en+en
energy and environment

16 - 06 - 2011

energy-saving potentials
experiences from Germany

节能产业的发展潜力

分享我们德国的经验

1. introduction
2. method of analysis
3. energy-saving – best practise
4. summary

1. 简介
2. 分析方法
3. 节能项目范例
4. 小节

1. introduction

energy-saving

minimizing of climate influence of production processes

long-term protection of fuel resources

***environmental protection* + sustainable cost reduction**

1. 简介

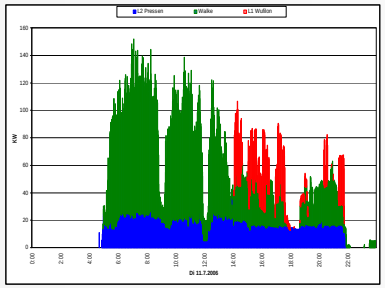
节能

减少工业生产对气候造成的影响
减少对有限资源的过度开采

环境保护+ 降低能耗

1. introduction

Besides other topics (see our website) experts of en+en can assist you in:



- investigation and measurement of material flows and energy consumption
- expertise of heat production (steam and hot water) and distribution
- analysis of production processes
- development of sustainable energy-saving concepts
- implementation of tailored energy-saving technologies
- realisation of energy-saving investments

1. 简介

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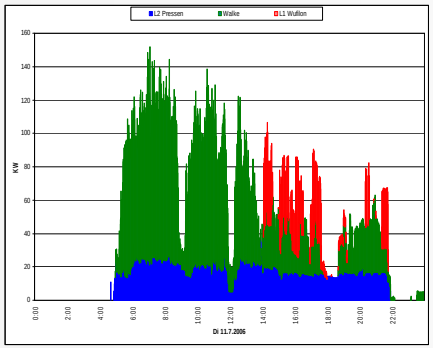
更多内容参见我们的网页



- 生产流程的耗能检测
- 产热（蒸汽和热水）和热分配的技术咨询
- 生产流程和工艺分析
- 推广可持续发展的节能理念
- 节能技术的应用
- 项目融资

1. introduction

results / experiences of two projects in Saxony (Germany):

- **development of methods to “certify” enterprises according to their energy consumption**
- **introduction of energy and material flow management in 10 enterprises**

cooperation with Energy Efficiency Centre of the Ministry of Environment and Agriculture of Free State of Saxony (Germany)

1. 简介

项目范例（德国萨克森州）

德国萨克森州当地政府扶植项目

- 方法学研究 - 针对企业能耗量的检测方法
- 为十个企业的生产工艺流程引入能耗管理方案

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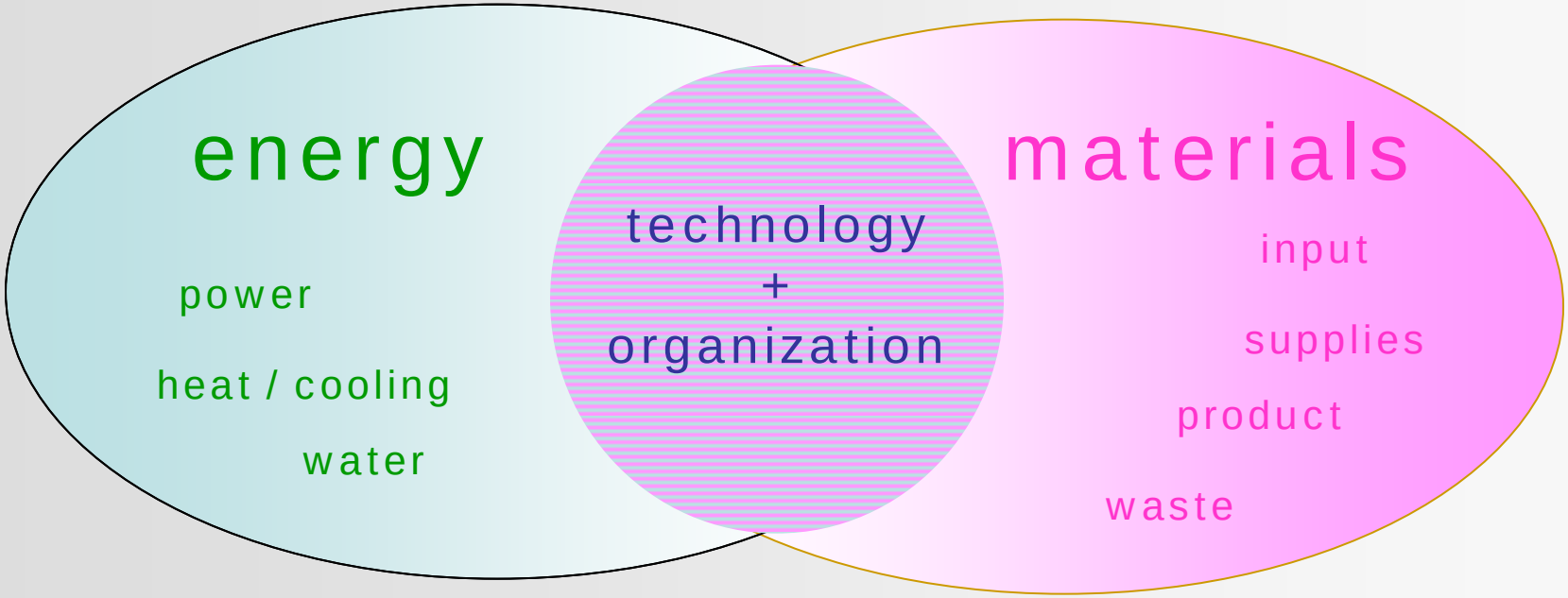
1. 简介

