Application of Dry Urinals

Mete Demiriz, *Gelsenkirchen University of Applied Sciences, 45877 Gelsenkirchen / Germany*

Introdution

Despite the fact that dry urinals have been in the market for several decades, it was during the last few years that they have been successfully marketed in Europe.One reason for the rise in their popularity was the increasing cost of water and waste water charges. Initially there was the misconception that urinals with no water access might be unhygienic and cause obnoxious odours. Those contentions, however, were refuted through scientific research and analysis under real conditions and circumstances [1]. Urine from healthy individuals is sterile and works as a disinfectant. Through consistent daily care of the urinals with special spray cleaners it is possible to keep these in top hygienic condition. To achieve this, the application of a window cleaner with alcohol content is ideal.
The surface of the urinals - made from sanitary ceramics, fiberglass-reinforced epoxy (FRE) or from fiber-enforced cement – can be cleaned easily and are urine-resistant.

Types

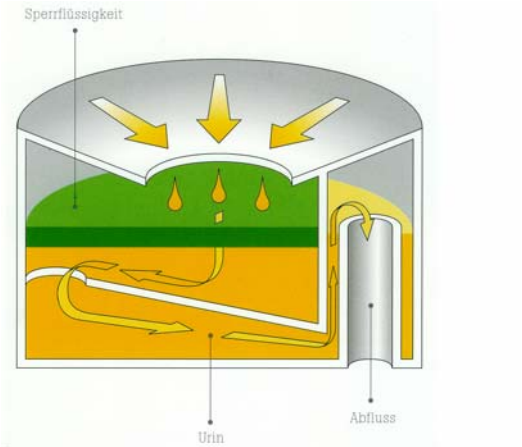
The dry urinals differ from waterflushed urinals, and as well, show variance amongst each other, mainly through the type and construction of their odor traps. Now a days two main variations exist in the market

1) Traps with a floating sealing liquid
2) Mechanical working traps

Traps with a floating sealing liquid

These function according to the principles of bottle or p-type traps. On the user side exits a floating sealing liquid with a lower density than water and urine. These floating sealing liquids are often pleasantly scented and have a higher viscosity and does not mix with water or urine. Hence, they form a layer over the water and urine on the user side, and prevent the obnoxious odors from escaping out of the urine surface. Entering the bowl urine flows through the floating sealing liquid without mixing with it. (Figur 1). In contrast to Feurich' s [2] contention, urine is neither filtered nor conditioned during this process. Organic floating sealing liquids are broken down biologically, and must be topped up or refilled on regular intervals. Liquids, which are tough to break down biologically, should not be used, since under certain circumstances they will find their way into waste water, and as a result reach waste water treatment plants.

Such traps are used by brands and models of Ernst, Sinaqua-Waterless, Uridan, No-Flush, Mc Dry.



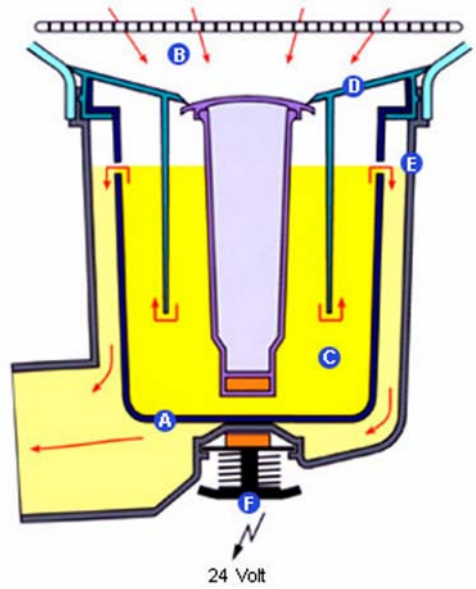
Figur 1: Trap with a floating sealing liquid (Source: Sinaqua-Waterless)

Mechanical working Traps

Currently there are two different types of mechanical working traps on the market:

Trap with a buoyancy body from Urimat

This patented system (Figur 2) consists of one cylindric plastic container (A) with overflow outlets along its circumference, a buoyancy body, and a rubber cuff with a sealing lip(D). The buoyancy body, floating in water or urine (C) is lifted upwards towards the rubber cuff and thereby seals the inlet opening. A sensor below the urinal detects the user. Subsequently an electromagnet moves the buoyancy body - before, during, and after use – downwards. As a result urine can flow from the urine collection point (B) into the trap.

