

Energy audits reveal savings potential

## Papermaking under close “energy-scrutiny”

In recent years the costs for oil, gas and electrical power have increased at breakneck speed. One of the biggest challenges in papermaking is therefore to reduce energy consumption, so as to ensure cost-efficient production. An energy audit carried out by Voith Paper provides an analysis of the energy consumption in paper production. It then identifies where in the production process energy can be specifically saved and/or better utilized.

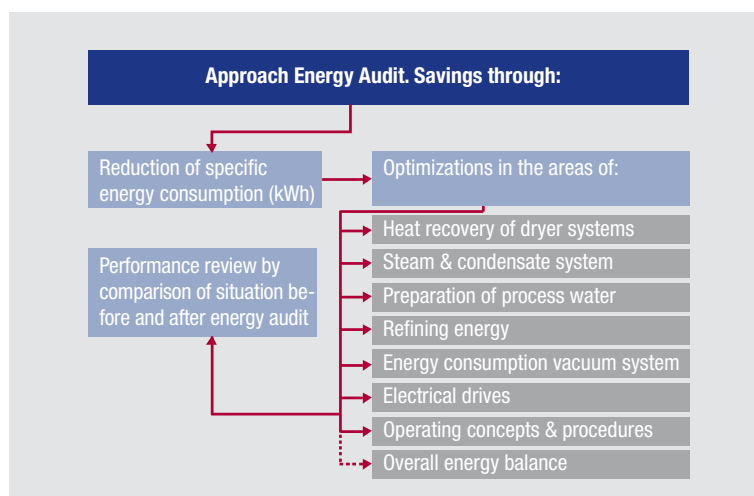


Fig. 1: Process focused on mass consumers.

The Voith process and product engineers are familiar with every step of the papermaking process as well as the latest products and solutions for saving energy effectively. They work closely with the customer to determine the best solutions for the respective situation.

Using state-of-the-art measuring technology the papermaking process is examined on site. The focus is not just on saving energy, but also on evaluating the locations where there is potential for energy recovery or energy production. The customer decides which area of the paper production process

is to be investigated. The energy audit with Voith Paper results in specific solution proposals with detailed cost analysis for each individual situation.

### Energy audit process

The energy-saving potential in the paper production is investigated and confirmed in three phases:

#### First phase: potential analysis

First, the current process data of large-scale consumers is looked at with the customer. The benchmark leads to selecting the key focal areas

which are to be investigated in detail in phase two. The dryer including the hood could be examined, for example. After all, the dryer is responsible for 50% of the energy used in paper production. Or, the actual consumption of the paper machine drive could be examined.

#### Second phase: detailed analysis

In this phase of the energy audit, Voith Paper's process engineers calculate, compile and evaluate the measured data. How much energy is consumed in total? Which measured data are particularly conspicuous?

The data from the customer's paper mill is compared with various parameters: the usual standards, the standards of Voith Paper products and future options. Specific solution proposals to save, recover or produce energy in the production process are now worked on. A detailed report is sent to the customer just a few weeks after the on-site analysis. This report contains:

- A summary of the energy audit
- Tables with all measuring results
- Detailed analysis of the data
- Comparative studies
- Solutions, options
- Voith Paper's recommendations prioritized according to feasibility and economic viability.

**Third phase:  
Offer and implementation**

The most cost-effective solutions that were worked out in phase two (detail study) form the basis for an engineering offer to the customers. Once the

customer has decided for a go, Voith Paper experts perform the engineering and implement the solutions. Efficiency monitoring confirms the economic viability of energy savings.

**Case study of an energy audit**

What form does an energy audit take in practice? Using an example, the individual steps will be shown in detail. In consultation with customer the air handling system on two paper machines with the associated steam and condensate system and hot water cycle (paper machine B only) have been determined as the area to be audited. Measurements were recorded and the existing processes were investigated and analyzed from the point of view of feasibility, the necessary investment cost and economic efficiency.

**Paper machine A**

Output: 130,000 t/a  
Product: Newsprint  
Main basis weight: 45 g/m<sup>2</sup>

Raw material: Recovered paper, TMP  
Sheet width at reel: 5,300 mm

The evaluation of measured data and process data on paper machine A led to the following results for the air handling system:

- One option achievable in the short term is to save steam by making modifications in the steam and condensate system of the production hall heating.
- There is no economically attractive modification possible in the area of the heat recovery system expanded in 1994.