2. 分析方法

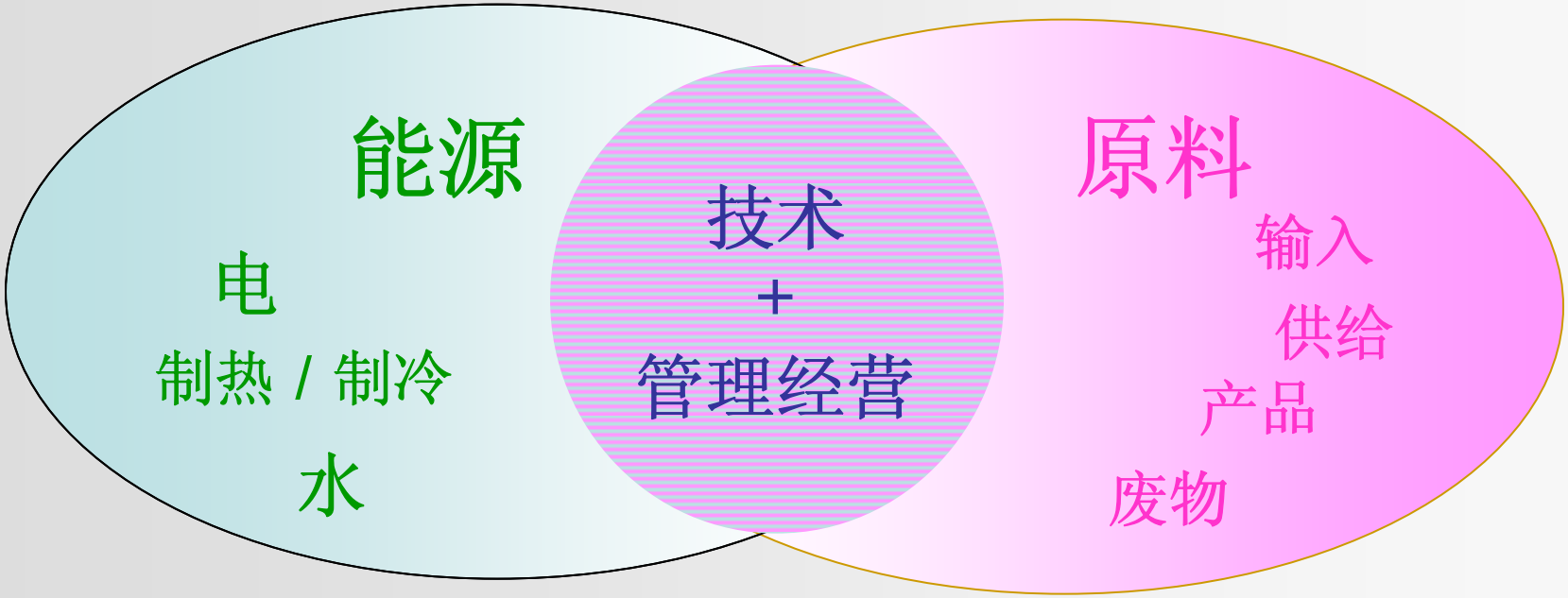
3.节能项目范例

4. 小节

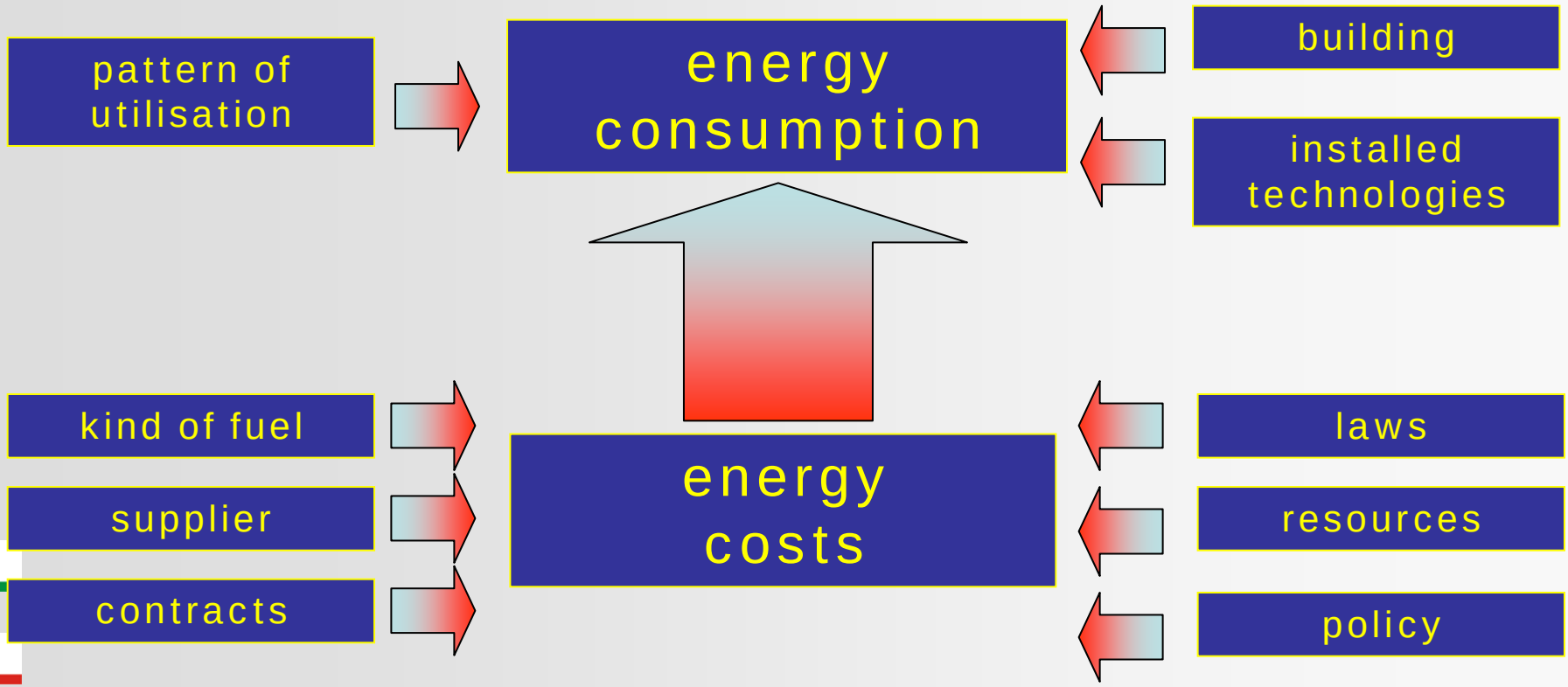
2. method of analysis



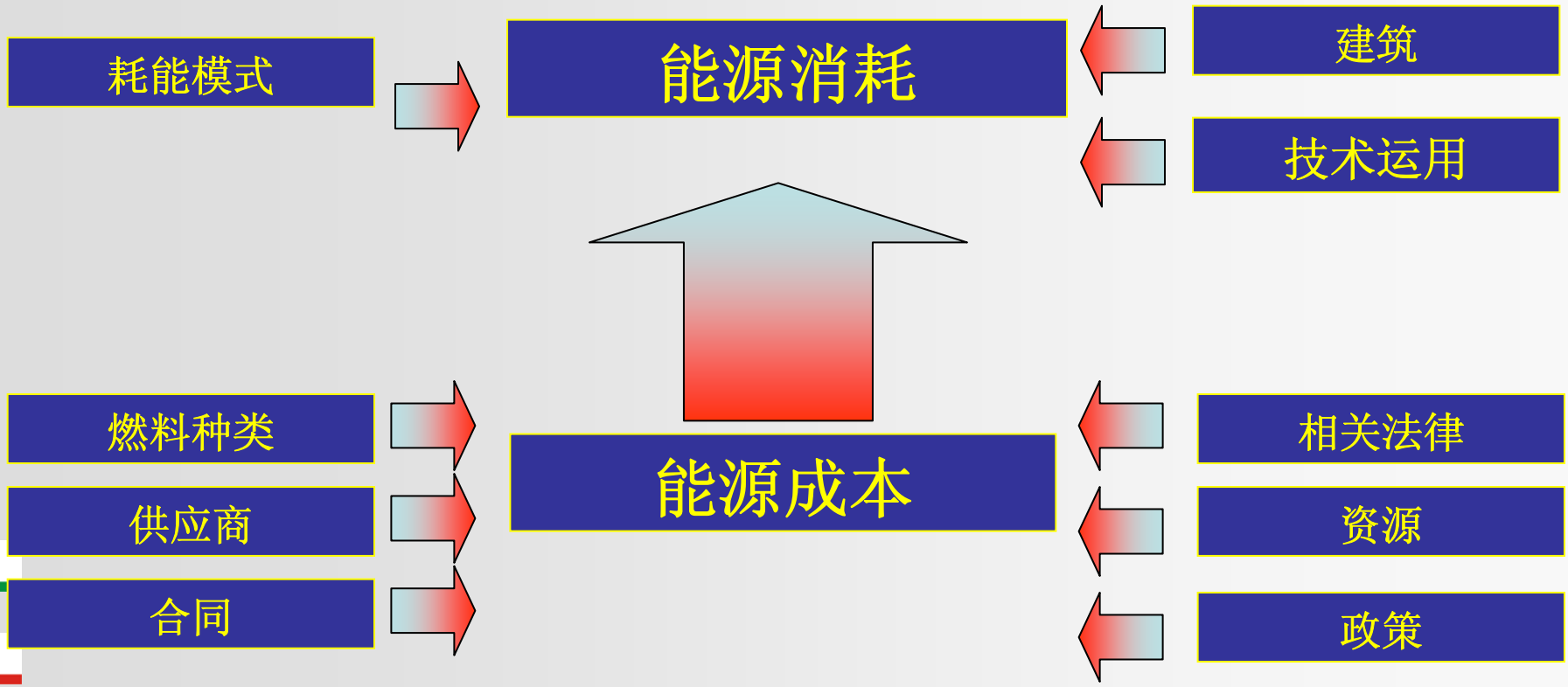
2. 分析方法



2. method of analysis

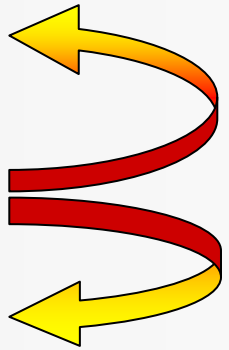


2. 分析方法



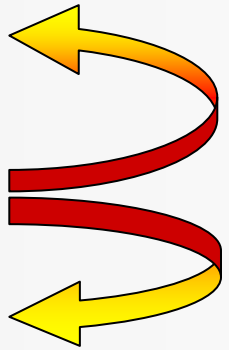
2. method of analysis

- **analysis/controlling of available data base**
  (invoices, monthly meter read-out, ...)
- **visualisation of energy data**
  (e.g. monthly consumption, power characteristic curve, ...)
- **inspections / to fix parameters of technology**
- **investigations / measurements**
- **proposals of possible changes**
- **evaluation of economic efficiency**
- **consulting /realisation of energy-saving investments and redevelopments**