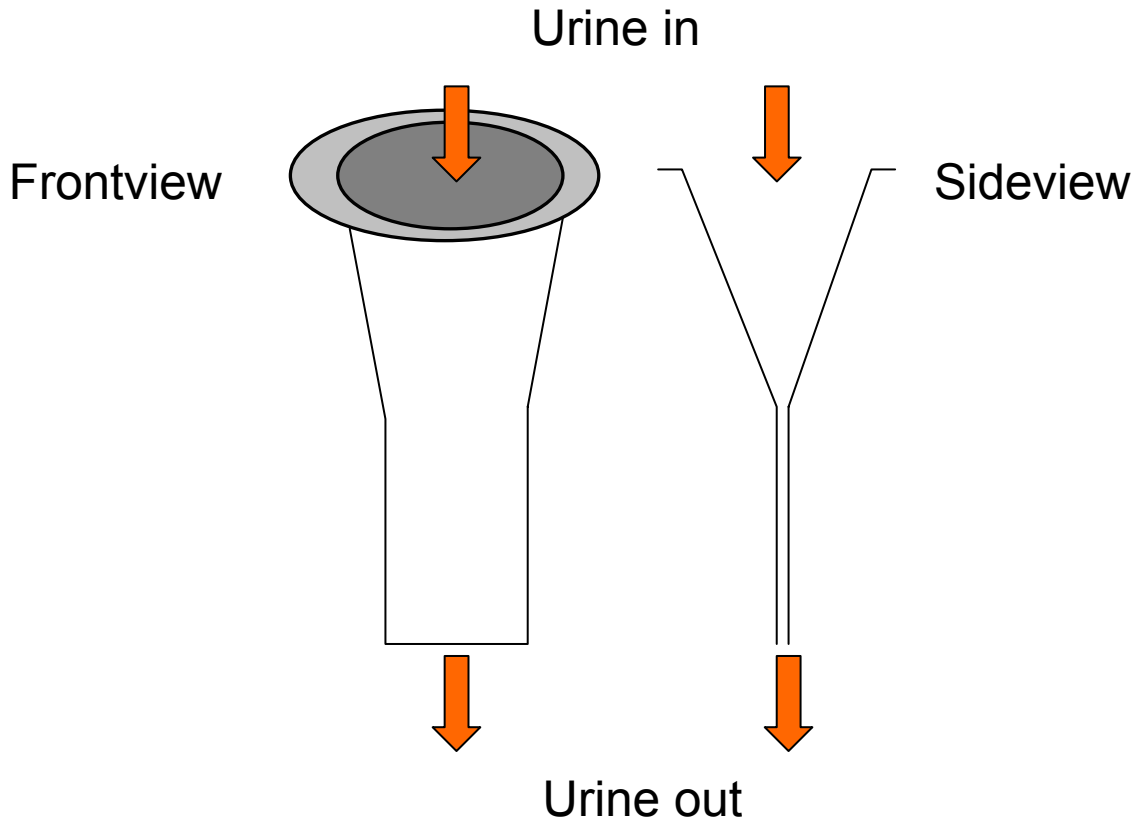


Figur 2: Trap with a buoyancy body (Source: Urimat)

Trap with a duck bill

Here, a hose made from special waterproof material, serves as a trap. Its opening is round at the top, and pressed together, not unlike a pressed trouser leg, at the bottom. It lets the urine through, and immediately closes shut afterward (Figur 3 and 4). This type of trap comes without the floating sealing liquid or any kind of auxiliary power. Traps operating according to this principle are used by companies such as Franke, Keramag, Kuhfuss, and Sphinx.


