Smart Pumping Technologies in nZEB Buildings

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be
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innovate

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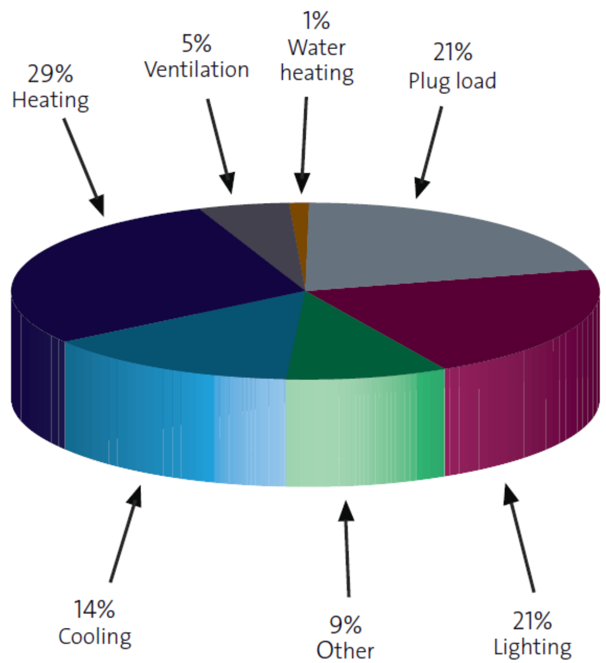
Pump energy demand in buildings



Energy composition split in a typical commercial building

In cooling systems, pumps can use up to 17% of the entire electric use

Most of the pumps are running outside of optimum parameter

Unbalanced HVAC hydraulic network can lead both to discomfort and energy waste.

How to reduce the energy use?

- High efficiency pumps and motors
- Proper control mode
  - Select the right nr. Of pumps
  - Select the right control mode
- Data analyse
- Holistic system approach
- Mainetnance service
- Optimisation services

Smart Pump Features

- Self learning and Automatic adaptation
- Two way communication and with different platforms – e.g. smartphones
- System optimisation and diagnostics
- Information instead of data!

iSolution – the smart platform of Grundfos

E-pumps

iSolution

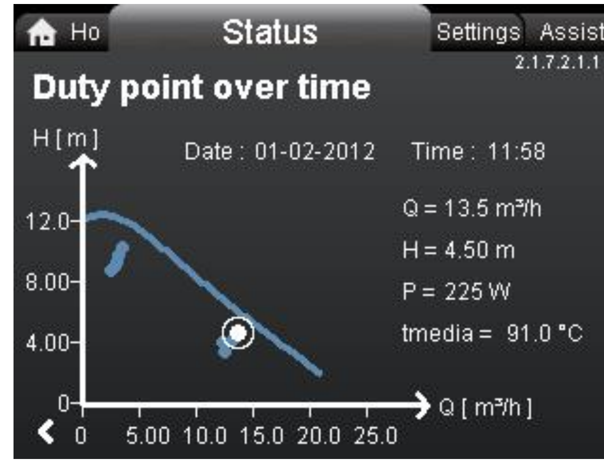
Pump + Drive + Control + Measurment + Communictaion

Circulation Pumps using iSolution platform

MAGNA3/TPE3 – High Efficiency Circulating pumps

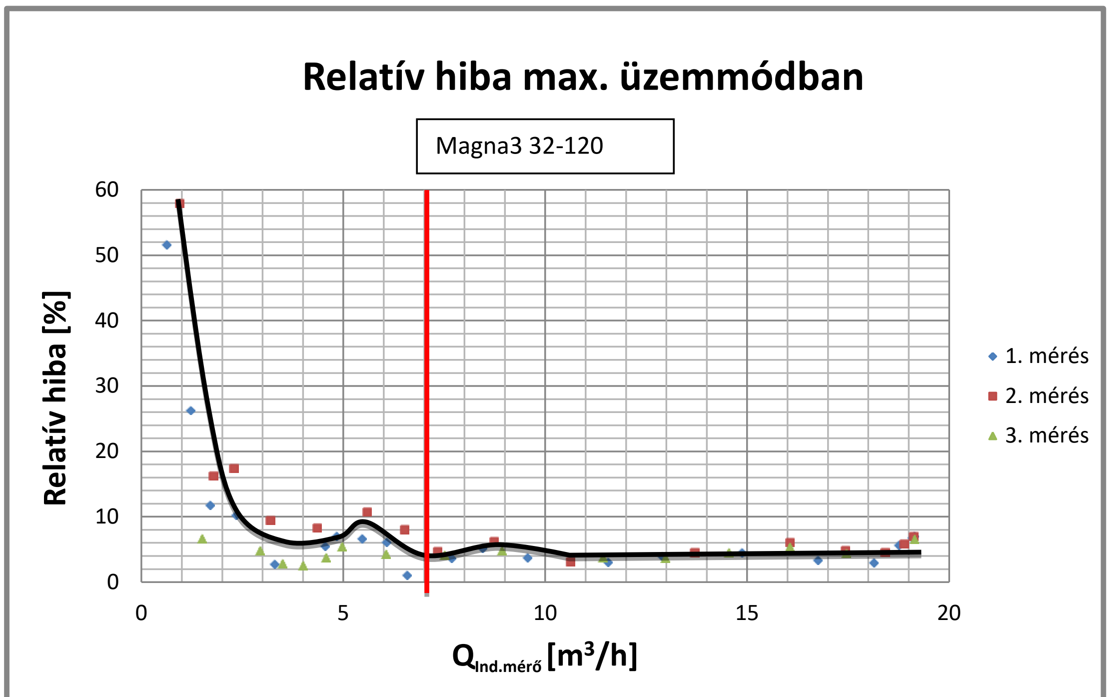
- Self Learning (AutoAdapt) Function and System Diagnose
- Built in measurement functions: Flow, Pressure, Power, Energy, Temperature, Heat Energy,
- Special Control Modes – FlowLimit and Flow Adapt
- Communication with Smartphone
  Wireless Cascade Communication
- BUS Communication