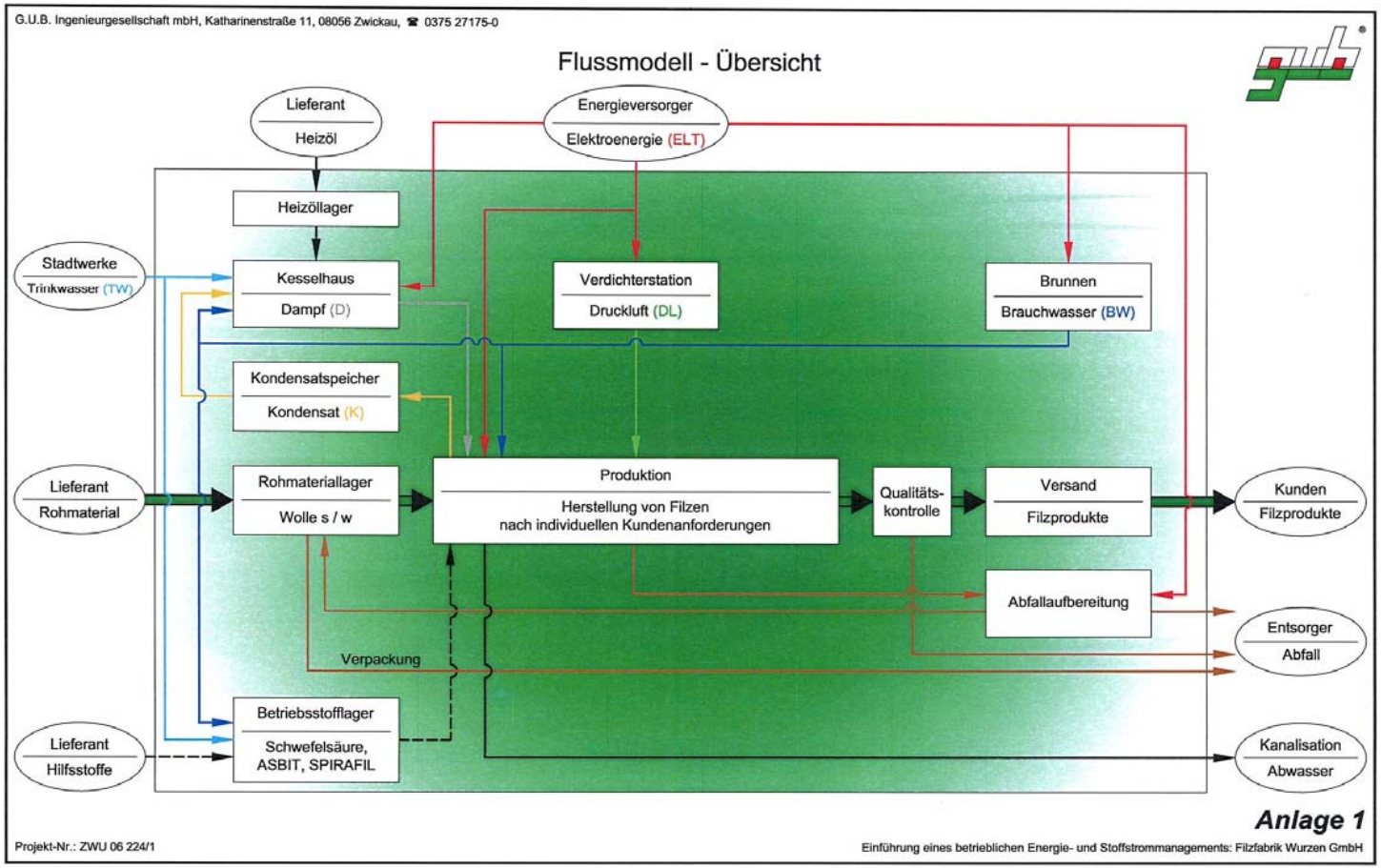
2. 分析方法

- 基础数据采集和分析
- 能耗量跟踪记录 (月消耗量，曲线图等)
- 检测/技术参数制定
- 调查/测量
- 改革提案
- 经济效益评估
- 咨询/实现节能、投资回报和发展



energy-saving – best practise

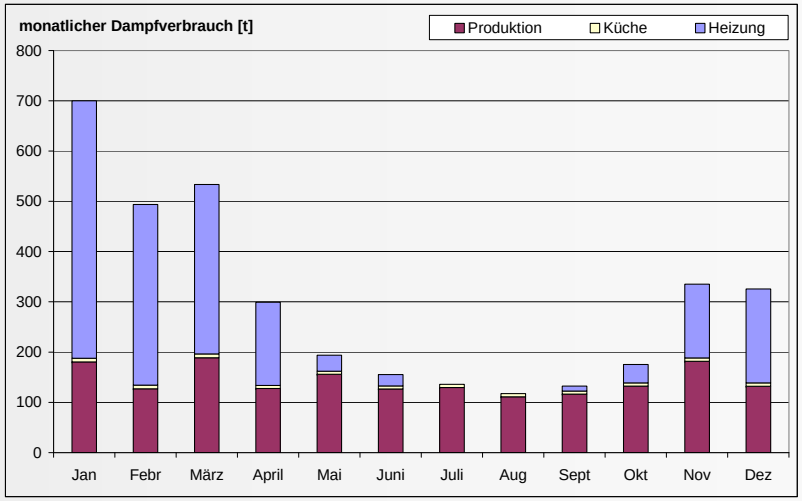
first step of the analyses → structuring of the enterprises

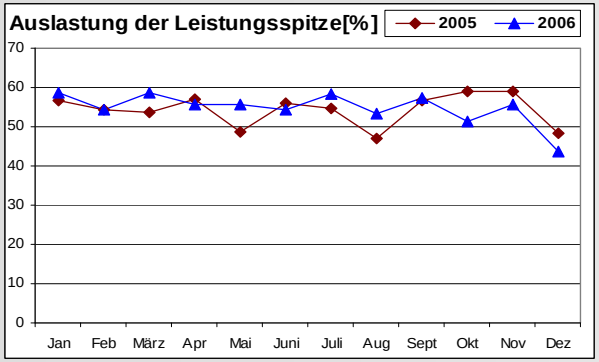


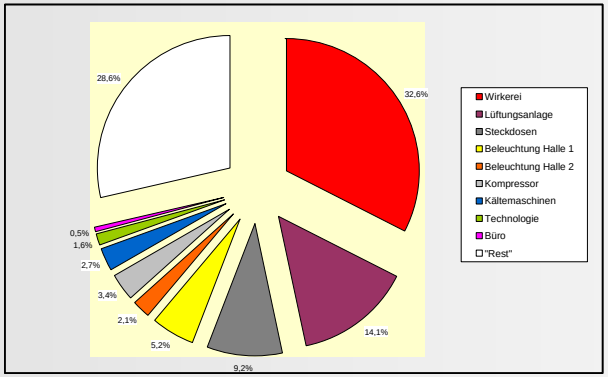
analysis of available data base (enterprise / power company / …)

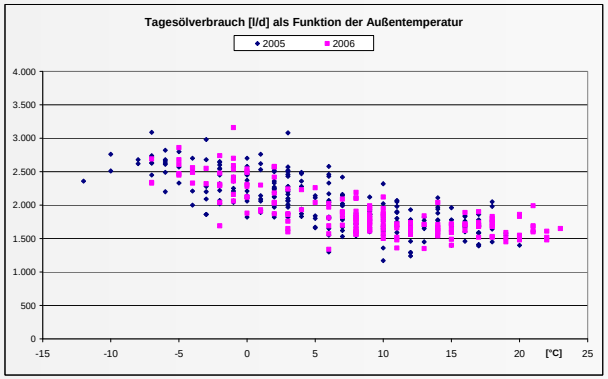
a) visualisation of the data from the enterprises

- monthly meter read-out
- daily read-out
- analysis of invoices
- ...





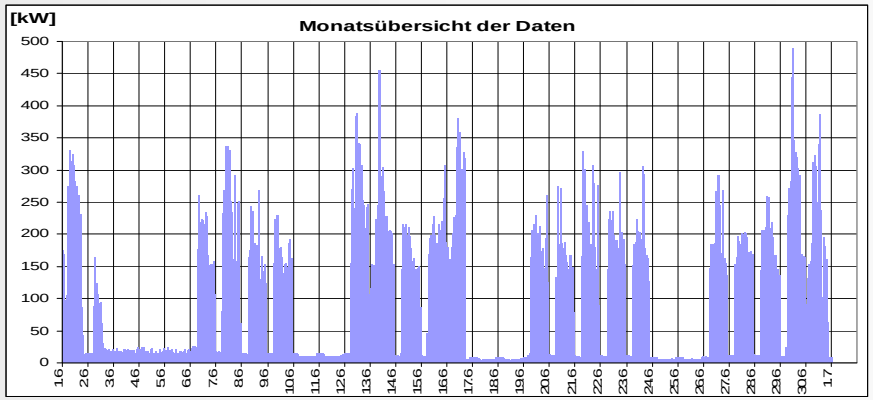


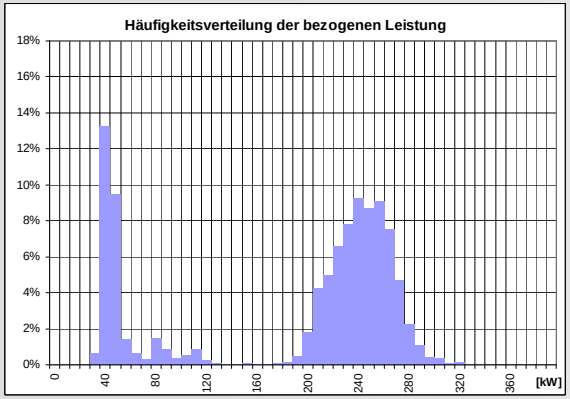


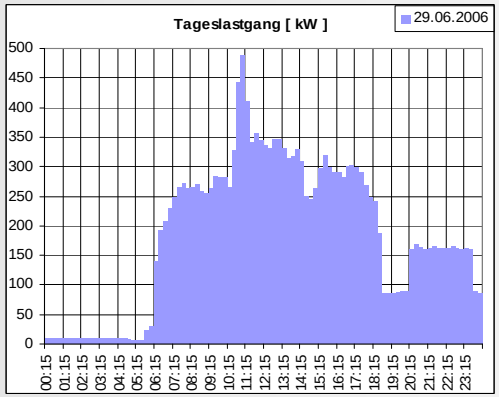
analysis of available data base (enterprise / power company / …)