Figur 3: Used duck bill



Figur 4: Principle of the duck bill

Long-Term Testing

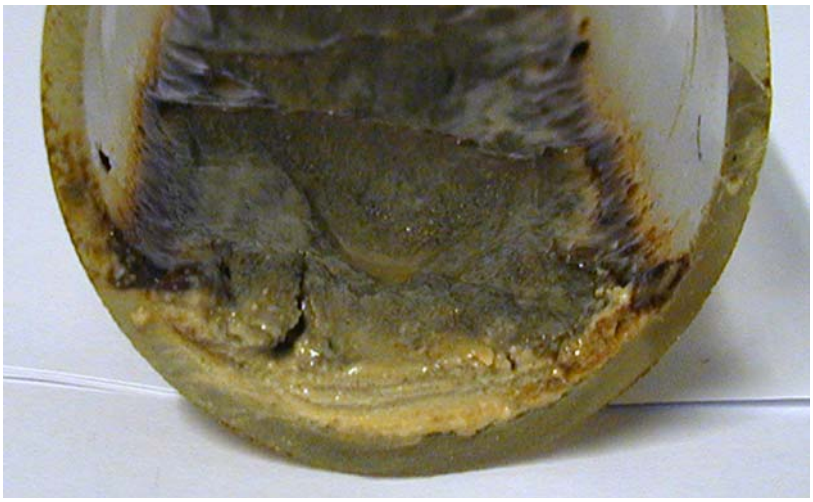
Two dry urinals each, from the companies Duravit, Sphinx and Urimat (ceramics by the Laufen Company), were tested under real life conditions for two years. For this purpose, the cafeteria toilet urinals of the Gelsenkirchen University of Applied Sciences were re-fitted. The installation was completed according to manufacturer instructions and presented the installers with no serious difficulties (Figur 5).

Figur 5: Test Dry Urinals (from r.to l.): Urimat, Sphinx, Mc Dry (Duravit)

The routing of the drainage line was diverted. All six urinals were connected to a 2-inch- collection line, made of glass, and joined with the individual connection line of the adjacent sink. The slope of the connection line was 1% (Figur 6). During the testing period it was observed that this drainline accumulated a slow but steadily growing build-up. This build-up consisted of an outer, hard layer of urine crystals, and a considerable thicker layer of sludge, which was partially penetrated by a fine hard crust, similar to puff pastry.

Figur 6: Colleting drainline out of glass

After nine months of use, a part of this contraption was dissembled and analyzed. The part in question was positioned after the connection of all six urinals, but in front of the junction leading to the water drainage (Figur 6). This enabled observation of accumulation of all urinals in use. The thickness of the accumulation layer was 7mm thick, and 42mm wide (Figur 7). The higher this layer, the wider the adjacent flowbed became, causing slower urine flow, which in turn led to additional build-up.



Figur 7: Build-up in the collecting drainline after nine month of use

Both Urimat urinals were *not* maintained according to manufacturers' specifications, so that the life span of the odor traps could be established. The manufacturer dictated a maintenance interval of 2-4 months, at which time the complete odor trap together with the buoyancy body was expected to be replaced. During the test period the odor traps gradually became dense after 8 months, and up to that point had been used 4150 times on average. Therefore, the specified maintenance interval - or even a shorter one - was deemed realistic.

The traps were clogged with hard deposits as well as sludge with organic and inorganic components. It was possible to dismantle them, and to clean them by tapping, wiping, and scraping. After that they were again fully functional. However, before re-installing them, they had to be re-greased, since otherwise urine penetrated between the ceramic and the trap.

