



CORROSION REDUCTION & COST SAVING FOR HEATING & CHILLED WATER SYSTEMS





Reflex // The products

The product range

Storatherm Aqua A-Speicher

Reflex N

Sinus HydroFixx

Variomat

Reflexomat

Servitec 60

Fillsoft

Extwin

Exdirt steel



Energy efficiency

EneShaping the energy transition

- As a consistently future-oriented business, Reflex is committed to a sustainable energy policy.
- We support the German Federal Government's energy policy objectives and are already making an important contribution to protecting the environment through our efficient, sustainable products.
- This is built on proven technologies and future-oriented innovations.
- With a comprehensive product range of vacuum spray-tube degassing units, combined with sludge and dirt separators, we offer solutions for finely tuned operation of heating and cooling water systems which save the maximum resources.





Problems at Chilled Water or Heating Systems ?

Pressure Mainanance

Continuous Make up

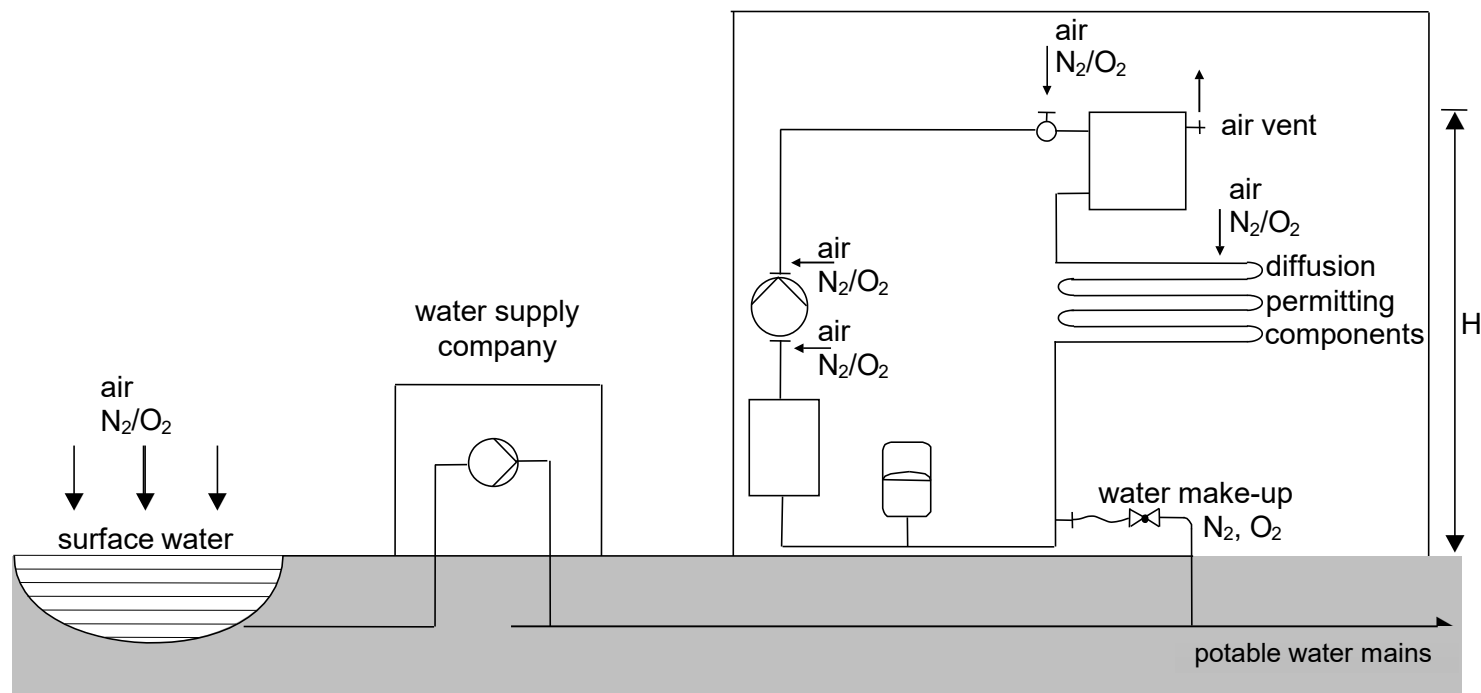
Air-Dust- Dirt

Cavitation

Corrosion



How is air entering closed circuits ?