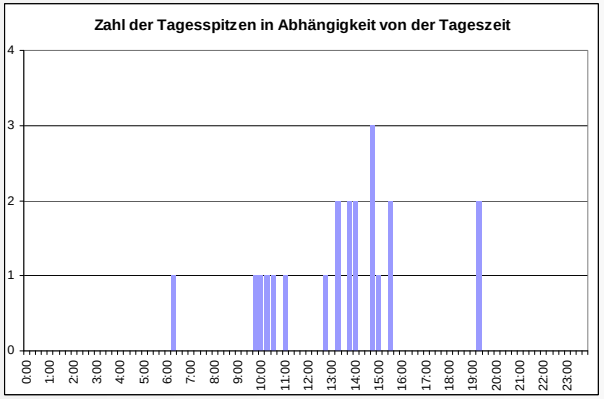
b) visualisation of data from the grid companies (power, natural gas)

- monthly / daily power curves
- seasonal dependency
- analysis of invoices
- base load (power/gas/…)









2. method of analysis

Measurements used

- infrared thermography
- power analysor
- datalogger (temperature, pressure, ...)
- ultrasonic flow measurements
- compressed air analyser
- air flow anemometer
- ...








2. 分析方法

测量方法

- 红外温度探测
- 功率分析
- 数据日志（温度压力等）
- 超声测量
- 压缩气体测量
- 风速计
- ...





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3. energy-saving – best practise

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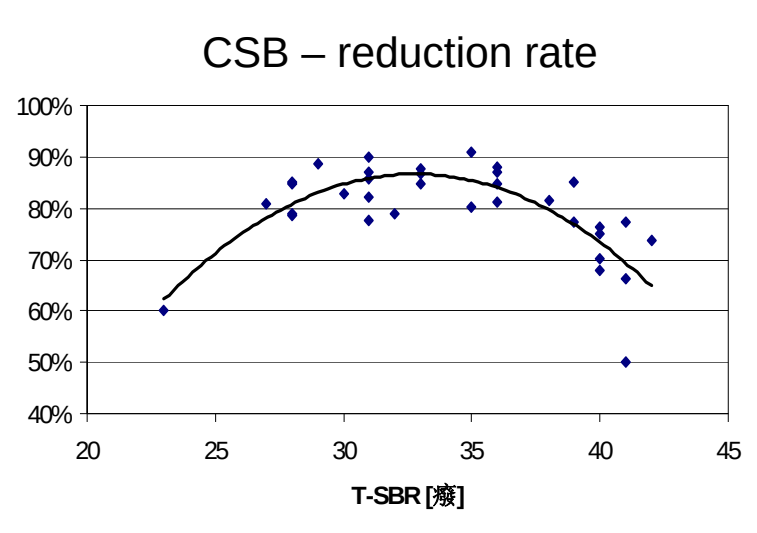
3. energy-saving – best practise

project: **heat recovery – waste water**

problem: **waste water too hot for biological treatment**



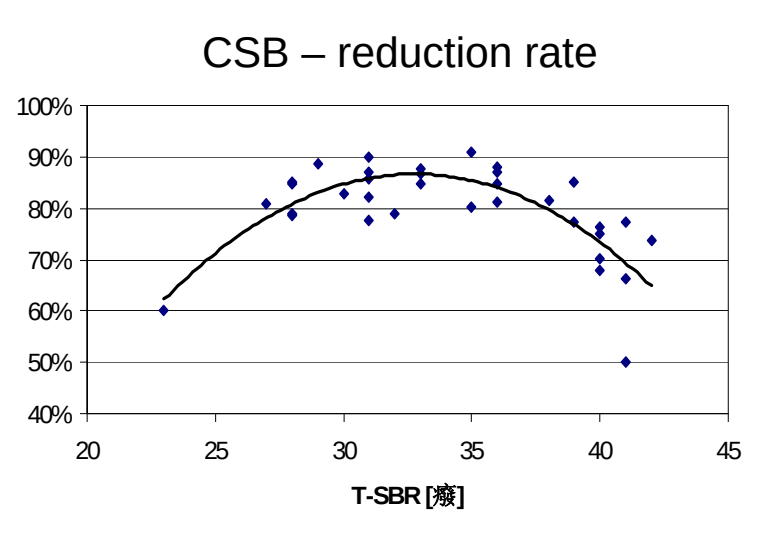
1.

cooling tower

3. 节能项目范例

项目: 废水中的废热回收

问题: 废水的温度太高，无法用生物法处理



1.