**Paper machine B**

Output: 190,000 t/a  
Product: LWC and newsprint  
Main basis weight: 57 g/m<sup>2</sup>  
Raw material: Recovered paper, TMP  
Sheet width at reel: 5,400 mm

At paper machine B the air handling system, production hall air condition-

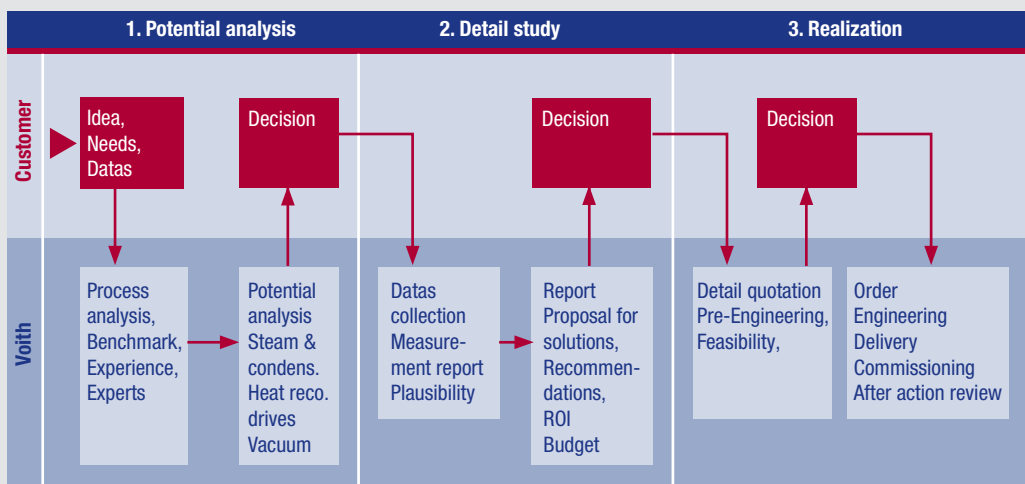


Fig. 2: Energy audit phases 1-3: step-by-step to an individual solution.

ing and hot water cycle were examined thoroughly. The measurements and process data show that energy savings can be implemented economically for the air handling system and also the hall ventilation.

**The following solution proposals were formulated:**

**Air handling system**

- Operating mode with lower hood intake air temperature
- Savings of energy through expanding the heat recovery systems and integrating a waste water heat recovery process.

**Hall ventilation / air conditioning**

- Optimizing the operating mode through optimum use of the heat recovery energy from the hall air conditioning system thanks to Voith EOS (Energy Optimization System), resulting in a ROI in less than a year (details Fig. 3).

As a follow-up contract to the completed energy audit, detailed engineering – including quotation for the conversion of the heat recovery systems, ducts system and integration of waste water heat recovery in the process water cycle – was carried out for the air handling system. Here, too, a ROI of less than 1.5 years could be shown. Voith Paper energy audits produce the following results:

- Solutions for sustainable energy savings
- Unlock hidden potential
- Amortization period usually < 1 year
- Complete customer satisfaction

Many references confirm these results.

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**Infobox**

The following sub-systems may be part of an energy audit:

- Hood and air handling system
  - Dew point measurement and hood balance
  - Air flows, humidity, air temperature
  - Insulation, leak and corrosion tests
  - Operating window for fan
- Drying cylinder
  - Cross profiles and heating curves
  - Siphons
  - Evaporation calculations
- Steam and condensate system
  - Review of concept
  - Assessing components (valves, pumps, separators, pipe routing etc.)
  - Actual values and operating window
  - Evaluation of operating point
- Heat recovery
  - Balance
  - Checking heat exchanger capacity
  - Calculating maximum load and economic load
- Hall ventilation
  - Balance
  - Air volumes, temperatures
  - Testing hot water cycle
- Process water treatment
- Energy for refiners
- Energy consumption vacuum system
- Electrical drives

**Results of case study Paper machine B**

Investment energy audit Saving optimization controls machine related air systems	ROI = 0,3 a
Investment Energy Optimization System (EOS) Saving optimization controls hall ventilation	ROI = 0,5 a
Investment alternative hood exhaust air 3 Saving inclusive wastewater treatment plant	ROI = 1,4 a
Investment alternative hood exhaust air 1&2 Saving inclusive wastewater treatment plant	ROI = 1,3 a
$\Sigma$ Required investments	ROI = 0,9 a
$\Sigma$ Saving potential	



Fig. 3: Amortization period < 1 year for a high degree of customer satisfaction.

Fig. 4: Solutions for sustainable energy savings.