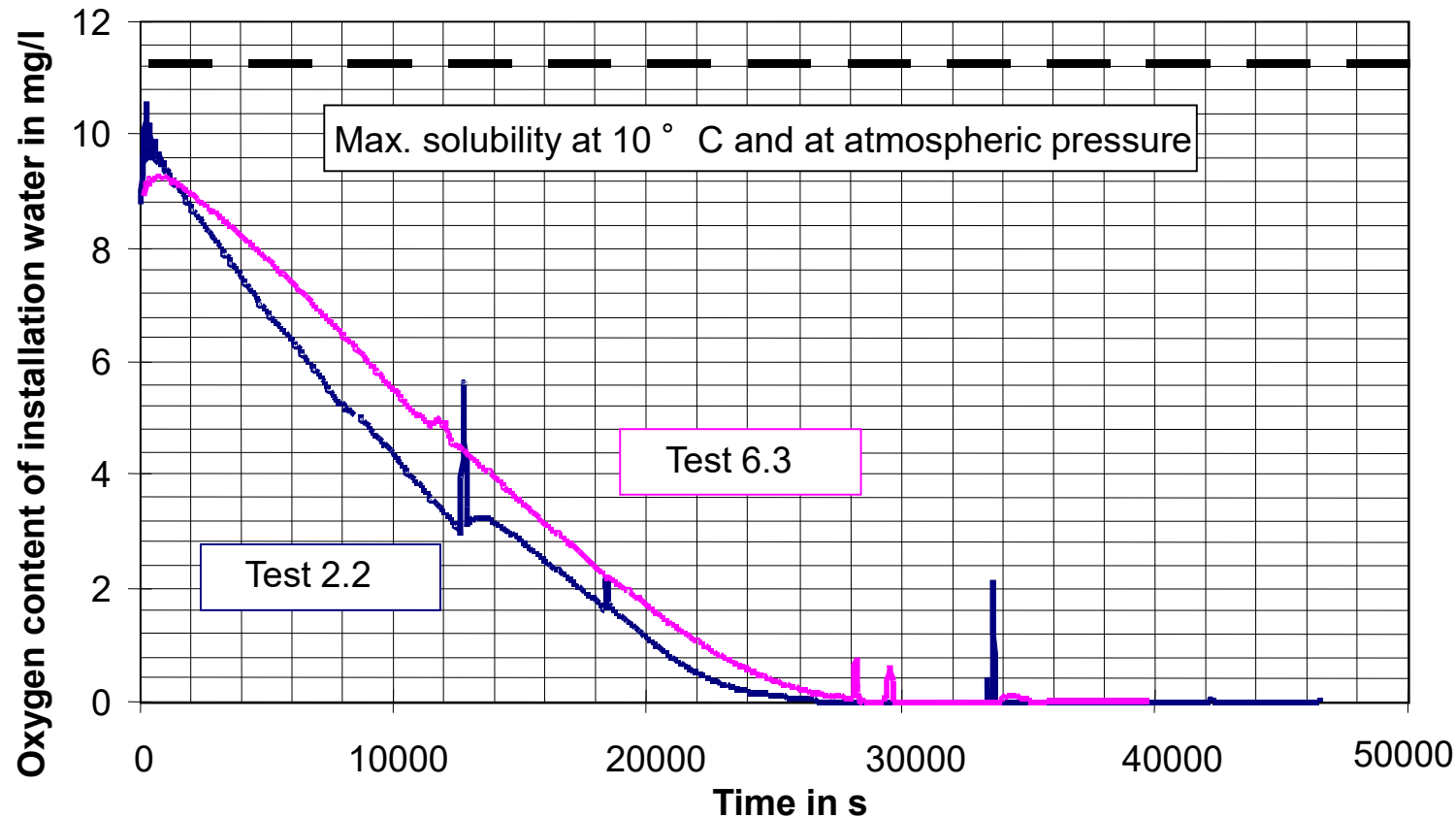


Course of the gasses in a heating installation

1. Air enters the heating installation from the mains system. Research at the Technical University of Dresden showed filling water loaded with air up to 10% by volume. This is a very high concentration. The air then diffuses into the system water. One of the main causes for air entering the system is the diffusion of air from the mains into the system water. This is particularly true for rubber hose pipes. Even if the air is diffused into the system water, the air will be aspirated into the circuits. Consequently in case of air problems, first check-up the pre-set pressure and the dimensioning of the expansion vessel.