Diagnose and Optimisation in Magna3 and TPE3



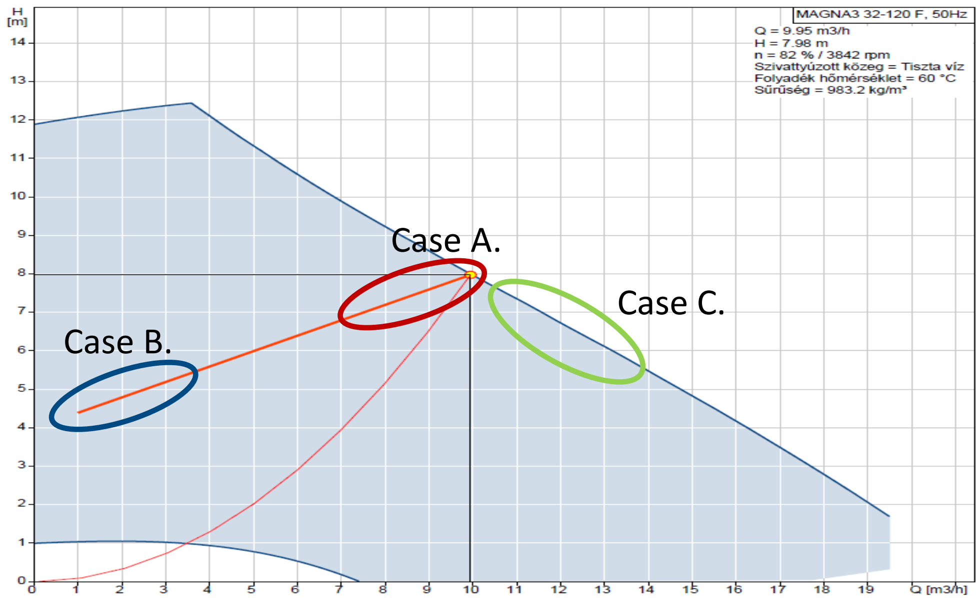
System Hydraulic

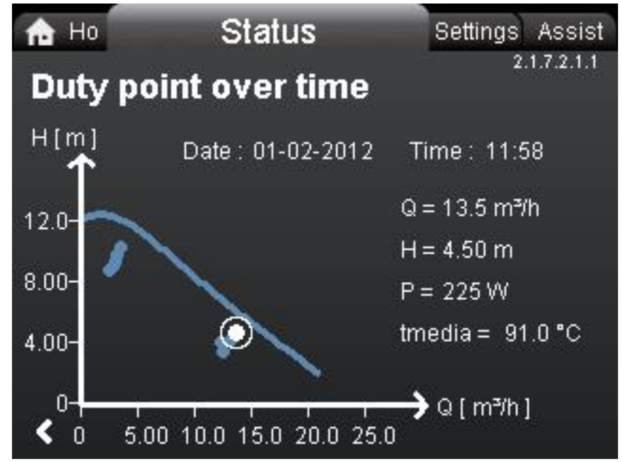
- Pressure measurement (built in sensor)
  Accuracy: 2% (FS)
- Flow Measurment (calculated)
  Accuracy: 3-5% (FS), in 90% of the curve



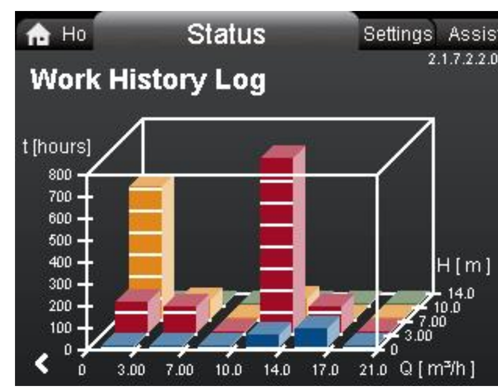
Diagnose and Optimisation in Magna3 and TPE3

Optimisation using trend data





Shows historical data presentation over time compared to curve
Real system processes!!!!

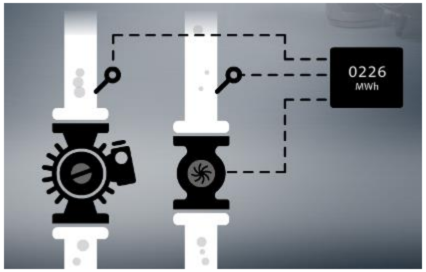


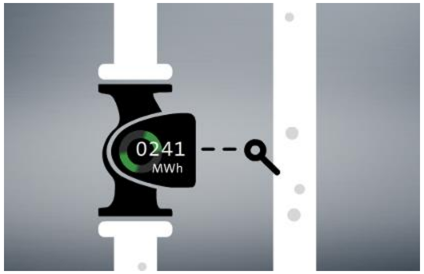
Case A. : $Q > Q_{Design}$, unballanced system, high value setpoint (Static ballan.), Low flow temperature (weather compensation control.)

