Author name: J. Neskudla

Date of submission: Monday, 10 February 2014

Submission:

Vacuum toilets offer a 90% reduction in water consumption and a 90% reduction in waste water produced. Vacuum Toilets Australia has this technology installed in the Melbourne Water building at Docklands (see attached) and Legion House in Sydney. This technology, if utilised will have a major impact on any infrastructure needed to accommodate the Barangaroo project. There are benefits across the board from design to end user in selecting a vacuum toilet system. We market the Jets Vacuum System from Norway. It has been utilised in some of the largest buildings on earth including a 70,000 person stadium. Jets is also number one globally in the marine market with the largest cruise ships utilising this system. We can make a major difference to any considerations given to this project.

MELBOURNE WATER BUILDING and VACUUM TOILET TECHNOLOGY



The Project

Melbourne Water have built a new head quarters located at 990 LaTrobe Street Docklands in the Melbourne CBD development known as "Digital Harbour". Work was finished in late 2011.

The structure is a new 9 storey commercial building with the plant room located on the lower level with the foyer, lower car park and commercial area on level 1 and upper car park and commercial area on level 2. Offices are located from level 3 to 8 with level 9 being the roof plant level.

The population of the building is approximately 1,100 persons during normal office hours.

It is equipped with a Jets Vacuum Toilet System supplied by the Australian and New Zealand Distributors, Vacuum Toilets Australia Pty Ltd.

The Equipment



There are 72 Jets 50M floor mounted vacuum toilet pans installed in the building. These pans are being serviced by a Jets 130/195 MBA vacuum pump station located on the lower level.



The vacuum pump station is fed power via a constantly active Uniform Power Supply that is used in a backup mode to drive the vacuum pumps should there ever be a power failure. The vacuum pump station has been delivered with "soft starters" and is configured to handle the present population of 1,100 persons. The control panel and mounting frame and plumbing are so configured that should Melbourne Water decide, in the future, to increase the building population to 1,500 it is a very simple job to insert one extra 65MBA vacuum pump and connect the already present electric supply and plumbing to it, to meet the required increased capacity.

Additional toilets can be added to the existing piping network by simply breaking into the Blucher push fit piping system and running the extra piping, without hot work, bending, grinding or cutting to the positions where toilets are required. Gravity fall is not required so the pans can be located anywhere in the building.

The Build Process

The system became live half way into the build process when the two mid level floor ablutions were plumbed down to the vacuum station. This allowed the workers the luxury of visiting ablutions quickly, safely and easily instead of the long, time wasting journey to ground, that was previously required. With all the sanitary piping in place (or yet to be installed) we were able to isolate all pipe runs/branches not yet fitted with vacuum pans, with the installed isolation valves which allowed the system to go live very early in the build process.

The Jets 50M vacuum pans have a 50mm outlet. All branch piping, of which each floor has three, one for disabled, one for female and one for male is 50mm diameter. The risers are 75mm diameter. The entire system is piped with Blucher push fit SS piping and as such there was no hot work required, no cutting required, no bending required and no wasted piping left behind. Adjustments to the piping were done very simply and the piping was passed under or over any obstructions due to the beauty of vacuum technology.

The Operation of the System

The vacuum piping network, which is a totally closed network with no vents what-so-ever, is kept at a vacuum level of 35% to 55% (-0.35 bar to -0.55bar) by the Jets 130/195 MBA Vacuum pumps which are controlled by a vacuum sensor mounted directly to the piping.

As toilets are being flushed, vacuum drops to the start level (35% vacuum) and the vacuum pump(s) restart rebuilding the vacuum to 55% and then stop, only starting again when more toilets are flushed dropping the vacuum level once again. This process continues all day whilst toilets are being used. At night, when toilets are not being used, the vacuum pumps lay idle not consuming power. When a toilet is flushed, the waste is forced into the pipe system by atmospheric pressure (not sucked by vacuum!) and travels at approximately 15m/second through the pipe work to the vacuum pump. At the pump it is macerated to a fine "soup" by the inbuilt macerator and discharged, by the pump(s), to the sewer point. There is no intermediate tankage for holding collected waste, all waste travels directly from pan to pump to sewer, in the one motion (pardon the pun).