Air is not always of the composition we suppose



Reduction of oxygen during circulation of the system water

$t_m \approx 30^\circ \text{ C}$, piping and other components made from carbon steel, first fill with drinking water



Water as a system component

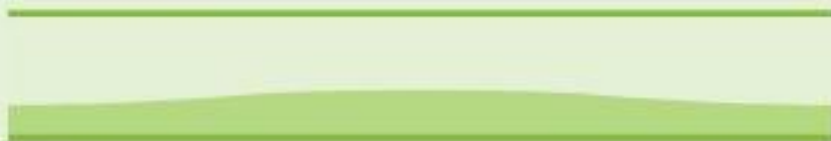
Plug



Slug



Stratified



Dispersed Bubble



Pipe with free, microbubble and dissolved gases

- Circulation interruption due to the total failure
- No optimal heat exchange and output
- No reach of the calculated mass flow and thus no correct hydraulic balancing
- Erosion / abrasion and cavitation by air
- Etc...



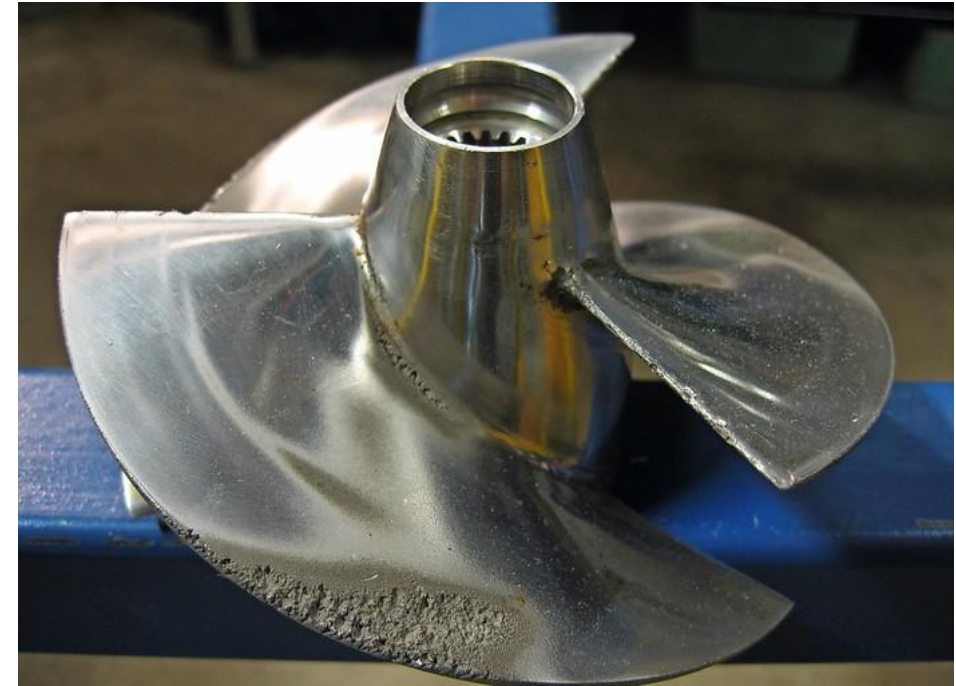
What is Cavitation ?

Classical example

Cavitation on a ship propeller.



Cavitation damages



Continuous operation with cavitation



Solutions For Air Problem ?