Case B.: overside pump, higher pressure losses than design val. ($Q < Q_{Design}$)

Case C.: High value setpoint, Ballancing issues (FLOWlimit)

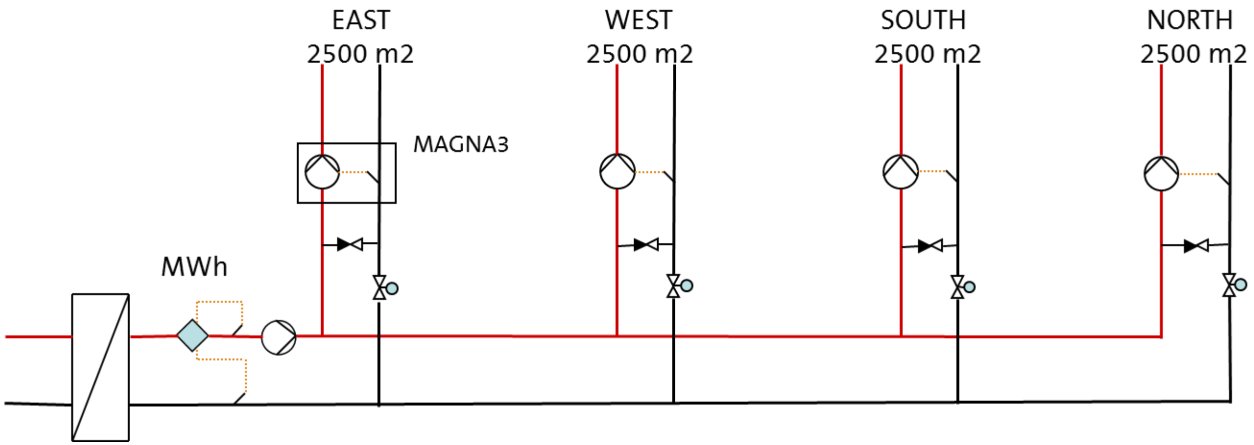
Diagnose and Optimisation in Magna3 and TPE3

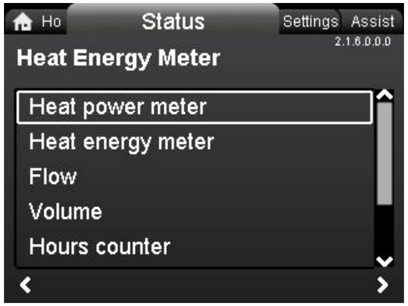




System Energy Ballance

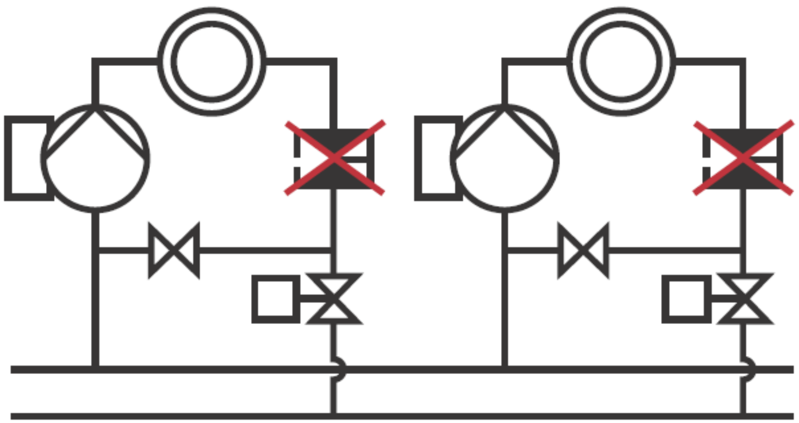
- Heat Energy Monitor function:
  - Measurment accuracy +/-1% és +/-10% varying on system conditions.
  - External temperature transducer (on return pipe) directly in pump.
  - Very good for Energy Balance

