Sustainability and Energy Efficiency

Choosing the right strategy for simultaneous bottleneck removal, process efficiency improvement and dealing with obsolete, inefficient machinery combined with limited investment possibilities is naturally very challenging.

MAIN OBJECTIVES

The key objectives of asset integrity analyses include performing a lifetime analysis and risk review, estimating the required capital expenditure needs for a chosen time frame for the areas and obtaining key equipment included in the scope. This is then compared to investment costs associated with replacing the equipment that stand out from the agreed criteria with new machinery.

By conducting such an analysis, the report will support mill owner´s capex investment planning for the areas at the mills in scope, providing the mill with an in-depth understanding of the viability and technical condition of the equipment covered in the scope.

Sustainability profiling together with limited product sales profit margins are shifting the profitability potential towards potential in operating costs, typically through improved yield and improved energy efficiency. Simultaneous tightening of environmental limits, image-related aspects and increasing commodity pricing together increase the pressure further, making it vital that careful decisions to improve the competitiveness of the assets are made.

Maintaining the energy efficiency development requires constant monitoring and actions. However, when going beyond “low hanging fruits”, more comprehensive actions, in the form of investments, are required. Multiple other overlapping drivers, such as workforce trends, constantly renewed regulations and an increasingly competitive landscape are contributing to the owner’s dilemma. The state of permanent challenges requires constant improvement in any plant’s performance .

WORK FLOW ASSESSMENT

The work flow for asset integrity analysis consists of four main milestones.
The initial step of the analysis is to define the work for assessment. The majority of attention is focused on evaluating the repair and replacement needs for main machinery and/or unit processes with the related systems.

Typically, close co-operation with mills is required to define all objects and their complexity for the final breakdown of the work. In order to set up the analysis definition, a certain threshold for object value must be set, e.g. replacement value of > 2 MUSD/MEUR and which needs to be replaced in the next 10 years for any of the main equipment/system in areas mentioned above.

A MILESTONE APPROACH

The first phase is desktop work, during which the initial data (through data exchange and/or files available) is processed. During the evaluation, topics such as production data, process concepts, main equipment features and maintenance practices are reviewed. The primary conclusions and expectations are formed during this phase by data review and comparison to peer mills.

This phase is followed by the evaluation phase. The evaluation phase is highlighted by the mill visit, when the assets are inspected closely in situ. Additionally, discussions with mill experts (operators, technical management etc.) are conducted to understand all potential issues related to assets.
After the evaluation phase, conclusions are drawn and action plans preparation is initiated. In practice, this phase is done to define if equipment is to be rebuilt/ refurbished/replaced and subsequently develop the capital needs for all key equipment in scope. Review workshops and report preparation conclude the work.

OUTCOMES AND REPORTING DELIVERABLES

During the final phase of the work, findings are documented and the conclusions are described in detail. The work is thereafter concluded by preparing coarse numbers for the replacement costs for defined objects by utilizing reference files and records for comparable object(s), i.e. no supplier quotations (specifically for the asset integrity analysis) are used.
The reporting consists of four main parts: the technical report, cost estimate, investment timeline, and the main report.

OPTIMISATION OF INVESTMENT PLANS

A suggested timeline for investment phasing is prepared as part of reporting. Typically, there are some items with several alternatives, in which decisions have an impact on the other investments. In general, the most critical items are prioritized in the early years, and the rest are pushed forward to balance the investment demand during the ears, taking into account early upgrades to any systems to avoid increasing costs and eventual obsolescence.

Generally, some items require clear strategic decisions before implementation, and some investments are dependent on other decisions, but most critical items are prioritized to the early years and a 2-year accuracy is typically used in the tables to indicate the approximate time frame for investments. Other features, such as low risk – medium risk – high risk scenarios can be prepared if seen as necessary to e.g. evaluate impacts of potential threat of downtime that will affect production. Some items always have several alternatives and these are subject to discussion during the reporting of the outcomes.

Typical investment plan prepared based on asset integrity analysis is illustrated in the grapch to the right.

SUMMARY

Asset integrity analysis provides a complementary, objective "second opinion" to support investment decision-making. Additionally, it is possible to understand the investment demand landscape as a whole. One major outcome is a supplier-independent cost data, whereas supplier-independent recommendations on alternative technological solutions to simplify necessary investments can be presented.

The real value for the owner is associated with understanding the phasing potential of investments to avoid overly hasty moves and high expenditures. This information is very useful in multi-mill decision-making gates, where investment demands for multiple production units needs to be decided simultaneously.

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

References

LIND T., et al, "Sustainability and Energy Efficiency in the Pulp and Paper Industry; Part 1: Overview", PaperASIA, May/June 2016,

LIND T., et al, "Sustainability and Energy Efficiency in the Pulp and Paper Industry; Part 2: Environmental Scenarios in Europe and in China", PaperASIA, July/August 2016

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MAIN INVESTMENTS (> 4 M EUR) SUGGESTIVE TIMELINE EXAMPLE MILL - *ILLUSTRATIVE!*

Recovery Island, Power Island, Automation*

		Year 1	Year 2-3	Year 4-5	Year 6-7	Year 8-9	Year 10-11	AREA
Alternatives	Recovery boiler – ESP	Decision making			18.9 MEUR			Recovery Island
	Evaporation; new plant			51.0 MEUR				
	Evaporation; upgraded existing		23.8 MEUR					
	Recaustizicing; Mud washer / GL/WL liquor clarifier					6.9 MEUR		
	New feed water system for recovery boiler		5.0 MEUR					
Alternatives	Power boiler 4 rebuild; new economizer and superheater					6.5 MEUR		Power Island
	Power boilers; Option 1 or Option 2				14.7 - 20.0 MEUR			
	New power boiler**				103.3 MEUR			
	Automation; PLC X upgrade to Control Z series		5.2 MEUR					Automation
	TOTAL		18.2 – 6.3 MEUR	13.2 – 52.3 MEUR***	27.5 – 123.5 MEUR***	18.8 – 8.2 MEUR	3.3 – 0.0 MEUR	81.0 – 190.3 MEUR***

* No items exceeding the 4 M EUR threshold for electrification and water plant
** Major strategic overall decision, alternative to other objects in the investment list
*** Depending on the chosen alternative and phasing of the evaporation plant and power boiler replacement strategy

CONCLUDING REMARKS TO THE REPORT SERIES

"Only executed actions lead to change, planning is not enough"

The pulp and paper industry is facing enormous transformation demands, set by operational requirements, profitability perspective, but also by sustainability targets becoming more demanding.
Countries in the Far East, especially China, need to take giant leaps in sustainable development, to avoid the same long development route as Europe.
From the sustainability perspective; Chinese large, modern mills are performing well, while smaller units with less modern technology have the most development potential. Many sustainability challenges are associated with insufficient deployment of state-of-the-art engineering solutions and modern technology.

Asset base is the main component in developing efficiency; in-depth evaluations and corrective actions are often needed to map all details contributing to increased performance and efficiency.

Through high standards of engineering, these details can be covered and efficiency highly improved. In connection with increased investment demands, asset integrity analyses, combined with energy audits, provide a superior way to pinpoint the real efficiency restrictions of an operating mill and support the owner in addresses investments requirements correctly.

In general, the main message of the report series for any decision maker in pulp and paper industry is to:

a) understand the direction through set targets
b) prepare clear short term plans and actions for improvement
c) know the limitations/potential in asset base and be prepared on time for any further development.

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