Air vents

Air tube + Air vents

Air separators

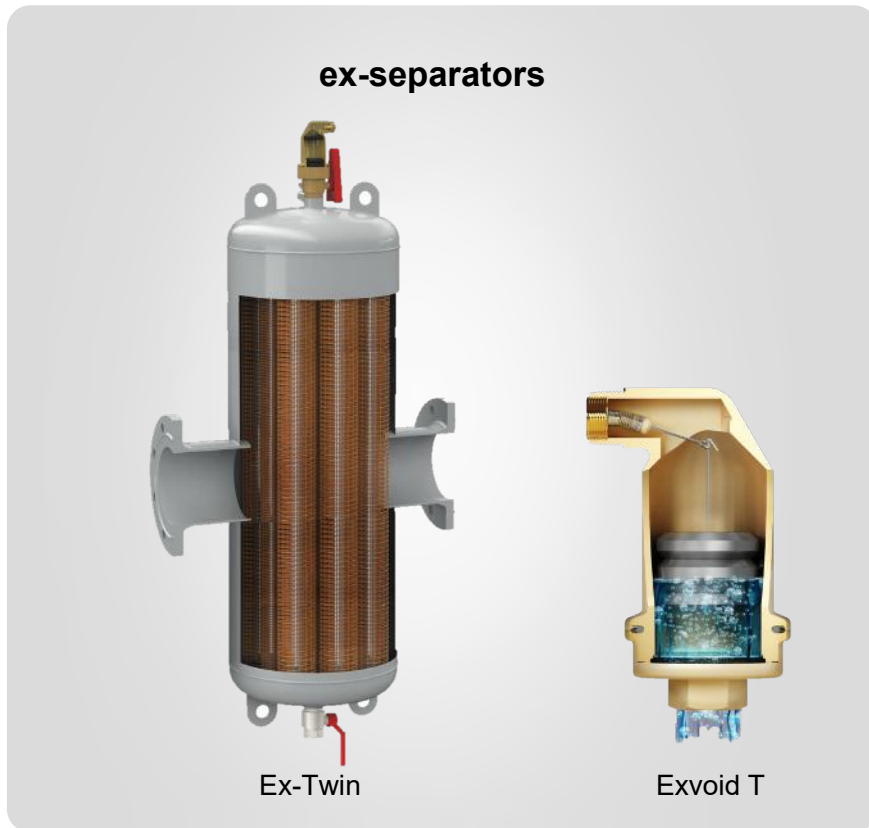
Chemical liquids

VACUUM DEGASSERS

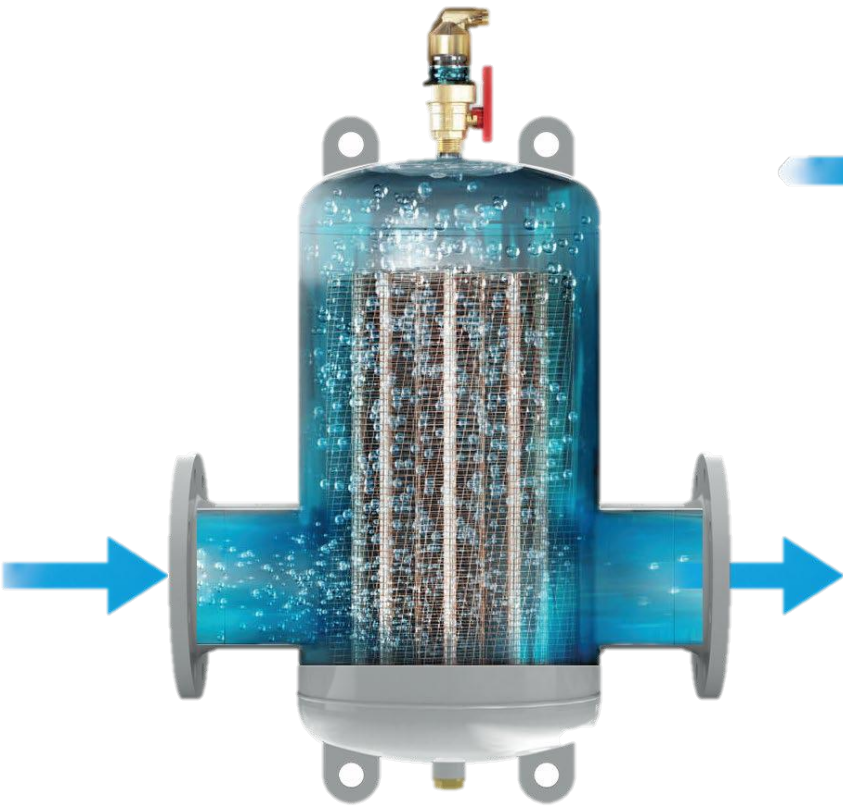
WINKELMANN BUILDING+INDUSTRY



