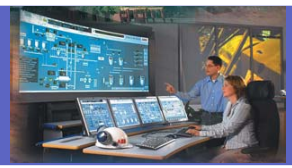
# PQF LV Active Filters: Bringing energy savings to you…



# Key elements of poor LV Power Quality

Harmonics

Reactive power

Load imbalance

Energy losses and high running costs

# Customer inquiry

- Can ABB PQF active filters help to realize energy savings?
- The question becomes more popular with increasing energy prices
- The answer is...

→ **4 field reports**...

# Field report 1: Installation on ferries

- The installation

  Power plant: 2 generators
  Main load: 2 DC drive propulsion units

  Performance without filters:
  G1: 660 A, G2: 580 A  cos φ: 0.76
  THDV = 22%, THDI = 25%
  Av. consumption:14000-15000 l/month


- The inquiry
  - Install filters to solve harmonic problems due to propulsion DC drives
  - Perform cos φ compensation without overcompensation

# Field report 1: Installation on ferries

- Reasons for choosing ABB active filters
  - Compact solution (paramount given the limited space aboard)
  - Excellent filtering performance
  - Possibilities to perform transient-free reactive power compensation up to target cos $\varphi$
- Customer findings and consequent actions
  - Technical problems resolved
  - With ABB PQF active filters operational, about 10% of fuel savings were reported resulting in drastically reduced running costs
- Further actions of customer and findings
  - Installation of ABB PQF active filters on other ferries of customer
  - 10% of fuel savings have also been confirmed on the other ferries

***Customer gain: per ferry about 18000 l fuel per year***

# Field report 2: Industrial extruder lines

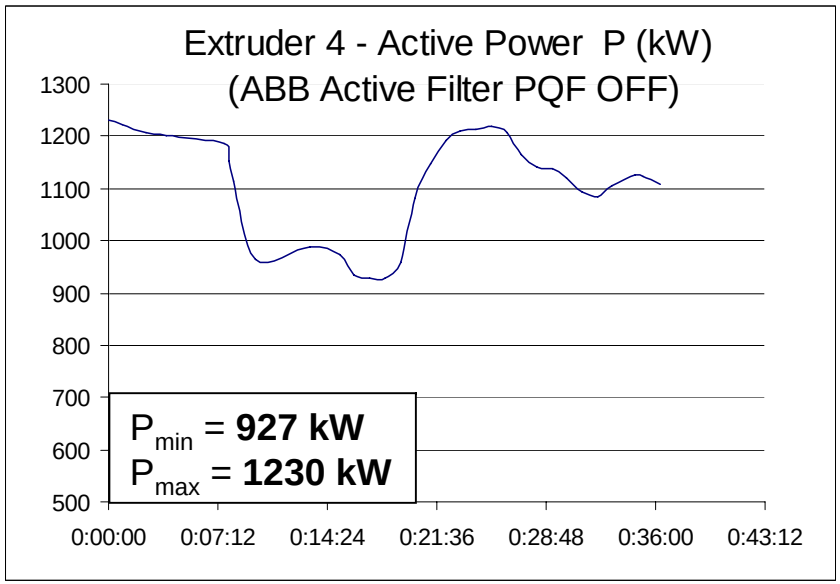
- Customer
  - Runs various extruder lines resulting in THDV of about 11% on LV side
  - Extruder lines are DC drive based
  - Due to the harmonics in the voltage, voltage wave form had multiple zero crossings which upset the DC drive control causing damage
  - Hopes to have reduction of losses in (long) feeding cables and feeding transformers (billing aspect and cable overheating aspect)

