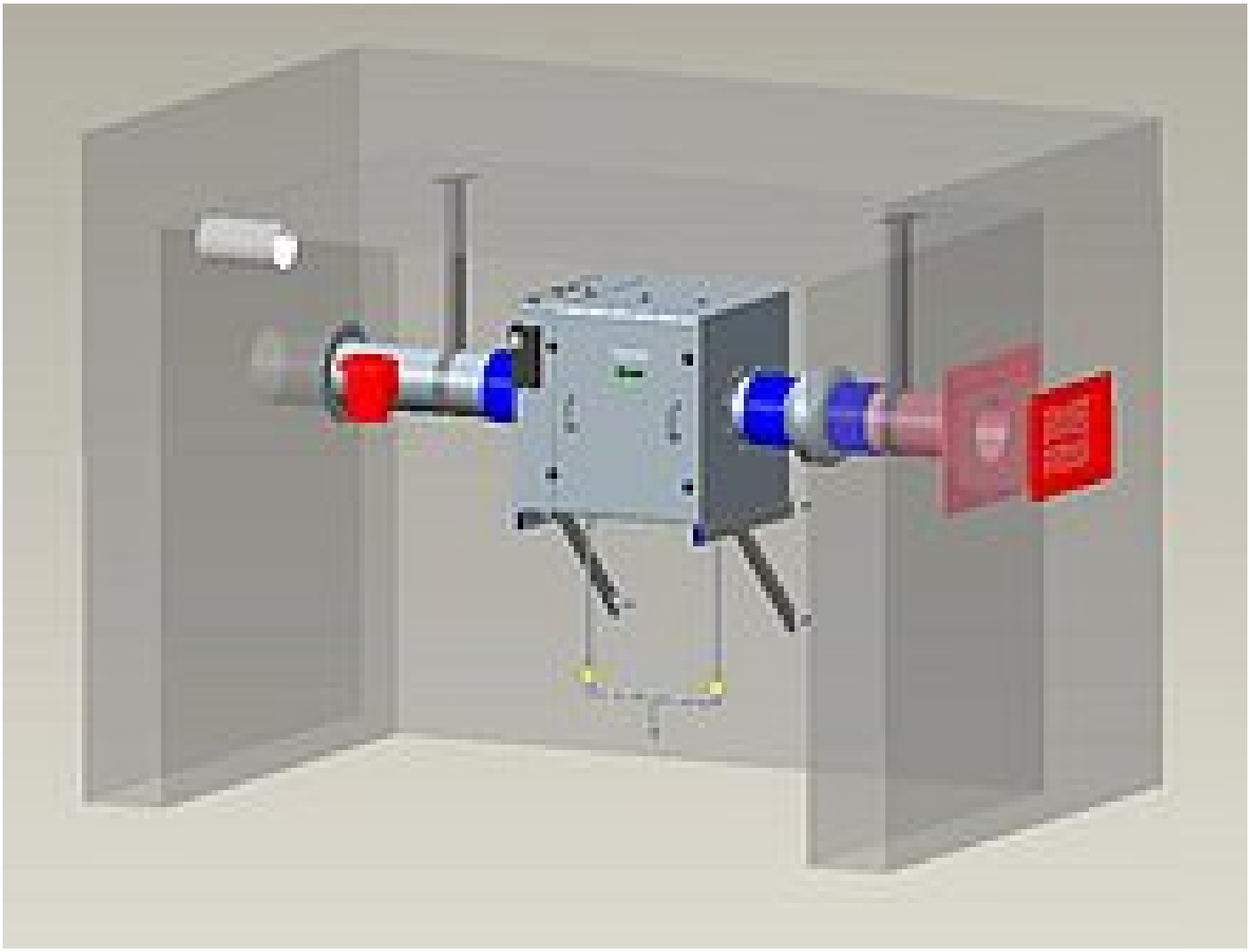
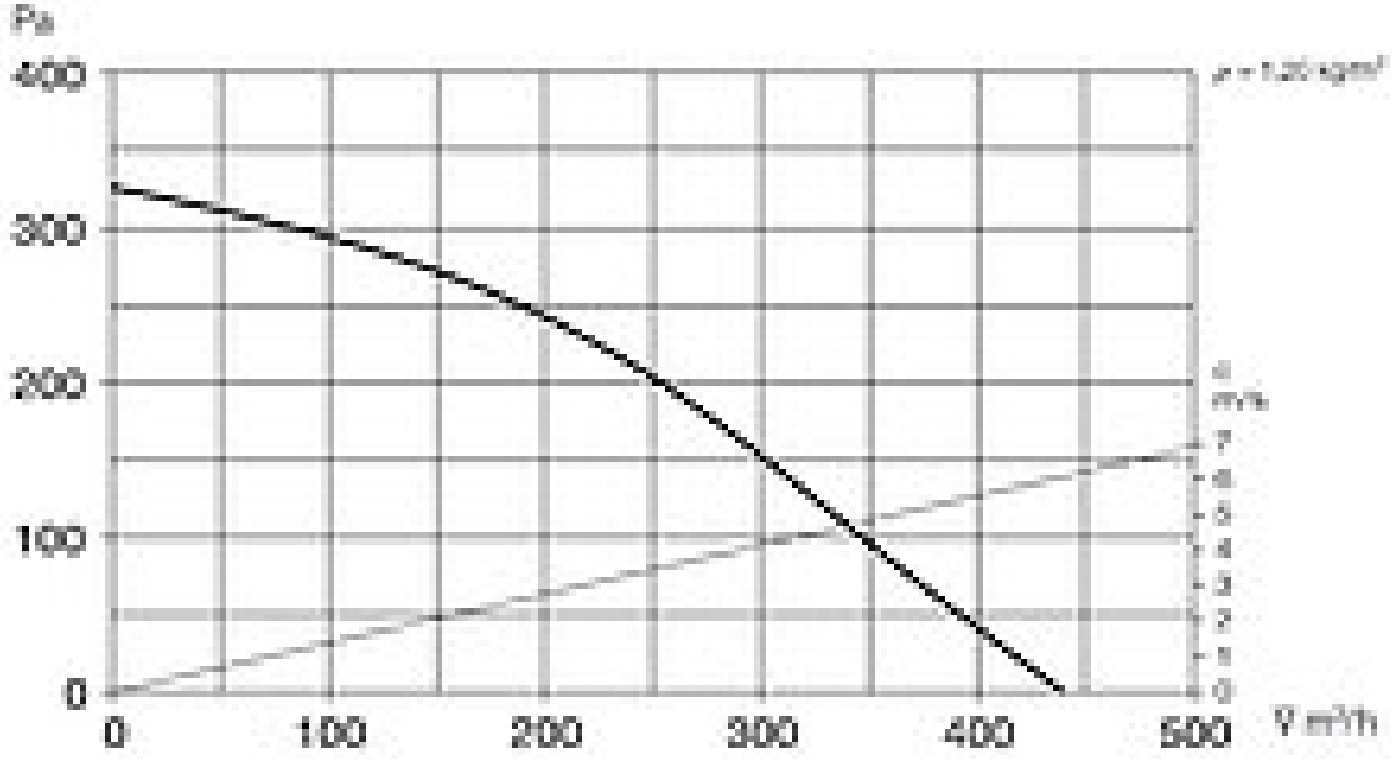
Minimised condensation in water chambers through forced ventilation