In the case of the dry urinal by Sphinx, the manufacturers' specifications concerning maintenance intervals matched the test results. At the end of the test period, the trap was taken apart, and the hose valve – acting as the odour trap – was examined for functionality. A replacement was not required, since the original one was still fully functional. There was some minor deposit at the lower edge (Figur 3). Apart from this no other anomalies were observed. Since this is a brilliant contraption, without moving parts, floating sealing liquid, or auxiliary power, only minimal breakdowns are expected.

As far as the Mc Dry model from Duravit is concerned, some congestions were noticed, mainly in the relatively small drainage openings, due to cigarette butts stuck in those openings like corks. During the monthly maintanance of the odor traps, the remainder of the floating sealing liquid had to be rinsed out together with build-up and cigarette butts.

One of the Mc Dry urinals , after an 18 month proper operation - such as cleaning and maintenance according to manufacturers' specifications – was not maintained for six months and no sealing liquid was used during this period. To document the accumulated deposits it was sawn open. It was observed that in the odor trap, a 2-6mm thick build-up had accumulated.

Efficiency

It is a fact that dry urinals use only a small amount of water for maintenance purposes. But to answer the question which of these systems is the most sensible in terms of efficiency, an efficiency evaluation using real data has to be conducted. Next to the cost of investment, the following aspects also play a crucial role in a proper efficiency evaluation.

- Water and waste-water charges
- Actual maintenance costs of water-flushed urinals
- Planning and construction of water connections of water-flushed urinals
- Actual maintenance intervals and costs of dry urinals
- Cleaning costs of dry-urinals
- Cleaning of drainage pipes of dry urinals
- Eventual energy costs

It is, in particular, the maintenance intervals that is the deciding factor in how efficiently the dry urinals can be operated. Complaints about the short life-span of the waterless odor traps, lead to constructive changes in the manufacturers' specifications. By enlarging the trap volume, and the orientation of the urine over-flow over the discharge pipe, 7000-8000 uses are expected to be achieved per trap. [3] Uridan urinals also have a relatively voluminous trap, so that in their case the manufacturers' specifications [4] of 5000-7000 uses can be considered realistic.

In some published efficiency calculations, the daily use of urinals are set at too high. Realistic average values are maximum at around 50-70 uses per urinal per day. Our own measurements have shown, that by automatic urinal flushing 1.5-2 litres of water are used per flush. By using this amount the drainage pipe stays clean, and no urine crystal build-up is formed.

Conclusion

- Dry urinals can be oparated hygienically, if they are maintained and cleaned according to manufacturers' specifications.
- The optimization of existing dry urinals, and new techniques in recent years have increased the life-span and the maintenance intervals, which made it possible to operate them cost-efficiently.
- Despite some statements – as in Sanitarbau 2003[5] – urine deposits and forming of crusts in drainage pipes of dry urinals is still the case. It is not possible to remove these by application of high water volumes through the urinal itself.
- A very intense odour developes in the drainlines leading away from the dry urinals. A larger clearance has to be taken into consideration during the design and positioning of the breather pipes and the air inlet ducts.

References

[1] M. Demiriz, Wasserlose Urinale, TAB Technik am Bau Technische Gebäudeausrüstung 31, 2000, Heft 11, 63-68

[2] H. Feurich, Urinale in der Kritik, SBZ 59, 2004, Heft 7, 26-29, Gentner, Stuttgart

[3] K. Hettwer, Persönliche Mitteilungen, 29.03.04, Gelsenkirchen

[4] Uridan, www.uridan.de

[5] Arbeitskreis Maschinen- und Elektrotechnik staatlicher und kommunaler Verwaltungen (AMEV), Planung und Ausführung von Sanitäranlagen in öffentlichen Gebäuden (Sanitärbau 2003), lfd. Nr.: 83, Bundesministerium für Verkehr, Bau- und Wohnungswesen, 2003, Berlin