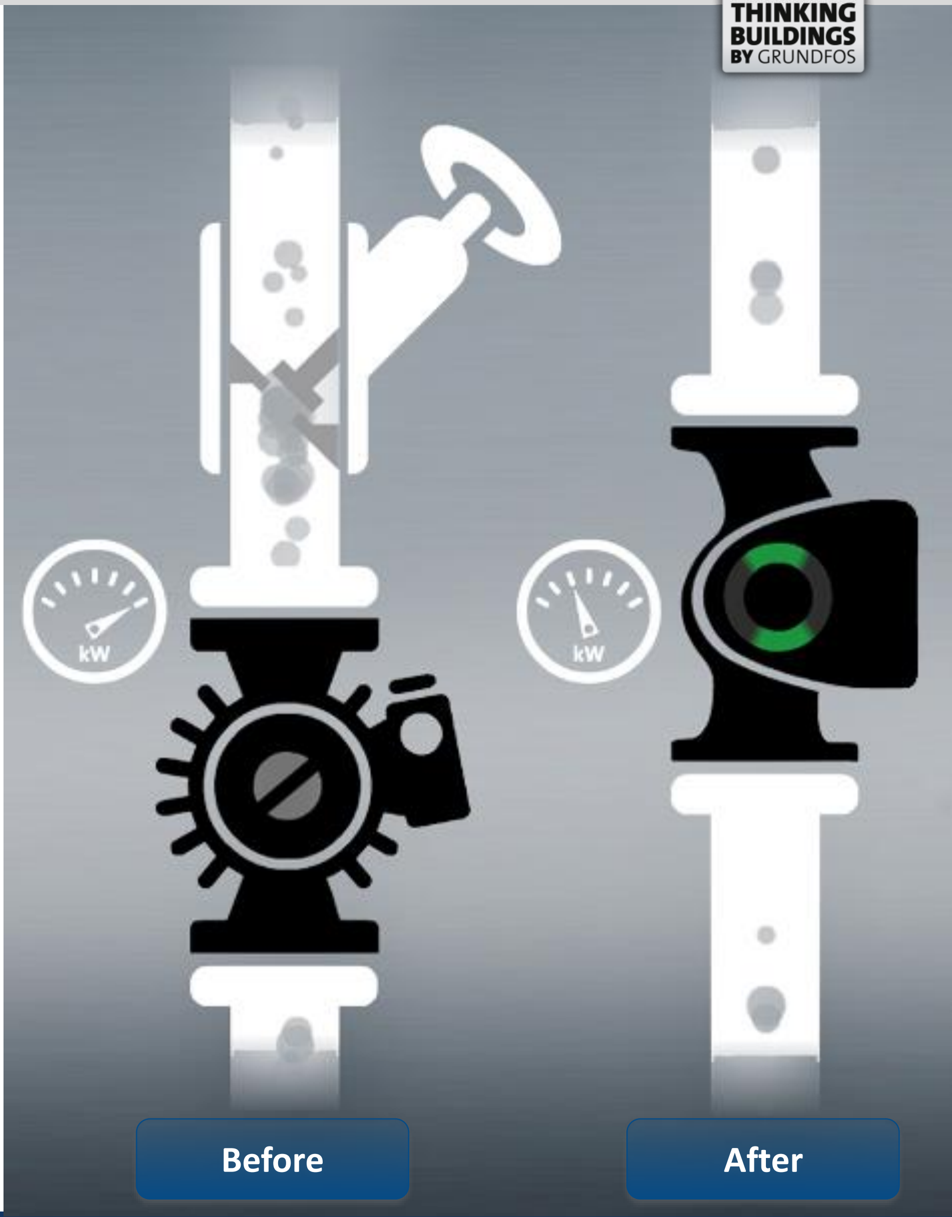




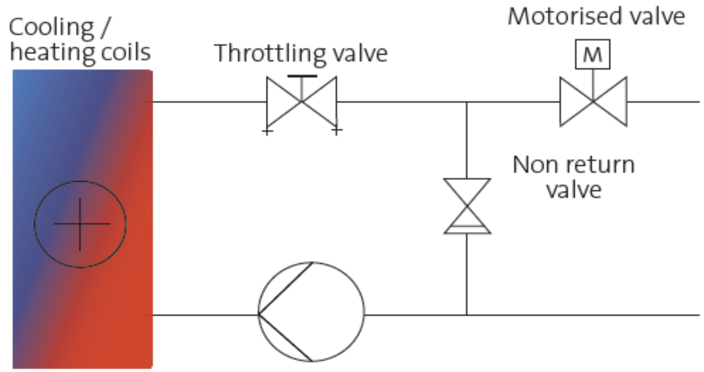
FLOW*LIMIT*

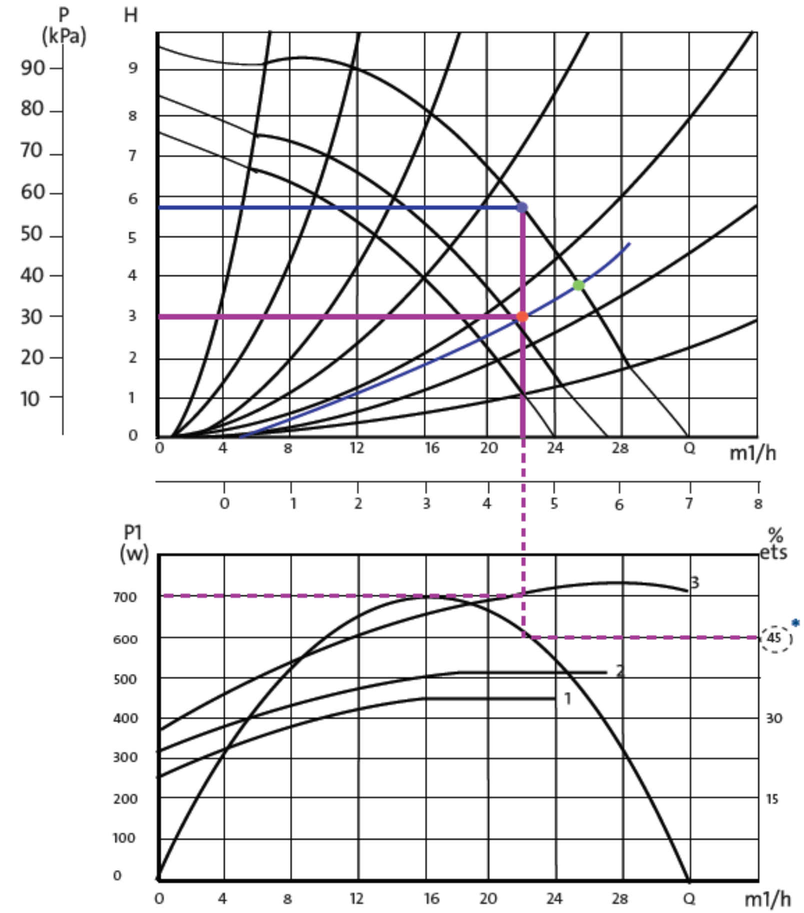
- FLOW*LIMIT* can set maximum system flow allowed without throtling valve.
- Usable in case of static ballancing of system (e.g. AHU bypass pump, main circulation branches).





