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KSH CONSULTING

A CONSULTING CONCEPT

PROCESS ISLAND
OPTIMISATION SERVICES

KSH
Consulting



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BACKGROUND

Three main drivers impact cost performance: regional factors, mill configuration and operational performance (Figure 1). Regional factors typically determine 15% to 25% of the cost variability between different operations. However, a company has little control on it since it is driven by the plant location. The biggest driver of cost performance is the mill configuration, which typically accounts for more than 50% of mill-to-mill differences. Operational performance is typically the smallest cost determinant. However, it is the only cost factor that can be managed and improved on the short-term since the mill location and configuration are largely determined at the time of initial investment and cannot be easily changed.

Figure 1
Drivers of Cost Performance



The cost competitiveness of a mill generally deteriorates over time due to technological advancements at newer mills and to increasing maintenance costs. Global market developments are also impacting cost competitiveness.

When a mill ages and stops to be a value creator, its owner needs to take action by repositioning the asset. The ultimate goal is to optimise the asset with a long-term perspective by making the required modifications to the mill configuration.

However, at most mills, there exist opportunities to enhance asset operational performance with a short-term focus and only minimal investments. KSH Consulting has designed its “Process Island Optimisation Services” to specifically focus on operational performance.



OBJECTIVES

KSH Consulting, as part of its consulting practice, offers mill optimisation services. These services are designed to assist our customers in assessing the current situation and future competitive position of their existing mills and then formulating plans, which will maximise the short-term and long-term value of these assets.

KSH Consulting has designed its “Process Island Optimisation Services Program” to specifically concentrate on short-term opportunities for specific process islands and develop an operating strategy, which would yield an immediate improvement in operational performance. The focus is on maximising quality, throughput and short term profitability by adjusting flexible and “low investment” parameters.

SCOPE OF SERVICES

Process Validation

The first step in this planning process is to perform a technical audit of the process island. This phase is principally based upon data gathering and evaluation at the site and is supplemented by our internal database.

Although the consultant’s knowledge of the process island situation should be gained from an independent assessment of the island rather than the opinions of mill management and operating personnel, it is absolutely necessary that close working relationship be established at the management and operations level within the mill. Through observation, walk-through, interviews and operating data collection, the situation of the process island is validated from both a historical and current perspective.

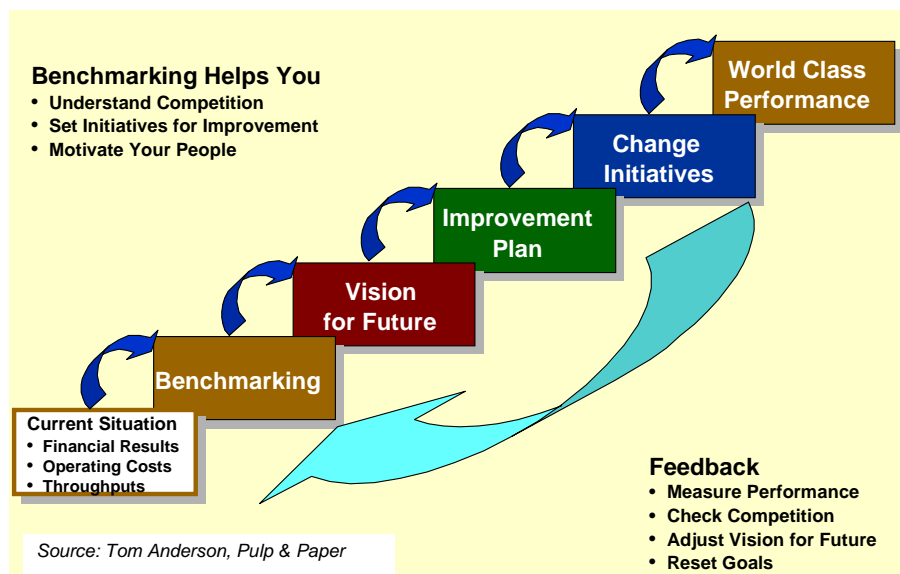
- ✔ Process design.
- ✔ State of the equipment.
- ✔ Character and content of operations information measurement.
- ✔ State of organisation and rationalisation of accountability and responsibility.
- ✔ Substantiation of unit process operating parameters and material flows and quality.
- ✔ Process output related to mill requirements .



Benchmarking

To establish a vision for future development, the process island characteristics and operating performance must be benchmarked against industry standards. This analysis along with KSH expert opinion will allow a proper assessment of the current island situation and the gap that exists relative to the industry standards. Benchmarking provides the required feedback to the project team to develop a vision of what the island needs to become, to establish realistic targets and to develop and implement the key change initiatives required to move forward (Figure 2).

Figure 2
Benchmarking – How Does It Add Value



Data gathered during the technical audit phase are compared against industry competitive standards using specific performance indices. This comparative analysis will focus on:

- ✔ asset characteristics: design capacity, technical age, etc.;
- ✔ operating performance: production stability, efficiencies, utility usage, personnel productivity, manufacturing cost;
- ✔ maintenance performance: workforce, cost, planning, capital reinvestment; and
- ✔ operations and maintenance management practices.