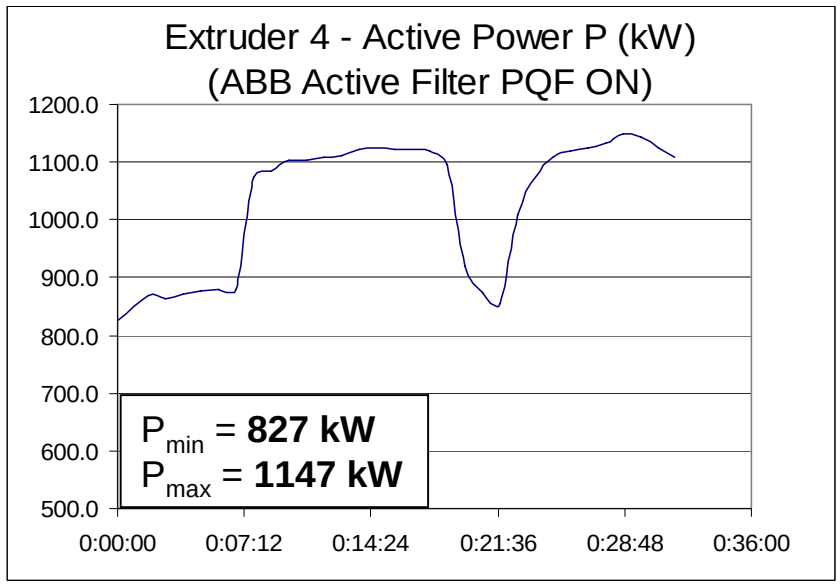
# Field report 2: Industrial extruder lines

- Reasons for choosing ABB active filters
  - Only supplier with long term track record for large power active filters
  - ABB in house engineering of the product giving confidence for future support
  - Possibility to set cos φ target value and possibility to assign resources to this task

# Field report 2: Industrial extruder lines

- Customer findings and consequent actions
  - Technical problems in production line disappeared
  - Cos φ of the installation increased from 0.84 to 0.92 on average
  - In house on-line power consumption monitoring indicated around 10-15% savings of active power which resulted in very short pay back time of installation