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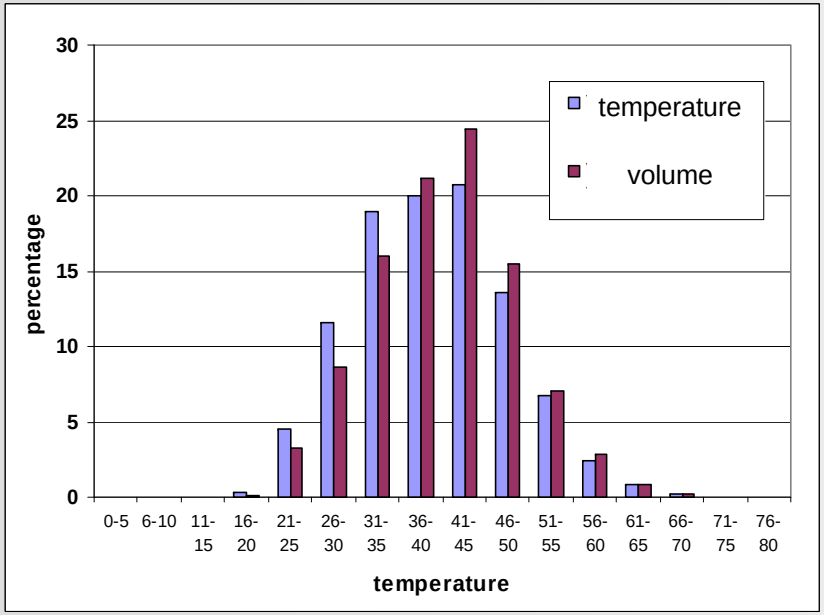
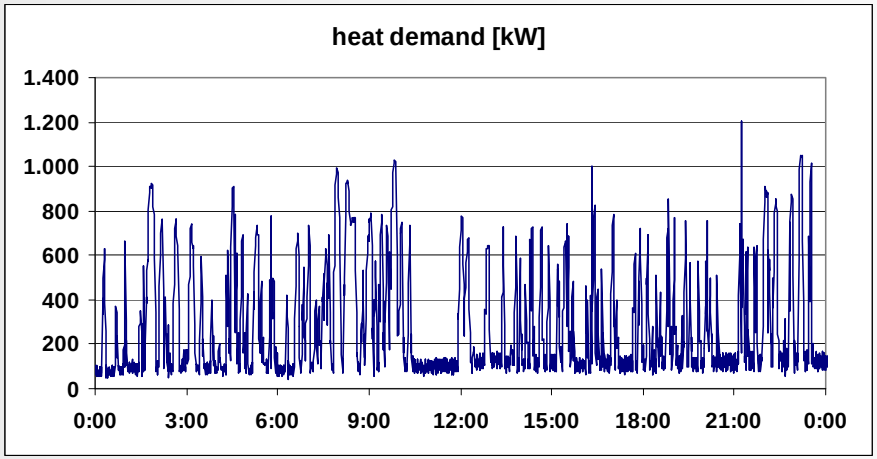
3. energy-saving – best practise

project: **heat recovery – waste water**

analysis / measurements:

(for each dyeing apparatus)

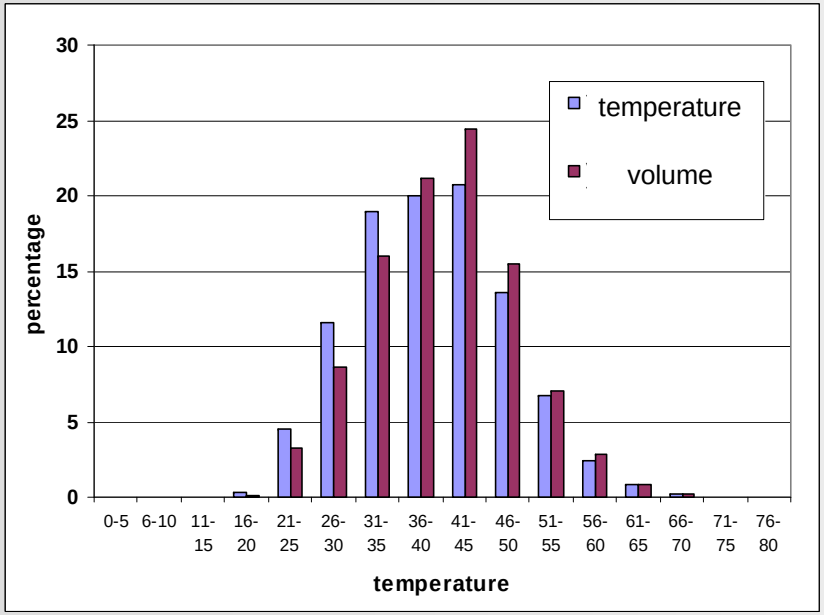


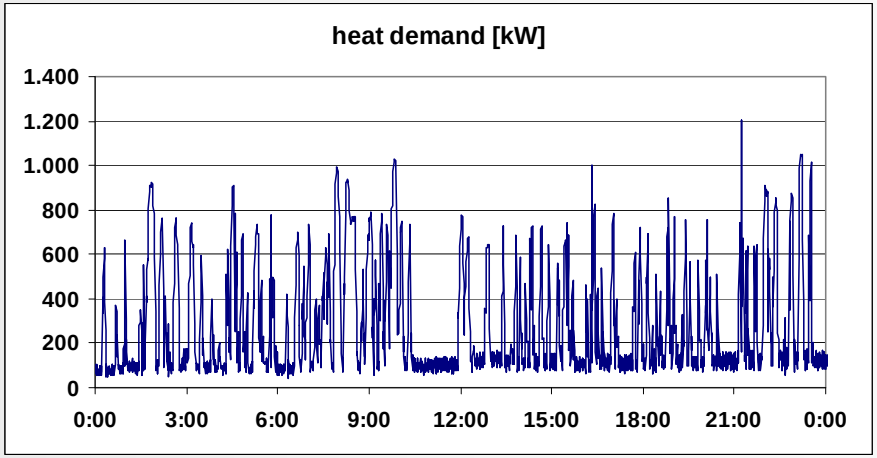


3.节能项目范例

项目: 废水中的废热回收

分析/测量:





3. energy-saving – best practise

project: **heat recovery – waste water**

solution:

- **separation of hot and cool waste water**
- **two heat exchanger**
- **discontinuous water flow and heat demand**
  → water reservoirs

- **investment:** **160,000.00 €**
- **savings:** **121,000.00 €/a**
  1,764.00 t CO_2/a