Magna 3 – FLOWlimit function
Bypass Pump ballancing in as in good old days...





- Design duty point
- Real duty point (with no throttling valve or FLOWLIMIT)
- New duty point

Resulted annual energy consumption of pump with ballancing

$$E_{electricity} = \frac{700 \cdot 8760}{100} = 6132\ kWh$$

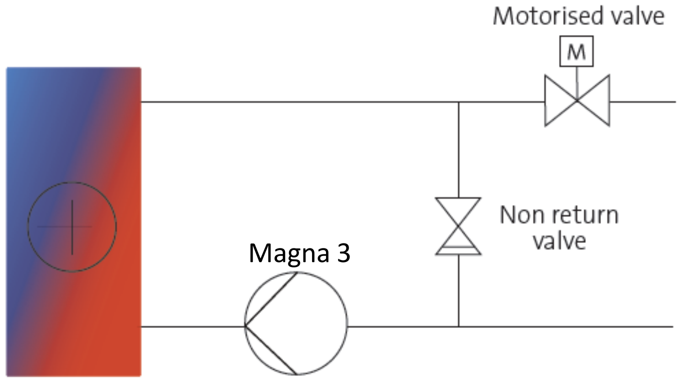
Resulted energy loss on the pump ballancing

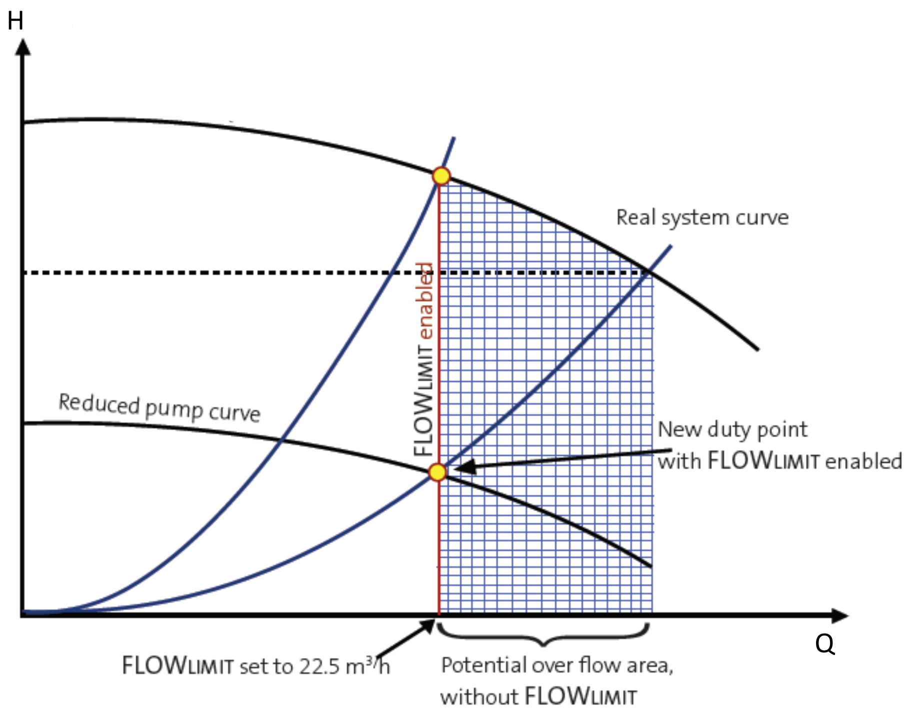
Ph = q ρ g h / (3.6 10^6) = Hydr. Power (kW)
q = Volume Flow (m3/h)
ρ = density (kg/m3)
g = grav. acc (9.81 m/s2)
h = delivered pressure(m)

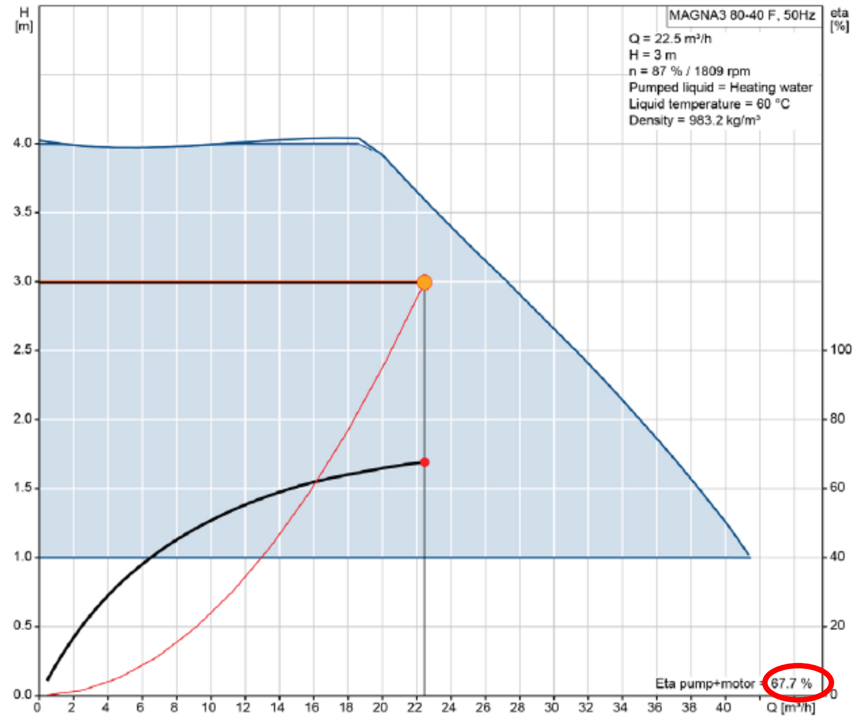
Ph= 22,5 X 1000 X 9,81 X 2,5 / 3,6 X 10^6= $\frac{0,153\ kW}{0,45}$ = 0,34 kW