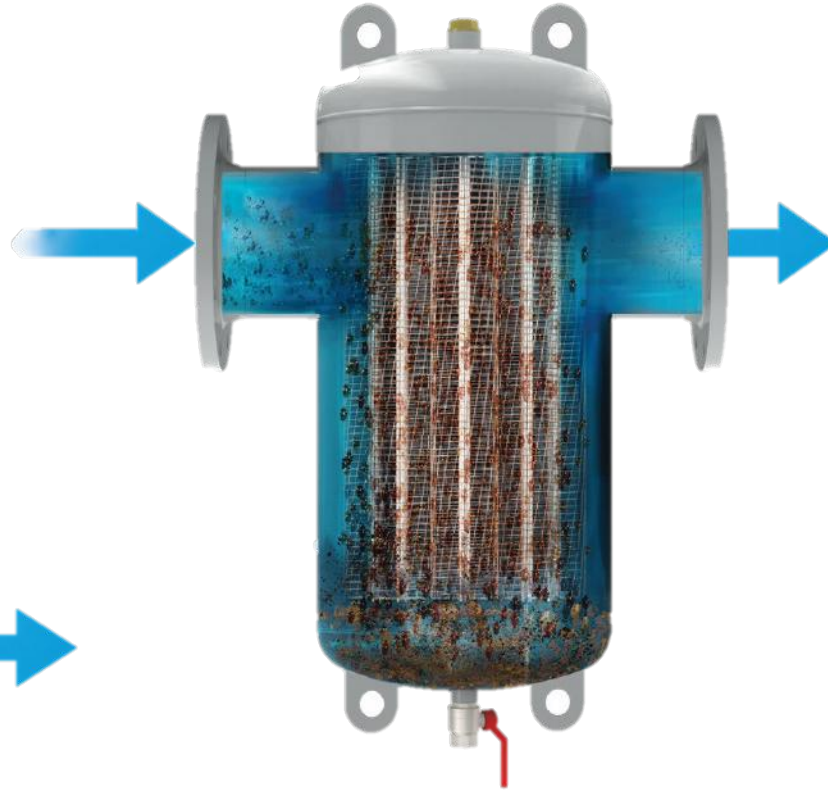
Separation technology



- Low pressure loss
- High performance for HVAC system
- User friendly
- High performance for air separation
- Easy to install



