

IEA FORSCHUNGS KOOPERATION 4E Electric Motor Systems EMSA

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Tools for Energy Audits in Motor Driven Systems
EMSA WORKSHOP, Vienna, 2010
Marcus Hofmann, Austrian Energy Agency



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Content of the presentation

- **klima:aktiv energy efficient company programme**
- **General Tools**
 - Energy Check Simpel
 - Pro Tool
- **Detailed Approach:**
 - Compressed Air
 - Pumping Systems
 - Fan Systems
 - NEXT STEPS

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klima:aktiv energy efficient companies

- klima:aktiv is a national climate programme financed by the ministry of environment
- Increase awareness for energyefficiency, information and conferences, workshops
 - „Investment in energyefficiency leads to cost reduction“
- Implementation of energy efficiency measures in industrial and other production companies
 - cooperation with regions and consultants
 - Conducting pilot audits
 - market and technological partners



Best practice: Alpenmilch Salzburg

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klima:aktiv approach for trainings

- Klima:aktiv trains regional consultants (regions have budget for energy audits)
- Energy consultants within the regional programmes are already quite experienced. There are minimum requirements (like number of consultancies, time of consultant activity etc.) to be registered as consultant
- Trainings have to offer useful tools and information to be accepted, Trainings are optional! (up to now)
- From 2006 to 2009 250 consultants have been trained in several workshops:
 - using the energy check tool
 - energy management implementation
 - cooling systems, compressed air systems, electric motor systems
 - Pump-, Compressed Air Campagne...
- feed-back workshop one year after the training on the tool



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Tools for Energy Checks. Energy Check Simple

- Show companies but also consultants in which areas saving options exist
- Covers all relevant aspects in 16 technologies:
 - energy management, IT, lighting, all motor systems, heating and steam systems
- It is based on 8 to 25 questions per technology
- First very rough idea in which areas saving opportunities exist

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Calculation of Energy Demand: Pro Tool


- key information needed for the evaluation of energy savings and recommendation for further activities are:
 - Energy demand of different machines and/or technologies within the company,
 - condition of these technologies and
 - expected saving potential
- Usually this information is not available in companies
- Excel tool was developed by sattler energie consulting by order of the AEA.
 - find out energy consumers
 - point out the major possibilities for energy savings




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Detailed Analysis
Focus Compressed Air – Keep your breath






Halten Sie die Luft an! –
Machen Sie Druck auf Ihre Energiekosten

- Problems for conducting audits in Austria:
 - not enough information available
 - Not much time for auditor (1-2 days per company)
 - Focus on main points is necessary
- AEA developed:
 - Guideline for Compressed Air System Audits
 - Questionnaire (Data to be collected)
 - Standard-Report
 - Workshop for Auditors (together with KAESER, OETIKER, SCM Pneumatic)
 - Auditors were invited for Case Studies (listed on webpage as CAS consultant)
 - Signet, Folder







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7 Top Measures for increasing EE in CAS Systems






Saving Measure	Indicator for Saving potential	Key Costs/Savings
Data collection (full load, part load)	Electricity used in kWh for compressed air; Electricity used above 80-100 W/Nm ² ;	Annual costs for compressed air
Reduction of leakages	Leakage rate of 10%;	20-50 EUR, valves up to 350 EUR
Optimization of pressure within system	Pressure above 7 bar; Pressure drop within complete air system above 0.5 bar (old ones 1 bar);	1 bar reduction corresponds to 7 % energy savings
Optimization of control system	Control range above 0.5 bar for single compressor; above 1 bar for more compressors;	4.000 EUR for control system



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Top Saving Measures Compressed AIR II

Saving Measure	Indicator for Saving potential	Key Costs/Savings
Reduction of part load	Part load above 20%;	See above
Heat recovery	Heat recovery not already installed? Need for low temperature heat (60-70°C), pre-heating for steam boiler feed water, etc.	Costs for heat exchanger (per kW)
Switch off compressors (connected to machines, time switch)	Running time during production breaks;	200 – 1.000 EUR (automatic or not)
Compressed air users	Some kind of cylinders Some kind of nozzles Some kind of tools Vacuum Applications Too much pressure drop within machine Old Filters Leakages in machines	

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Detailed Analysis Focus Pump System

- Same problems:
 - not enough information available
 - Not much time for auditor (1-2 days per company)
 - Focus on main points
- AEA developed:
 - Guideline for Pump System Audits
 - Questionnaire (Data to be collected)
 - xls – sheet for data collection and analysis
 - Standard-Report
 - 2 Workshops with Grundfos and Andritz (80 participants, 100 registered...)
 - Auditors were invited for Case Studies (listed on webpage as Pump consultant)

Pump genau
Energiekosten senken – Wasser richtig lenken

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Pumping Systems Top Saving Measures

- **Replacement of Motor**
 - Efficient Motor technology
 - Correct sizing, esp. if any changes in installation occurred
 - Control technology
- **Optimization of pipe system**
 - Reduction of static height
 - Check of pipe diameter (Tool for head loss)
 - Reduction of dynamic height
 - Optimization of suction inlet and outlet
- **Operation and Maintenance**

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Audit Description

- **Focus on the sector paper and chemical industry as well as water treatment**
- **10 Audits in detail:**
 - wastewater disposal for market township Guntramsdorf
 - two hotels
 - five companies in the sector paper and chemical industry
 - two companies in the sector plastic & foam industry
- **Average savings:**
 - From 0 up to 60 %
 - Amortisation time within 3 years (best case in a few month)
 - highest savings in hotels (heating and air conditioning)

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Audit results




- Bottom Up Analysis figures out as useful for consultants
- Identification of the most energy-intensive pumps through selection filter is possible
- data acquisition figures out as difficult
- necessary to take measurements – cooperation with experts or manufacturers
- More focus on pump process would lead to a better understanding and to a maximum saving potential

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Fan Systems

- More focus on the “process approach”
- Top Saving Measurements (first draft):
 - General (reduction of operation hours e.g section operation)
 - Transport (flow rate control e.g FC, replacement of ventilator and filter, maintenance)
 - Air Treatment (waste heat recovery, recuperator, moisturization, heat pump, etc.)
 - Special Applications (drying plant, extraction unit, DEC unit)

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Next Steps

- **Fan Systems: (klima:aktiv energyefficient companies programme)**
- Finalisation of the Fan Guideline
- 2 Training Seminars for regional consultants
- At the moment 10 Pilot Audits are conducted (subcontracted)

- **Next Years:** Motor Guideline for Motors, Frequency Converters, all Systems (within IEA-4E EMSA Project)
- Policy Instrument Analysis (within IEA-4E EMSA Project)

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