Annual energy losses: 0,34 X 8760 = 2978 kWh

Magna 3 – FLOWlimit funtion
Bypass pump ballancing using FlowLimit and no valve







Chosen Pump: MAGNA3 80-40
Annual Consumption : 2331 kWh/yr

Basic solution energy:	6132 kWh
New solution energy:	2331 kWh
Savings:	3801 kWh = 62%

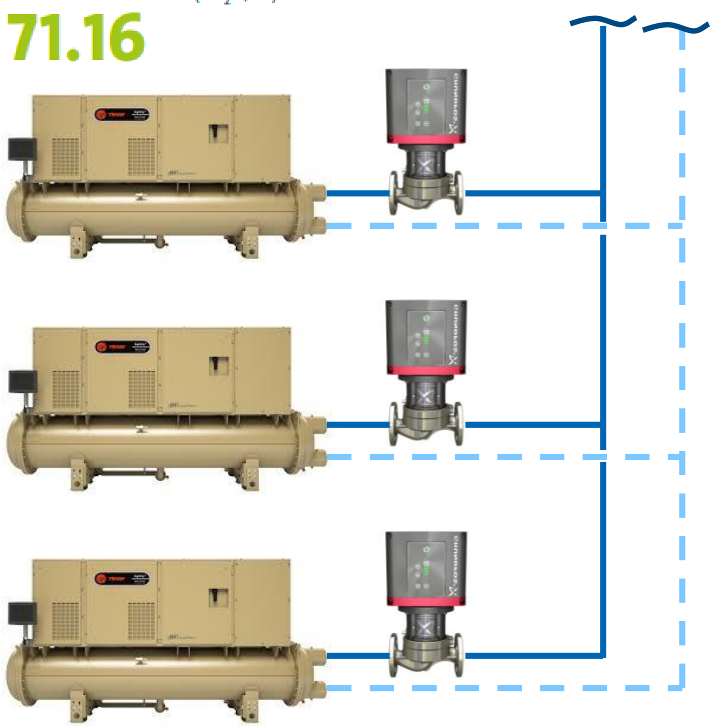
Case Story – saving in Pharma Production Plant - Romania

YEARLY SAVINGS (EUR)
20,014

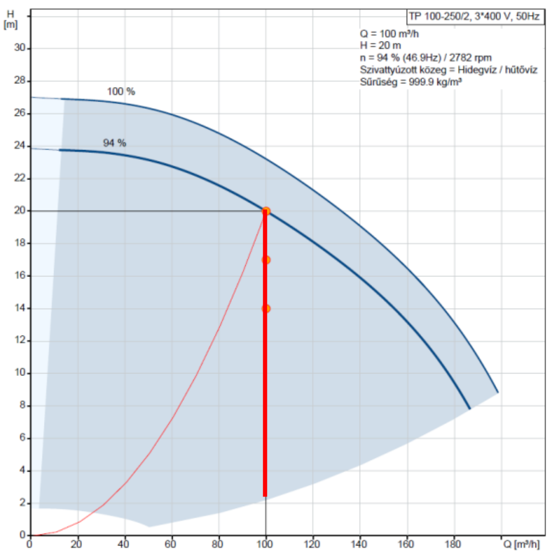
PAYBACK TIME (YRS)
2.22

ENERGY SAVINGS (kWh/YR)
222382

EMISSION REDUCTION (CO_2 T/YR)
71.16



- Refurbishment with solution change:
  From Primary loop to primary-secondary
- Control mode primary loop: Constant Flow
- Pressure drop primary loop:
  - 26mWS on full load
  - 16mWS on minimum load
- Load profile: 50% technological 50% comfort cooling 365 days working
- Advantages of control mode:
  - Easy balancing of system
  - No overflow on system > Low Dt syndrome reduced
  - Reduced pump running cost



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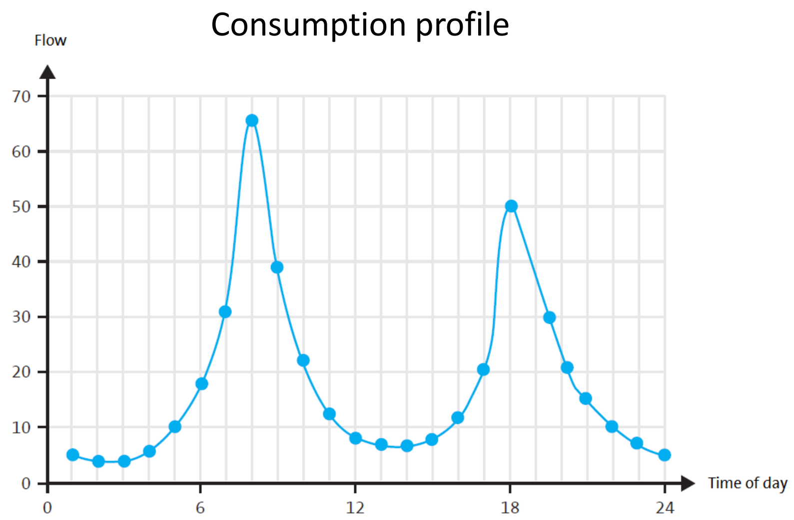
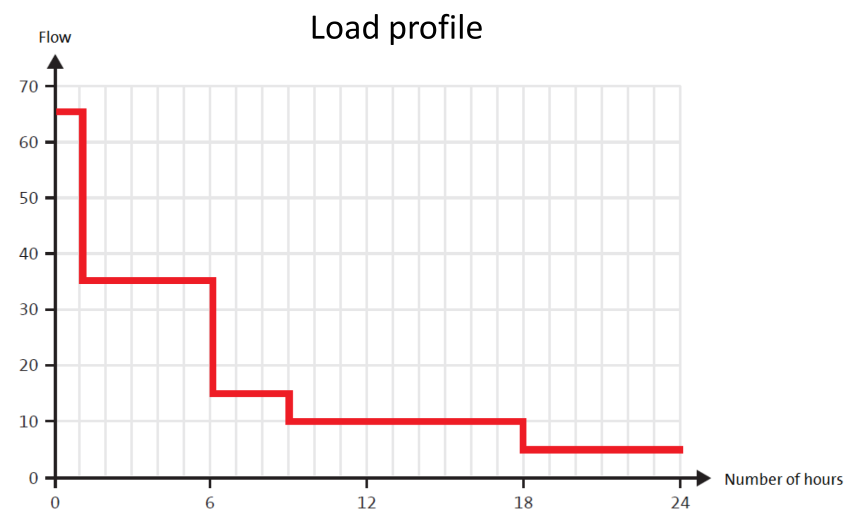
Reducing energy consumption in boosters