Exair

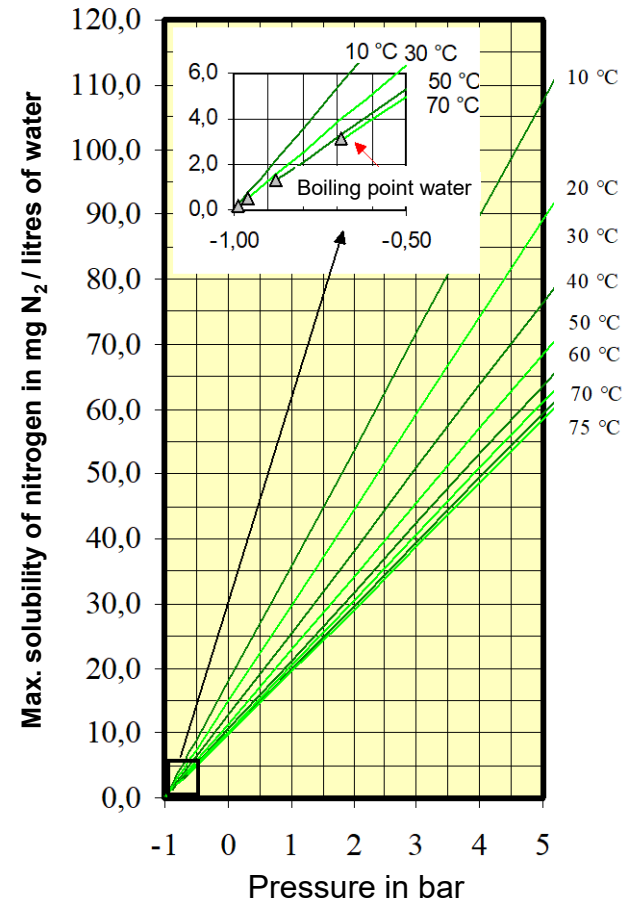


Exdirt

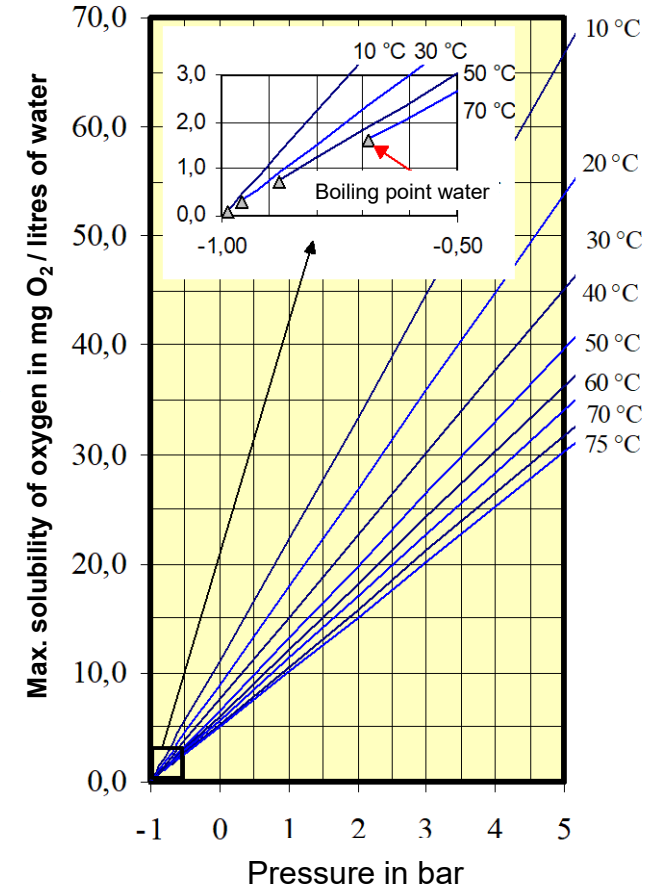


Extwin

Henry's law



Max. solubility of nitrogen out of the atmosphere into water



Max. solubility of oxygen out of the atmosphere into water

Degassing systems



- Space saving
- Cost saving
- Able to make pressure maintenance
- Easy alarm settings
- Automatic water make-up degassing
- High performance for air separation
- Easy to install
- Performance increase for HVAC system
- User friendly
- Silent