3.节能项目范例

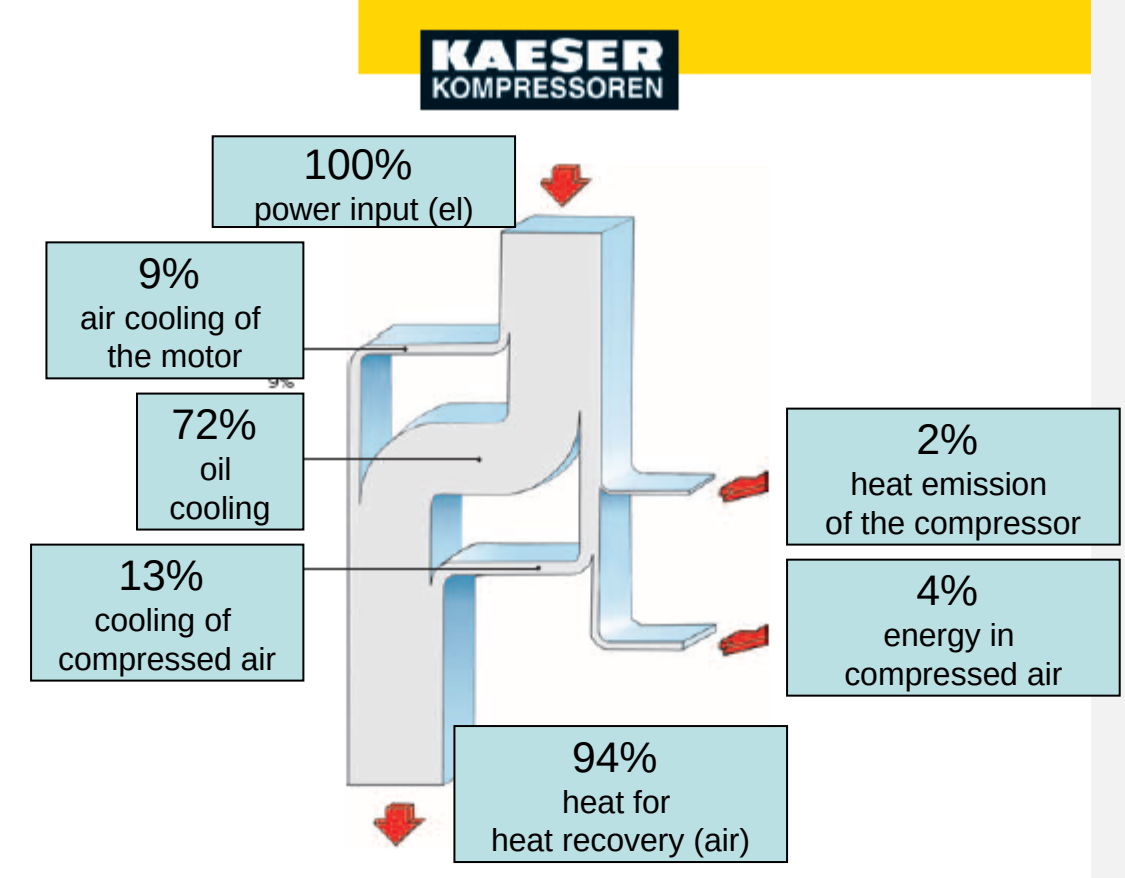
项目: 废水中的废热回收

解决方案:

- 冷热水分离
- 热交换
- 利用储水器控制水流和热流

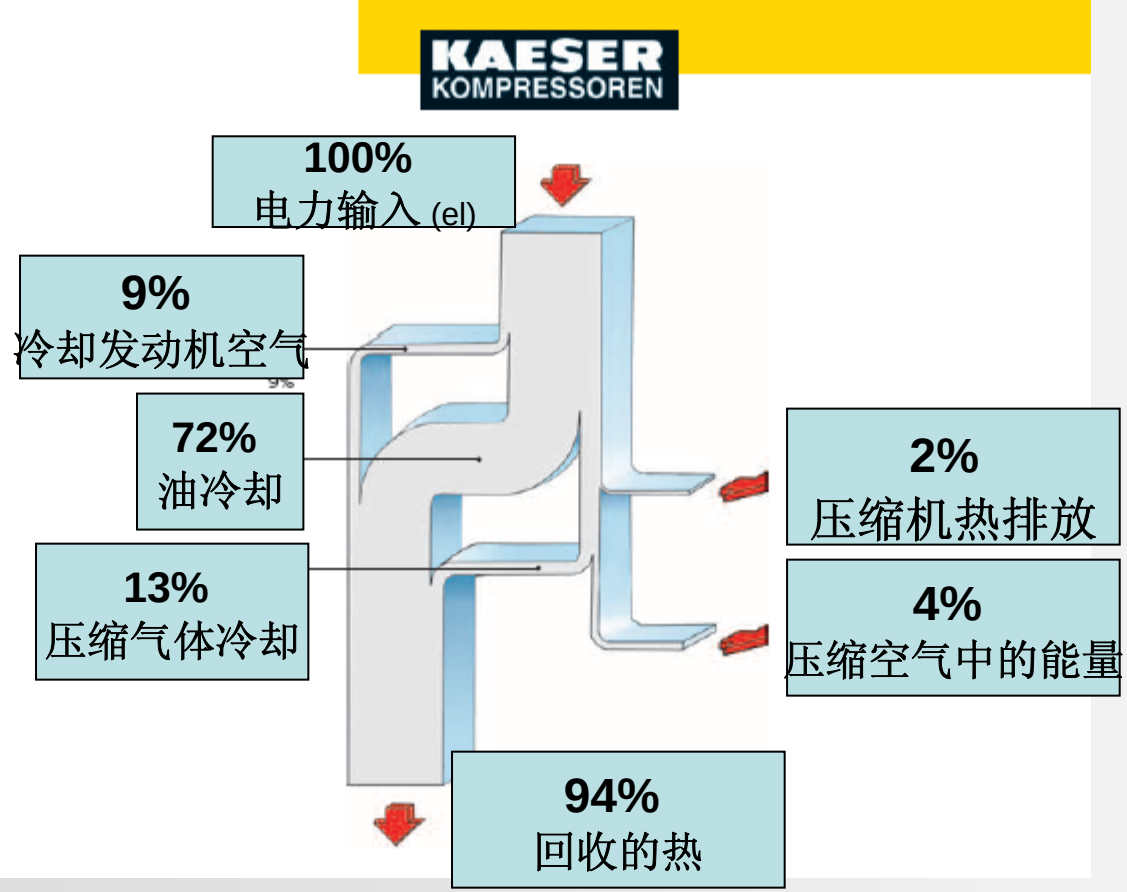
- 投资额: 16万欧元
- 节省金额: 12.1万欧元/年
- 减排量 1764 吨 CO2/年

project: heat recovery - compressed air production



3.节能项目范例

项目: 压缩气体流程中的废热回收



3. energy-saving – best practise

project: heat recovery - compressed air production

„energy losses“ due to:

compressor leakage	(... 20%)
No-load/follow-up operation	(... 20%)
pressure reduction	(... 20%)
leakage rate	(10% ... 30%)
air treatment	(5% ... 10%)

3.节能项目范例

项目: 压缩气体流程中的废热回收

“能源损失”程度取决于:

压缩机泄漏	(... 20%)
压缩机空转	(... 20%)
压力降低	(... 20%)
泄漏程度	(10% ... 30%)
气体的处理	(5% ... 10%)

