Sustainability and Energy Efficiency

More demands are constantly placed on the pulp and paper industry, in terms of quality targets and sustainability. On the other hand, direct costs are typically increasing and main machinery quickly becomes obsolete.

INTRODUCTION

This equation is often challenging but is certainly not impossible to solve. Correctly planned engineering actions are the key to overcoming this challenge.

The devil is in the details; i.e. there are no easy single tricks to improve the overall energy efficiency of an operating plant. However, a structured approach to improve the efficiency needs to be employed. In practice this means focusing on a single piece of equipment and evaluating short payback items. Virtually each mill has multiple non-identified improvement objects that, by correct measures, can have payback times shorter than one year.

DEVELOPMENT OF ENERGY EFFICIENCY

Traditionally, efficiency improvement has been focused on shaping the development to gain cost reductions in consumption of utilities (water, electricity, steam, fuels etc.), in addition to gaining more from less (i.e. improving the utilization of raw materials). These drivers are solely focused on improving the cost structure of the business. Especially in the past, improved efficiency was often associated with lower quality parameters, unfavorable compromises and increased complexity in daily operations.

During recent years, image related elements, such as sustainability, social responsibility and different political initiatives have shaped the decision-making more than anticipated 20 -30 years ago. Increased prices of electricity and authority demands (permitting) also support the efficiency development. All these factors together impact the stakeholder networks in general. This includes equipment suppliers and end users who require higher level of sustainability from the pulp and paper producers.

Overall energy consumption in the pulp and paper industry has increased rapidly from the 1970's. The reason is obvious: constant increase of production volumes. Figure 1, below, illustrates the energy consumption development in Finland since 1970.

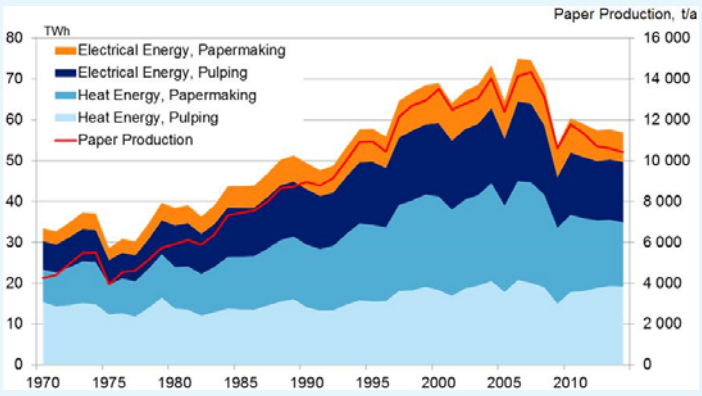
ENERGY INTENSIVE GRADES PLAY IN

In paper and board making, energy efficiency has improved ~10% since the 1980's. Even if the know-how and technical development would allow further reductions, the industry has during this time shifted production towards more energy-intensive grades and simultaneously increased the amount of technology and automation along with the increased quality parameter demands. Target quality is decided by the pulp and paper producers and their clients. It is therefore essential to meet targets and not exceed them, as any additional quality improvement usually consumes more energy.

Energy efficiency is traditionally measured as specific energy consumption, i.e. energy input per produced unit (typically kWh/t). In practice, the equation is simple; either increase production volume while maintaining the absolute consumption of energy or reduce the energy input if the production capacity is kept constant. This equation is shown in Figure 2.

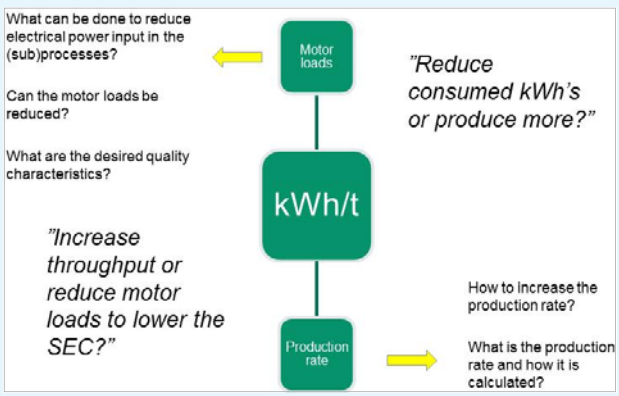
General developments in energy efficiency for mills/production units have become part of everyday work which is a key game-changer through awareness in energy efficiency contributors. This, in turn, leads to a refreshed mindset that is required for any change, covering all personnel groups from C-suite to floor level. This requires constant training of personnel, which should be considered as an investment.

Energy consumption development in forest industry in Finland



Gross excluding the energy production at production units

Fundamental problem setting by Specific Electricity Consumption



TYPICAL IMPROVEMENTS

In addition to advanced commitment of personnel to energy efficiency through improved awareness on details, energy efficiency is typically improved by e.g.:

- High quality engineering
- Replacing old technology with new technology
- Resource efficiency (fillers, low grammages, reduced water consumption)
- Shifting focus from large investments to smaller actions contributing to stepwise improvement of the energy efficiency (e.g. pumping optimization, advanced process control)
- Advanced recovery of any "waste energy sources" (e.g. recovery and utilization of secondary heat)

TYPICAL RESTRICTIONS

In addition to limitations in investment possibilities, development is typically restricted by e.g.:

- Lack of technological knowledge
- Unclear strategic direction
- Overly conservative approach in enabling new advanced technologies
- Laws of nature (e.g. it takes certain amount of energy to evaporate water)
- Hypothetical expectations on decreased electricity pricing (other priorities are preferred)

SEEING THE BIG PICTURE

As no change is usually done for free, there are obstacles for energy efficiency improvement.
The most typical restriction is reduced availability of investment budgets, connected to unclear strategic objectives and projected market demand forecasting.

However, it is always important to evaluate options and start by focusing on short payback development items.

Production units usually have surprisingly large quick wins potential in the energy efficiency, but if those are not known to details, there will not be any improvement. It must be understood that good plans are always needed and the change takes place after the plans are executed.

CONCLUSION

Energy efficiency and sustainability are common targets for any business globally, in order to achieve operational preconditions in the future.
High-end qualities of pulp, paper and board demanded by markets usually mean improved costs for the production but pressure for efficiency is increasing simultaneously.
Well-structured and executed plans bring benefits in more ways than one. Single contributors on "floor level" are the key to improvement. However, it must be understood that only actions lead to change, planning is not enough.

This is part 3 of 4 in the series of articles on "Sustainability and Energy Effiecency in the Pulp and Paper Industry.

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