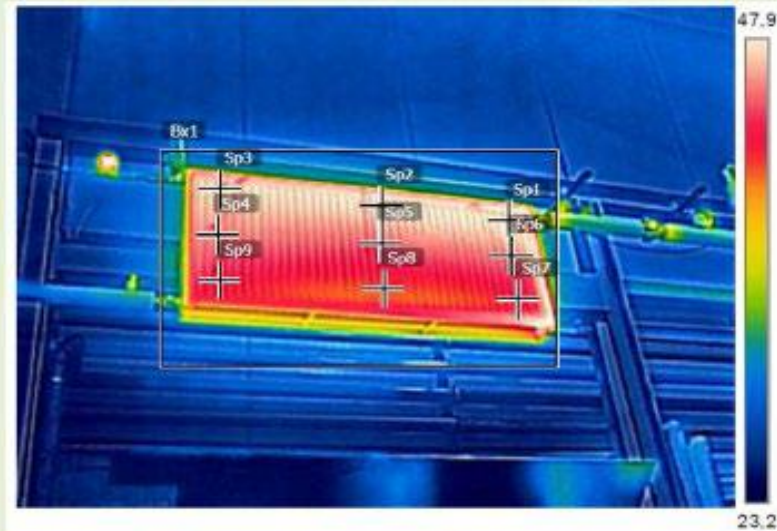
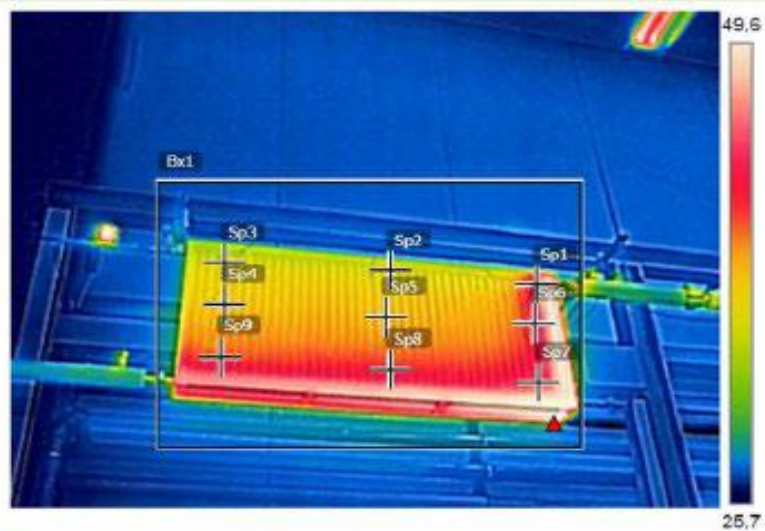






Energy efficiency increase in a heating radiator system

Within the scope of this bachelor thesis, a structure has been developed which makes it possible to investigate the effects of a vacuum spray tube degassing systems on the energy consumption of individual system components of a heating system.



Increased heating performance with increased efficiency of heating up to 8,3% for a radiator system with standard flow temperature of 70°C.



Energy efficiency increase in a cold water system

Reference: 3M Innovation Singapore Pte Ltd, Werk Tuas



- 9 year old industry building with a cold water plant with 4 x cold water generator with each 641,4 KW (Total 2600 KW)
- static pressurization with 1.500 l over a vessel
- System was equipped with a Servitec 60 to proof the effect to the energy efficiency



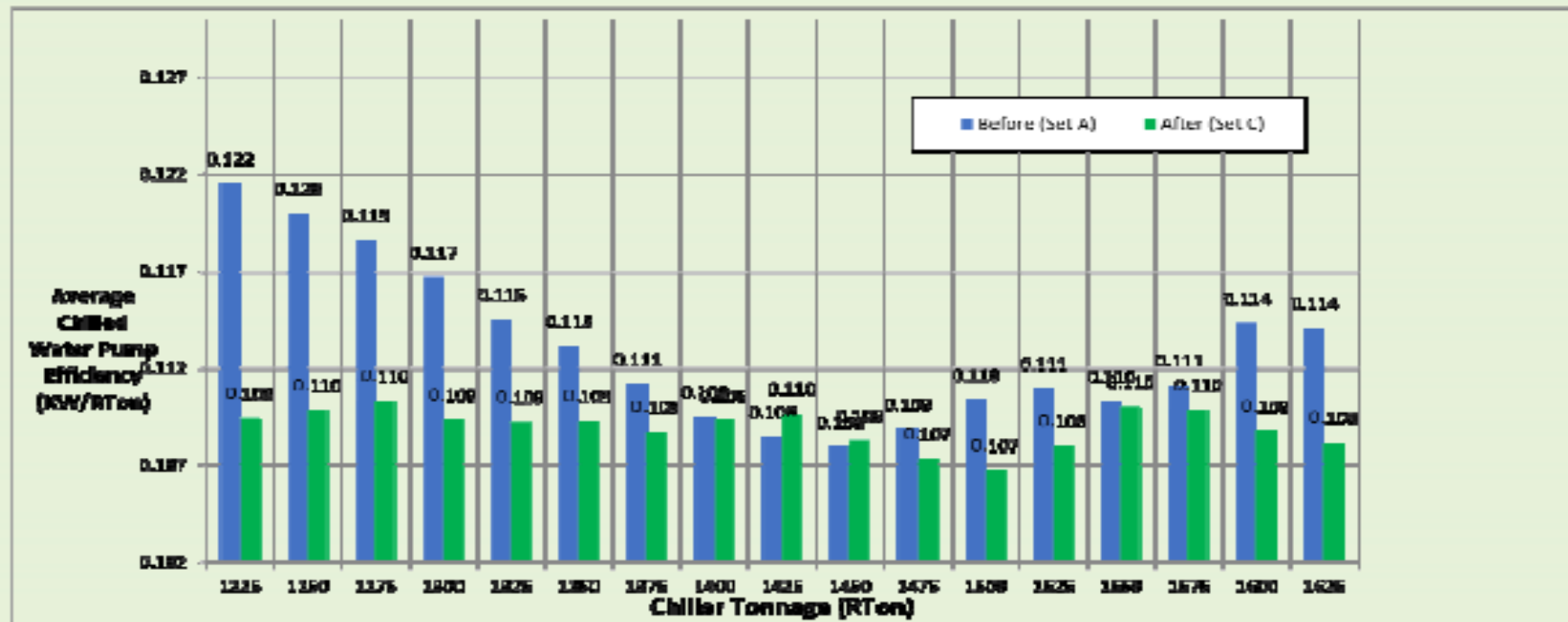
Energy efficiency increase in a cold water system