Solo-E

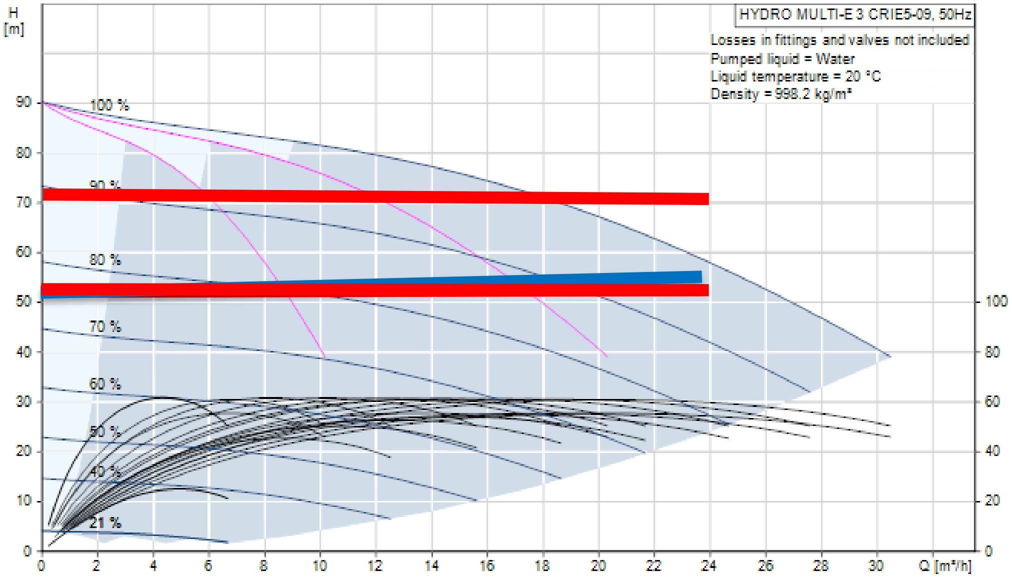
Consumption- and load profile





Constant pressure at varying flow

Set point influence




Sizing of Hydro Multi-E pressure boosting system for commercial buildings with improved system safety and energy consumption

By Kris Kaagaard, Grundfos, Denmark

Introduction

Modern societies depend on the secure delivery of clean water at constant pressure.

Demographic patterns show increasing urbanisation, which means that new commercial buildings are larger than ever. System safety and low energy consumption are not simply a request from customers: it is expected that the products provided can live up to the stringent engineering standards and health and safety requirements.

Hydro Multi-E based on the new MGE model H/I/J offers a wide range of features and intelligent functionalities, which can help not only to reduce the energy consumption but also ensure system safety.

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System control backup - Multi Master ... 7
System safety - Pipe filling ... 8
Conclusion ... 9

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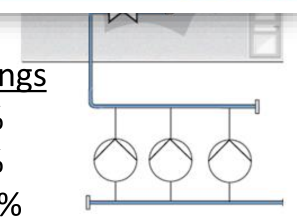