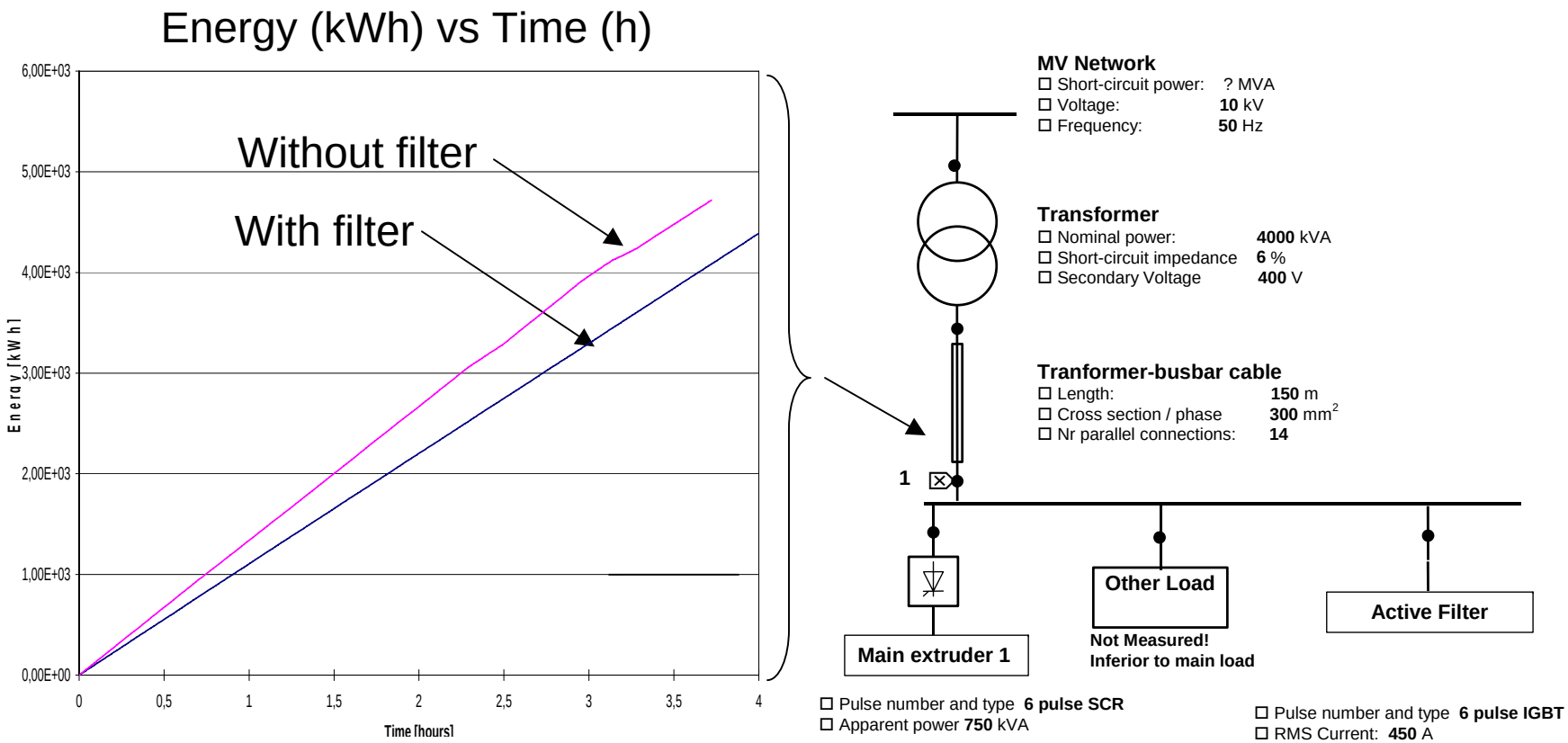



# Field report 2: Industrial extruder lines

- ABB verification measurement with high precision measuring equipment indicated that
  - measuring equipment used by the company functions correctly
  - during the verification measurement with and without active filter also around 11% power savings were recorded when filter running
- ABB contacted independent 3rd party European accredited measurement laboratory, ‘Labo Lemcko‘ to re-measure and verify the validity of the measurements made...

# Field report 2: Industrial extruder lines

- **Independent laboratory confirmed 14.5 % energy savings!**




***Customer gain: more than 70 kUSD per year***

# Field report 2: Industrial extruder lines

- **Financial analysis over time**

| Year | Accumulated energy savings (kUSD) |
|---|---|
| 1 | >70 |
| 2 | >140 |
| 3 | >210 |
| 4 | >280 |
| … | … |
| Note: during the first year, the customer has already profit because the production line down time is reduced. | |

Pay-back time

Additional profit

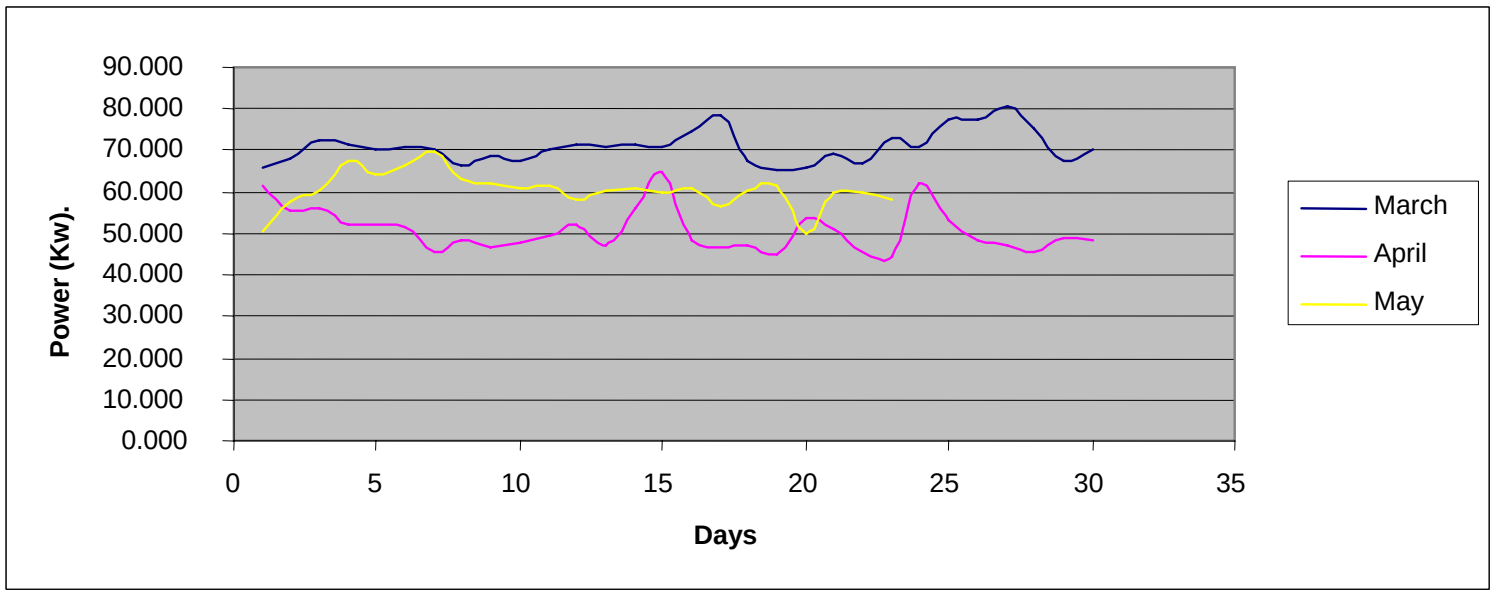
***Very short pay-back time is realized***

