to purge air when set to achieve a dewpoint suitable for Medical Air (-5° to -10° C pressure dewpoint range). In other words, if the dryer capacity equals the compressor capacity, 20% of the horsepower used for compressing the air is ***guaranteed energy wasted***. Although our medical desiccant dryers also require purge air, they consume only 15% of their capacity, and *only purge when they reach a pre-set saturation level*. Depending upon demand down the pipeline, our desiccant dryers may purge as little as 10% of total compressor run time. **So compared to membranes, desiccant dryers are more energy efficient and deliver up to 25% more process air to the pipeline.**

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Again considering the continuous purge of membranes, it is obvious that air-end maintenance and filter element replacement intervals will occur quicker with membranes than with purge-controlled desiccants. So the continuous purge factor results in strike #1 against membranes on the ownership scale.

Efficiency of membrane dryers is directly related to the capacity of the water molecules to pass through the membrane tube walls. As such, there are two keys to maintaining operational efficiency; protection against fouling (i.e. contamination by dirt, dust, oil, etc.), and controlling approach air temperature.

Since their structure is microscopic, membrane dryers cannot be cleaned; once compromised they must be replaced. To mitigate this risk, added filtration is recommended before each dryer (*another added cost)*, and indeed, some manufacturers require the membrane cartridges be replaced bi-annually to ensure their operational efficiency. Two more ownership costs not associated with desiccant dryers results in strike #2 for membrane ownership.

Equally important is approach temperature. Because membranes are made from cellulose fibers, they are highly susceptible to heat damage. In fact the warranty on some brands is conditional upon maintaining an approach temperature <= 6^{o}C above ambient. To ensure a suitable approach temperature, extra after-coolers and a wet-side receiver are commonly required, representing additional cost and maintenance; so that's strike #3 for membrane ownership cost.

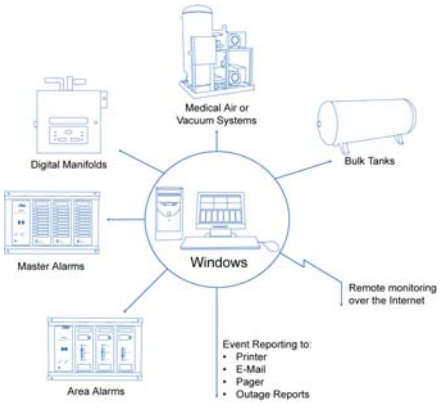
Where **O=own/operate,** it is clear membranes do not compare favourably to our medical desiccant dryers.

In conclusion, while membrane dryer technologies are certainly improving, and may someday be right for the medical application, our *BIO+sum* comparative analysis leads us to believe they still represent a compromise when compared to the medical air desiccant dryers we offer today.

For more information on our research into membrane dryers please visit our new website ***www.vitalaire.com***.

Introducing AIMS^{II}!

VitalAire is pleased to announce the release of **AIMS^{II}**, the world's first dedicated medical gas information management system now with **LAN Connectivity.** AIMS^{II} installs like any other plug 'n play network device; simply the most cost effective way to monitor the life support services distributed by your medical gas systems.



SEE AIMS^{II} ON DISPLAY AT THE NATIONAL CHES TRADE SHOW IN OTTAWA, SEPTEMBER 11-13.

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