Performance Improvement Program

A performance improvement program (PIP) for the process island is designed to provide an operating strategy, which should yield an immediate improvement in operational performance. The focus is on maximising quality, throughput and short term profitability by adjusting flexible, “low investment” parameters, such as:

- ✔ process operating conditions;
- ✔ process operating procedures;
- ✔ raw material inputs;
- ✔ labour utilisation and organisation;
- ✔ information processing;
- ✔ financial issues (purchasing, inventory, and production scheduling plans); and
- ✔ high return mechanical replacement (debottlenecking).

The analysis not only provides a short-term plan for improving the economic efficiency of the process island; the analysis and data it collects establishes the limiting parameters of the island from a process quality, organisation and mechanical perspective.

Natural consequences of the PIP analysis are therefore, a prioritised list of efficiency improvement projects including expected returns, a short and intermediate term capital spending plan and organisational recommendations.

TEAM

A team composed of senior specialists with superior experience in technical and economic analysis and planning renders the proposed services. All senior members of the team have long-standing experience in mill and process optimisation.



COMPANY PROFILE

General

KSH Solutions Inc. (KSH) is a Canadian consulting, engineering and EPCM services company, founded in 1923 in Montreal, having global reach and extensive experience in the pulp and paper and forest sector. Operating world-wide, KSH has the skills, experience and organisation needed to assist clients improve their asset performance and to develop and execute capital projects of all sizes and complexities, with its consulting, engineering and construction management expertise. In addition, with its European partner and key shareholder, MAN Ferrostaal in Germany, KSH offers its clients the ability to implement their projects under a turnkey / EPC contract customized to the clients' needs.

Built from its long history and strong presence in North America, KSH has expanded its capabilities by providing expertise and services on projects in Europe, Asia, Australia and South America, giving the company a global perspective, as well as the knowledge, track record, and ability to execute projects anywhere in the world.

The entire group provides access to a vast network of resources and offices giving KSH the support to evaluate undertake and execute projects anywhere in the world.

KSH Consulting

KSH Consulting is the consulting arm of KSH Solutions Inc. Our mission is to assist clients make positive, lasting and substantial improvements in their performance.

We have the global insights, consultants and tools to offer objective and sound solutions to various business problems for companies engaged in the pulp and paper and wood processing industries, governments, financial institutions, investors, lenders and sector organisations.

Our integrated services cover the whole supply chain, from raw material to end-use markets, and focus particularly on the following areas:

- ▶ **Resource, Energy and Environmental Management:** studies pertaining to resource supply, demand, cost, and end-use; regional resource comparisons; audits and benchmarking of forest, environmental and energy management practices; development of corporate strategies for sustainable development; development of regional resource management and master plans; and, government policy advice on sustainable developments.



- ✔ **Product Management:** rationalisation and optimisation of existing product-mix; product and manufacturing process design; process and product trial management and product launch assistance.
- ✔ **Marketing:** market analyses, market research, development of marketing plans and market launch strategies, customer satisfaction studies and introduction to key buyers.
- ✔ **Logistics:** distribution logistics planning and optimisation.
- ✔ **Mill Development:** performance audits, benchmarking, optimisation programs and long term development plans for existing assets and mills. Operations, maintenance, and plant management assistance.
- ✔ **Technology Management:** assistance in R&D activity planning, technology assessment and selection, strategic alliance/technology transfer assistance and technological risk management.
- ✔ **Investment Analysis:** opportunity and feasibility assessments, due diligence, asset valuations, business plan development, financial analysis and planning, lender's consultant, owner's consultant, strategic alliance identification, as well as economic and sector studies.

KSH Consulting has acquired strong expertise in consulting and strategic planning in the forest product industry with numerous completed studies. Some relevant optimisation studies involving KSH Consulting team members are described below.

SELECTED EXPERIENCE

Technical Assistance on Super TMP (2006). This bleached TMP mill located in eastern NA mandated KSH Consulting to provide technical assistance in converting the mill to the production of 45 mL TMP with superior bonding properties. The intent was to produce SCA+ from this pulp in combination with 10-15% groundwood but zero chemical pulp. KSH determined the required the paper furnish mix based on pulp and paper properties. KSH developed the flowsheet and assessed the results of pilot plant trials. The project was not implemented due to the premature shutdown of the mill. *(Kathadin, Port Cartier, 5BE-002)*

Technical Assistance (2006). PM14 at Domtar, Gatineau was experiencing random speed oscillation on the forming section which resulted in a high draw variance between the former and press which in turn resulted in sheet breaks and efficiency losses. KSH was mandated to find the cause of the problem and identify the solution. The variances were identified as being caused by the machine vacuum system and the problem solved during a shutdown for a felt change. *(Domtar Fine Papers, 5BD-001)*