The Jets 50M floor mounted pans are completely operated by the attendant vacuum directly behind the pan in the outlet piping. The pan's discharge valve, water valve and activation button are operated without power being required. The Jets vacuum toilets use air to transport the waste not water and as such, each flush only consumes 0.8 litres of water, not for flushing but simply for rinsing of the bowl.

The Benefits of Vacuum Technology

The benefits are many and varied. Let's look at them:

Water savings.

Let's compare a gravity pan system of 4.5 litres per flush with the Jets vacuum pan consuming 0.8 litres/flush. We can use the Melbourne Water population of 1,100 persons and make the industry assumption of 6 visits to the toilet per person per day.

Here is the math:

Gravity: 6	6 visits/day x 4.5 litres/flush x 1,100 persons	=	29,700 litres/day
Vacuum:	6 visits/day x 0.8 litres/flush x 1,100 persons	=	5,280 litres/day
THE MELE	BOURNE WATER BUILDING IS SAVING	=	24,420 litres/day

Now this saving brings us to the next important saving, power.

Power Savings

Over a year Melbourne Water building has consumed 8,791,200 litres less water than it would have had it been installed with a low flush gravity toilet system.

The power savings realised in pumping this lessor amount of water to the building are equaled by the savings realised in pumping the produced waste waters to the sewerage treatment works and, I am not even considering the power saving associated with treating such a reduced amount of waste at the sewerage treatment works.

Remember, this is only one building.

So far we have a massive savings in water and massive savings in power, what's next?

Design Flexibility

Vacuum pans evacuate vertically up or down or sideways. This means you can run the 50mm piping inside a wall cavity up to the ceiling spaces.

This opens up design possibilities previously not available to the Architects or Hydraulic designers.

With Vacuum Toilet Technology you can place a toilet anywhere in any design.

You have no gravity fall on vacuum piping and the piping is much much smaller than any gravity piping system.

Remember, you can also speed up the build time by activating the vacuum toilets on high, mid or low levels, very early in the build process.

There are no vents to be run to the roof.



Maximum piping diameter used in any vacuum installation is 75mm (risers).

Macerated Waste in Sewers

Low flush gravity toilets are designed to decrease the amount of good clean fresh water being wasted on flushing of toilets. Unfortunately the reduced water flow, taking the waste through the sewer systems that, in many cases were laid down in the Victorian era, is not enough to "lift" and "float" and "push" the waste along these sewer pipes. The result is that, today, one of the biggest costs incurred is the unclogging of sewers.

With vacuum toilets technology this is a thing of the past. The vacuum pumps have an inbuilt macerator that macerates the waste into a fine soup that flows unaided through sewer piping because there are no solids that need lifting or floating.

Maceration of the waste is excellent news when looking at Green Star ratings for buildings as, "Maceration", is classed as "Pre-Treatment".

Odours and Venting

When a vacuum toilet is flushed between 60 and 100 litres of air are forced down into the pan by atmospheric pressure (it is this air that transports the waste). Due to this, each time a vacuum pan is flushed, the toilet cubicle is totally refreshed with fresh clean smelling air. We have all entered a recently used toilet cubicle. With vacuum toilets, humidity and odours, are a thing of the past.

Core Drilling not Required

A conventional gravity toilet system is severally hampered by the need to obey gravity fall to allow the waste to be pushed by large volumes of water down the sloping sewer line.

Due to this need any gravity toilet system must involve core drilling of the plate (you must have holes in the floor of 100mm to allow the pan access to the floor ceiling space below). This is a costly and time consuming exercise which also determines where a gravity toilet pan can be located. The design of the hydraulic system is determined by gravity and aesthetics of the floor below.

Once again, vacuum toilet technology comes to the rescue, as vacuum pans evacuate vertically upwards into the ceiling spaces, or sideways along wall cavities (they can also evacuate down if needs be). This means they can be placed anywhere you want them to be placed and, more importantly, you can change the location at anytime in the build process with no detriment to the system.

Core drilling is a thing of the past with Vacuum Toilets, it simply is not needed.

Installation of the Vacuum Pans

Once the vacuum piping is in place the wall spigots can be stopped off (plugged) and tilers or painters can go about their work unhindered by a toilet pan.