# Field Report 2: Industrial extruder lines

- Further actions of customer
  - Customer has ordered additional ABB PQF LV Active Filters for other production lines

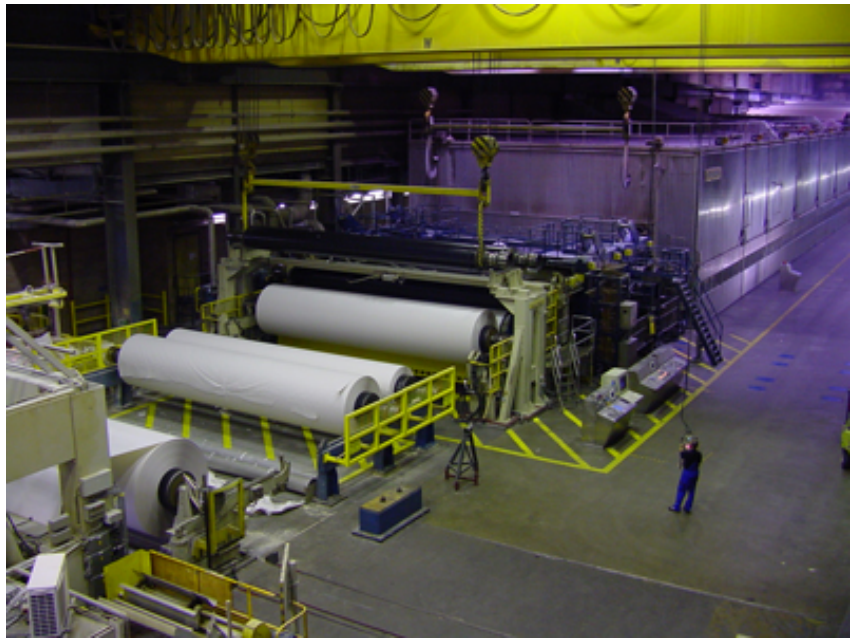
# Field report 3: AC drives – paper industry

- Customer
  - Runs many AC drives and has set up an evaluation program of savings with and without active filter
  - Measurements were done over periods of one month with and without active filter (March: active filter not running, April: active filter running)



# Field report 3: AC drives – paper industry

- Customer findings and consequent actions
  - Customer reports on average 10% savings when active filter is used
  - Customer is at present making inventory of all his harmonic loads and requests ABB to quote for an overall filter solution



# Field report 4: stadium flood lights

- Customer
  - Needs to offload supply cables to the flood lights (overheating problem due to cable losses)
  - Needs to ensure that system can run on stand alone generator basis due to international football organization rules
  - Installs active filters to accommodate the above

# Field report 4: stadium flood lights

- Customer findings
  - Cable losses are reduced by 33% resulting in acceptable operation
  - Technical problems (generator operation) are resolved
- Consequence
  - Reduction of cable losses has positive impact on energy bill

# Large induction machine analysis

- For a 1 MW induction machine a loss evaluation with and without harmonics was made
- Conclusions for the machine considered
  - If supply voltage contains 10% H5 distortion, the losses in the machine (due to n.p.s. current) increase by approx. 10-13%
  - Temperature increase in the machine due to the losses is approx. 10 Kelvin
- Consequences
  - Loss increase in the machine has to be paid for
  - The lifetime of this machine is greatly reduced due to temperature increase

# Conclusions

- More and more data emerge indicating that poor Power Quality of the electrical network results in substantially increased electrical losses and consequent down-time and financial loss
- Field reports indicate that ABB PQF LV Active Filters offer an efficient solution to reduce down-time and bring substantial energy savings to customers

**PQF LV Active Filters**

**Bringing energy savings to you!**

Power and productivity
for a better world™