Benefits

Lower pressure thus protection the pipework

Energy savings

Reduced maintenance cost

Pressure at tap = 20m

Inlet pressure = 20m

Friction loss at max flow = 3m

Energy savings

3m = 3,67%

6m = 7,49%

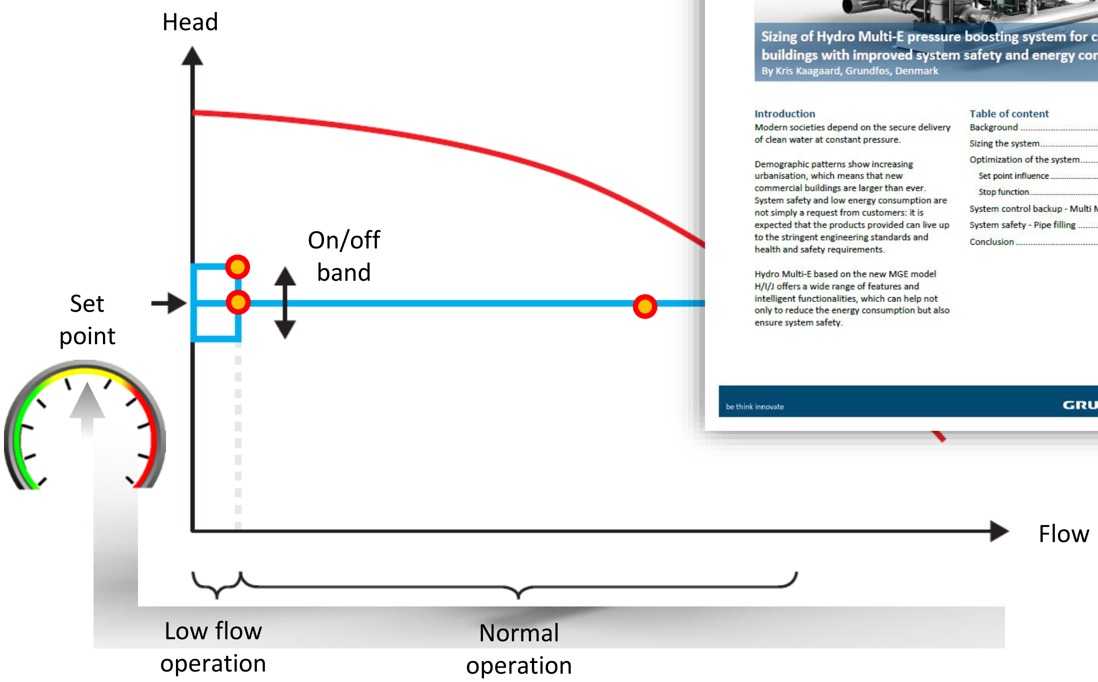
9m = 13,52%

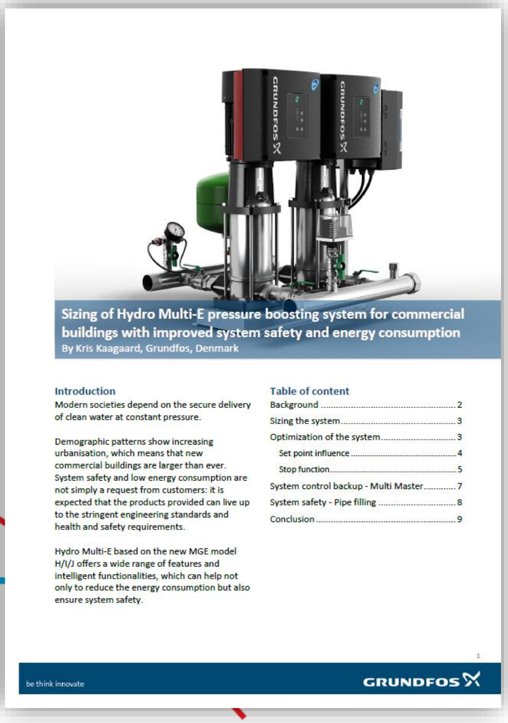
System stop at low flow

Which systems?
- All boosters with at least one E pump

Benefits?
- Less energy usage
- Minimize pump maintenance

Energy savings
5,0%





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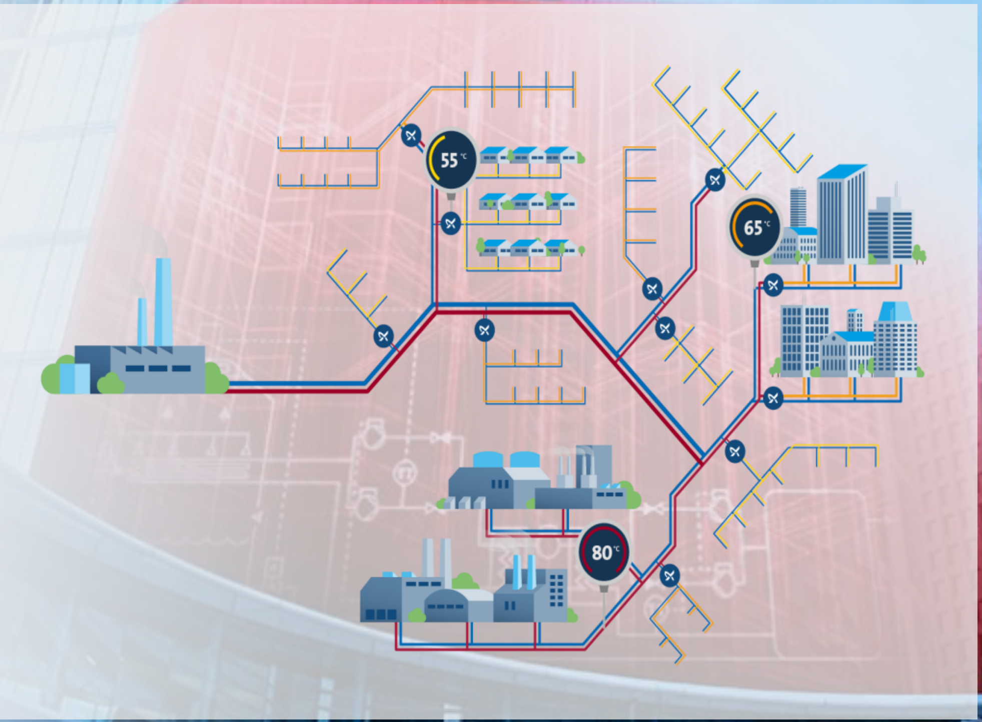
Future products – coming 2020

MIXIT – Mixing loop solution



iGRID – District Heating Solution

Thank You!