The Vacuum Toilet Pans can be mounted much later in the build process, allowing greater access for other trades and also keeping the pans in pristine condition until the big opening day.

Cisterns are a thing of the past with Vacuum Pans, we do not use them. Water is connected directly behind the pan to the water valve. Once again this makes mounting of the pans a dream.

Waste Discharge to the Sewer Point

Jets Vacuum Pumps collect all waste from the entire building and macerate it. Once the waste passes through the vacuum macerating pump it can be discharge up to 200m to a sewer point. This allows greater design flexibility when looking at a location point for the vacuum pump station.

Existing Sewer Line Upgrade considerations

Many new building and building upgrade projects are forced to look at the building population with regards to existing sewer infrastructure running past the project. In many cases this will require an upgrade to the sewer servicing that area.

With a genuine 90% reduction in flows associated with Vacuum Toilet technology, this is no longer a problem, in fact it will assist any waste entering the sewers from a traditional gravity toilet system by introducing a lubricating soup to assist with moving waste along the sewers.

Waste Discharge Charges

Waste Water charges are generally calculated on 90% of the fresh water consumed by a building. With vacuum toilets this cost is reduced by 90%. Who else can offer you 90% off anything??

Municipal Treatment works

Today our populations are on the increase and our ageing sewer infrastructures are battling to cope. Many new proposals for new towns, suburbs and large scale building projects are severally hampered by the capacity of sewerage treatment facilities.

Many of these facilities would need major upgrading to handle the increased loads from these projects. Many new projects never get off the drawing boards because of the costs associated with the needed upgrades.

Vacuum Toilet Technology, with 90% reduced flows alleviates this pre-requisite for many projects.

Upgrades and Refurbishments of existing Buildings

There are very many buildings in Australia that lay empty and forgotten because the costs associated with their upgrade to a useable facility are simply to high.

In 95% of those cases, it is the cost of getting the toilets system in place. Many old buildings could be turned into hotels and offices if only a solution to the massive cost of getting the sewer hydraulics into the building, could be alleviated.

Vacuum Toilets offer that solution.

An old bank building, an old treasury building, in fact any old building equipped with a few toilets at corridor ends, that makes use of an old victorian toilet system, can now have toilets in any position within the structure, simply, quickly and with very low costs.

Vacuum Toilets can be located anywhere without gravity fall, with 50mm piping and with zero in-ground work required.

The scope for old building refurbishments is totally unlimited with Vacuum Toilet Technology.

Greenfield Developments

Vacuum Toilet Technology can totally revolutionise the design and infrastructure incorporated in Greenfield developments.

Any greenfield development that decides to use Vacuum Toilet Technology can do so today with complete ease.

Each individual house can have a small domestic vacuum pump installed in the garage or basement servicing the entire house and discharging to the gravity sewer passing the house or, each house fitted with vacuum toilets can be plumbed to a vacuum station located somewhere within the greenfield development via vacuum piping between all houses and the vacuum station. Remember, this vacuum piping connecting all houses to the vacuum station does not need any gravity fall.

The cost savings of a "no gravity fall" sewer network within a greenfield development or entire suburb or city should be obvious to anyone.

Mining Camps

Mobile ablutions or semi permanent accommodation modules can now be located with ZERO in-ground work being required. This means they can be shifted and relocated at any time without having to dig in new gravity sewer lines. Again, each unit can have its

own dedicated vacuum pump delivering waste to a septic/biological treatment system or you can couple an unlimited number of accommodation units together and plumb to a single vacuum pump station located away from the camp (distance is unlimited - it can be 5 kms or more). We can set up 2000 individual accommodation units with zero in-ground work. Now that is a saving to think about and let's not forget that each man will go from consuming fresh water for toilet flushing, of 27 litres per day, to 4.8 litres per day. This is a win win for the resources sector. Grey water, not contaminated with black water could be used for many other purposes in mining camps.



The Future of Vacuum Technology in Australia?

Legislative change is currently underway. A draft ATS and AS have been lodged with the ABCB on the road to WaterMark.

Vacuum Toilet Technology is making inroads across Australia where it is accepted ahead of WaterMark approval because of the obvious benefits to the nation.