Reference: 3M Innovation Singapore Pte Ltd, Werk Tuas

- Examined and measured, among others:
 - Temperature cold water return distributor
 - Cold water flow rate at cold water return distributor
 - Temperature Condenser water inlet main manifold
 - Temperature condenser water return main manifold
 - Condenser water flow rate at condenser return main distributor
 - Current consumption of cooling units
 - Current consumption of cold water pumps
- Data collection within 3 months in 3 intervals of 7-day with a one-minute data collection

Energy efficiency increase in a cold water system

Reference: 3M Innovation Singapore Pte Ltd, Werk Tuas



- Performance analysis of chilled water pumps show a highest improvement of 9.94% (average improvement of 5.51%) of electrical input per refrigeration tons when the cooling units are operating at full power.
- External factors such as weather, relative humidity or water temperature do not affect the performance of the chilled water pump.



Energy efficiency increase in a cold water system

Reference: 3M Innovation Singapore Pte Ltd, Werk Tuas

Equip- ment	Data Comparison	Data Set A Average KW/RTon	Improve- ment	Improve- ment	Average Chiller Tonnage	Operating Hours	Number of Days	Energy Saving Per Year	Electricity Rate Per KWH	Electricity Saving Per Year
Chilled Water Pumps	Set A (Before) Set C (After)	0.11543 (KW/RTon)	0.0064 (KW/RTon)	5.51 (%)	1500 (RTon)	24 (Hours)	365 (Days)	84,096 (KWH)	0.20 (SGD)	16,819.20 (SGD)
Chillers	Set A (Before) Set C (After)	0.75766 (KW/RTon)	0.0319 (KW/RTon)	4.22 (%)	1500 (RTon)	24 (Hours)	365 (Days)	419,166 (KWH)	0.20 (SGD)	83,833.20 (SGD)
Grand Total:		0.87309 (KW/RTon)	0.0383 (KW/RTon)	4.38 (%)	Grand Total:			503,262 (KWH)	Grand Total:	100,652.40 (SGD)

- **Annual total energy and electricity savings**
 - Cold water pumps and cooling units save 503,262 kWh per year of electricity based on the investigation
 - That's SGD 100,652.40 or 63,941.76 €
- **Overall efficiency improvement of 4,83 %**
- **CO2-Savings**
 - 374 Tons per year
 - 1,87 Mio kilometers by car



Reflex // The products – Dinamic Pressurization Systems



Automatic Pressurization Systems



Reflex // The products – Reflexomat Pressurization Units

Compressor controlled pressure maintenance stations

Reflexomat

for compressor-controlled pressure maintenance



Reflexomat

- Fully automatic pressure maintenance
- Space saving
- User friendly
- 0,1 bar system pressure sensitivity
- Easy alarm settings







Thank you!