System drawing showing the technical elements for the forced ventilation of water chambers



Typical characteristics of a fan for ventilation of a water chamber

HUBER air filter plants are able to achieve separation efficiencies in excess of 99.95%

In some water chambers condensation drops occur on the ceiling and walls. This should generally be prevented through sufficient insulation of the ceiling, sloping ceilings or through special coatings. Frequently, however, the problem cannot be solved with static methods.

In 2011 already, we published a report about our experience with retrofitting forced ventilation systems in the elevated reservoir Utzenaich in Austria. When the reservoir with two rectangular chambers with 250 m³ capacity each was built in 2007 it had to meet high hygiene standards. The equipment components included stainless steel lining, sloping ceiling and air supply line with integrated air filter and underground loop with a slope to the air cooling and condensate discharge.

HUBER air filter plants type L251 to L662 filter the air with a class H13 HEPA filter (HEPA = High Efficiency Particulate Filter or filter for suspended matter). According to DIN 1822:2011 filter class H13 means a separation degree (integrated measurand) of > 99.95 %. This is standard for operating rooms.

The types L361 to L662 have a class M5 fine filter as pre-filter in addition to the H13 HEPA filter (according to EN 779:2012). Note: A water chamber with air supply via a HUBER air filter plant 'breathes' air as pure as in operating rooms of hospitals.

But: There are people working in an operating room who breathe in and out producing used air. Therefore, routing of supply air and exhaust air flows is provided for in these rooms.

We followed the example of such rooms and adapted this solution as far as necessary. Similar to the people working in operating rooms the water surface gives off humidity to the air. What is needed in the water chamber if it comes to condensation, in addition to the air filter plant, is forced ventilation (via ventilators) and exhaust air routing.

The water reservoir at Utzenaich was the first successful test to eliminate condensation through forced ventilation. In the course of the following years a number of other reservoirs were equipped with forced ventilation in addition to the existing air filters. In all these reservoirs condensation could be minimised. Another advantage of this measure is that the whole system, starting from the ventilator, is in a status of slight overpressure so that the entry of unfiltered air into the water chamber is reliably prevented.

What we do not know in detail is the behaviour of the relative air humidity in the area between the water surface and water chamber ceiling. Anyway, it does not make much sense to measure this profile because the frame conditions differ from case to case so that it is impossible to draw conclusions from one to the next case.

Now as air filter plants have been used for 15 years, the installation of an air filter plant should meanwhile have become state-of-the-art, although binding regulations do not yet exist.

If a new plant has been built of which all constructions are state-of-the-art or an old plant has been refurbished with taking all measures of condensate prevention that have been realisable with a justifiable budget but the condensate problem still exists, it is sufficient to know that condensation can most certainly be stopped completely by retrofitting forced ventilation (ventilator with approx. 150 – 250 Pa pressure increase in the operating range) and an air filter plant (unless there is one installed already) plus an outlet air line with an easy-to-open pipe plug (Δp approx. 80 – 120 Pa) or defined outlet air routing (which must not necessarily be a line).

Utzenaich – in flow direction: wall connection plate in the safety louvre (outside not shown), air suction line to the radial pipe ventilator with 5-stage transformer for rotary speed variation, L251 air filter plant (with differential pressure switch), safety valve type 170-1 (red, approx. 1,000 Pa triggering pressure)

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HYDROFLUX
WATER | SCIENCE | TECHNOLOGY

Hydroflux Pty Ltd
Level 26, 44 Market St
Sydney NSW 2000
Australia

Phone +61 2 9089 8833
Fax +61 2 9089 8830
Email info@hydroflux.com.au
WWW www.huber-technology.net.au

Representative of the HUBER group:
www.huber.de