3. energy-saving – best practise

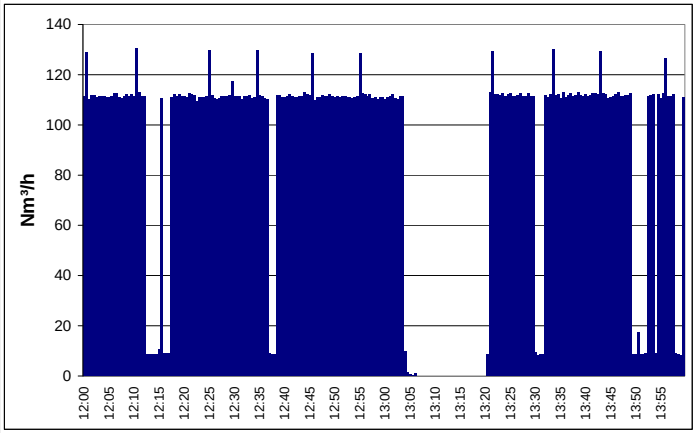
project: heat recovery - compressed air production

Questions to be solved in the beginning:

1. **How much of compressed air is needed (max. / av.)?**
2. **Maximum pressure ?**
3. **Different pressure levels ?**
4. **What is the leakage rate of the distribution system ?**
5. **Centralized or local system(s) ?**

→ **measurements needed ?**

→ **design of the system**



3.节能项目范例

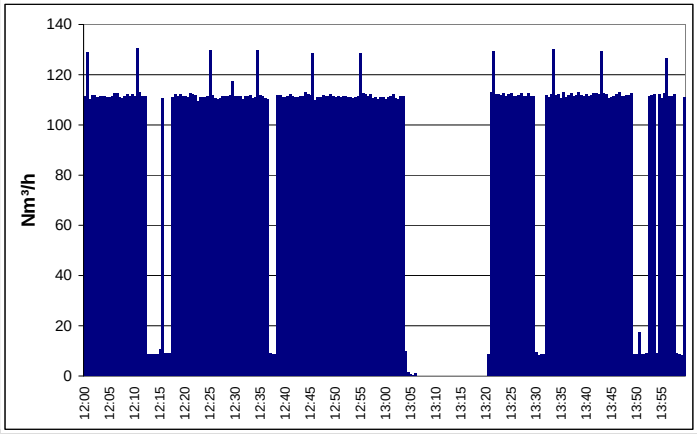
项目: 压缩气体流程中的废热回收

需要明确的问题:

1. 压缩空气的域值是多少？（最大值/av）？
2. 最大压力？
3. 不同的压力水平/具体到数值?
4. 整个分配系统的泄漏程度/具体到数值？
5. 集中还是独立系统？

→ 测量方法?

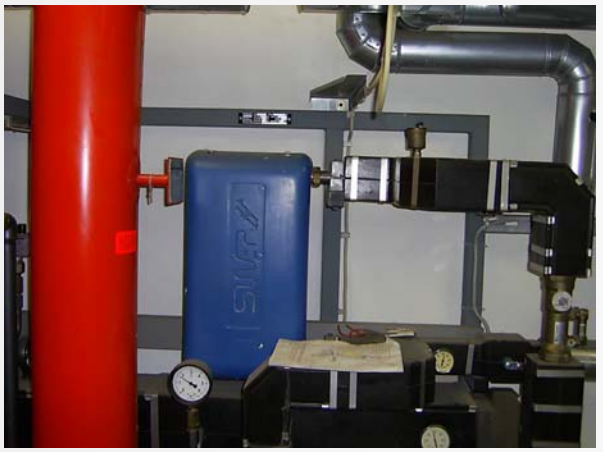
→ 系统设计



3. energy-saving – best practise

project: heat recovery - compressed air production

- central system nearby the main consumer
- new distribution system
- heat recovery (winter: air → heating / summer: oil → hot water)



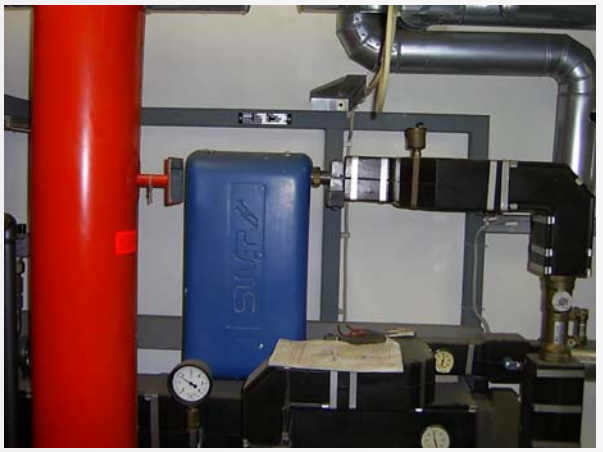
Compressor units: 2x 75 kW(el)

- investment: 12,000 € (heat recovery only)
- savings: 28,000 €/a
  11 t CO_2/a

3.节能项目范例

项目: 压缩气体流程中的废热回收

- 集中式供热系统/靠近终端用户
- 新的分配系统
- 热回收（冬季：热空气—供热）
  （夏季：热油—加热水）
- 压缩机功率: 2x 75 kW(el)
- 投资额: 12000 欧元 (仅指热回收)
- 节省金额: 28000 欧元/年
- 减排量： 11 吨 CO2/年



3. energy-saving – best practise

other projects(results):

	„e“-savings	ROI*)
- small scaled co-generation (public pool, buildings, hotels, ...)	30 - 40%	3 ... 5 yr
- ligthing	... 80%	3 ... 7 yr
- insulation (buildings, ...)	... 80%	5 ... >10 yr
- insulation (pipes, valves, tanks, ...)	... 15% of total consumption	1 ... 2 yr
- boiler	15 ... 50%	3 ... 6 yr
- power management		< 1yr

*) the ROI depends on the investment costs and the energy price !

3.节能项目范例

其他项目:

	节能量	投资回报
- 小型热电联产 (建筑、饭店、游泳池等公共场所)	30 ... 40%	3 ... 5 年
- 照明	... 80%	3 ... 7 年
- 建筑物保温层	... 80%	5 ... >10年
- 管道阀门绝缘层	... 15%	1 ... 2 年
- 锅炉	15 ... 50%	3 ... 6 年
- 电力管理		< 1年

注释： 投资回报时间取决于投资额度以及能源价格

4. summary

- → energy-saving potentials are in the order of 15 – 50%, (even in „new“ enterprises up to 20%)
- → to open up the potentials a detailed analysis is essential
- → best practises can be useful to cover the lack of information
- → a continuous training of the staff is necessary to make the savings sustainable
- → the question of energy comsumption shouldn‘t be the last question in an investment decision

4. 小结

- → 节能效率一般为15 - 50%（对于新企业大约为20%）
- → 详细地分析和研究对提高节能效率至关重要
- → 具体的实践工作能弥补信息量的缺乏
- → 长期的专业培训对于节能项目的可持续性非常重要
- → 耗能问题在项目投资中应该被重点考虑

4. summary

… more information desired ? … other interesting topics ?

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