Technical Assistance for a Restart of an Idled Market BCTMP Mill (1999). The mill was reconfigured to produce pulp for use in the production SCA+. The project involved the conversion of the existing three lines of two-stage refining to two lines of three-stage refining and modifications to screening, thickening and bleaching. The mandate included the preparation of a mass and energy balance (WinGems) and P&ID diagrams for the proposed process. *(Tembec Inc.)*

Mill Audit and Technical Assistance for On-Site Manufacture of Sodium Bisulphite (2005). A Canadian mill producing 625 t/d of newsprint from TMP decided to terminate the use of sulphur dioxide. This gas was used in the production of sodium bisulphite solution, which was used as a TMP brightening aid. A new process was started-up to produce sodium bisulphite from sodium sulphite. The system was problematic and was causing pH swings. KSH Consulting audited the system and recommended improvements. *(Abitibi-Consolidated, 5AF-001)*

Performance Improvement Program for a Pulp Mill in Malaysia (1995). The mill built in the 1980's was designed based on 100% mixed tropical hardwoods (MTH) and was changed to a mix of 50% MHT and 50% acacia mangium. An audit of the mill was performed, department by department, to identify performance problems and the causes of such problems. Various improvement solutions were identified; some of them being operational and other requiring minor and major equipment modifications. Capital cost estimates were prepared for each of the improvement solutions requiring capital investment together with the expected financial benefits. A performance improvement program was recommended to the Client. *(Sabah Foundation)*

Performance Improvement Program for a CGW/UGW Paper Mill (1999). Technical audit of two small paper machines specialising in CGW and uncoated high bright papers and related process islands. The paper machine performance was analysed and low cost solutions to improve efficiency and production were proposed. *(Tembec, St. Raymond)*

Benchmarking and Optimisation Study from Log Yard to Digester (1995). This study involved a technical audit of the log yard area to the digester of this state-of-the art UFS paper mill. The operations parameter of the existing systems were analysed and benchmarked against the best operations in North America, South America and Scandinavia. Based on the established benchmarks, an optimisation program was developed to improve the mill situation. In a first step, potential projects and operational improvement options were identified as well as the associated capital cost on an order of magnitude basis. In a second step, the best alternatives were selected and the associated capital investment and benefits were estimated with a better accuracy. *(Domtar Inc.)*



Energy Saving Program for a Kraft and Paperboard Mill (1995). An integrated paperboard mill jointly with its electrical power supplier mandated KSH to perform a technical audit of the mill to identify potential opportunities to reduce power consumption. The report described the identified energy saving measures, the associated savings in dollars and associated benefits such as reduced labour, quality improvements, etc. The capital investment required to implement the proposed measures was also estimated.

Production Improvement Program for a Newsprint Paper Machine (2001). A newsprint producer located in Thailand was operating its paper machine at the limits of its design capacity and at a high overall efficiency. KSH was awarded the mandate to assess the opportunity of increasing the speed of the machine. The required modifications were identified and the project economics in terms of capital investment and financial returns were analysed. *(PanAsia)*

Optimisation Program for BSKP Mill (1998). Technical audit and analysis of optimisation alternatives to increase the pulp mill capacity from 750 tpd to 935 tpd. The implementation program was phased in so that the effects of each phase could be fully accessed and adjustments made before implementing subsequent phases. *(Klockner INA, Germany, 506-001)*

Optimisation Plan for a Decorative Laminating Paper Mill. Technical audit and identification of optimisation alternatives to reduce manufacturing costs while maintaining the paper quality standards. Each alternative was individually reviewed to assess technical suitability, the required investment and impact on the mill cash flows.

TOOLS AND MODELS

In addition to our global insights, analytical skills and database, the proposed study team has access to various models to support its analytical process. Some of the models that are used are as follows:

- ✔ Distribution Logistics Optimisation.
- ✔ Financial Model.
- ✔ Furnish Optimisation Model.
- ✔ Conceptual Cost Estimating.
- ✔ Manufacturing Cost Estimating.
- ✔ Cash Cost Curves.
- ✔ Econometric Modelling.
- ✔ Mass & Energy Balance.



CONTACT

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Appendix 1 Operating Performance Indices

Overall Machine Efficiency:	Percent up time x percent saleable product.
Uptime (effective usage of time):	Annual hours sheet on reel/ annual available hours.
✔ Annual available hours:	Total hours in one year less major shutdown (more than 24 hours).
✔ Schedule Maintenance:	Percent of available hours.
✔ Unscheduled maintenance:	Percent of available hours.
✔ Breaks:	Percent of available hours.
✔ Grade changes:	Percent of available hours.
✔ Miscellaneous operating:	Percent of available hours.
Saleable Product (eff. to produce saleable paper):	(Saleable tonnage/ reel tonnage) x 100.
✔ Total production at the reel:	Tons
✔ Losses between the reel and the winder (trim, slab, off-quality):	Tons
✔ Losses after the winder:	Tons
Headbox consistency:	%
Flatbox vacuum:	Ft ³ /min./in. fabric .
Couch vacuum:	Ft ³ /min./in ² .
Consistency off couch:	%
Consistency after last press:	%
Moisture entering size press:	%
Steam consumption:	Lb. steam/LB water evaporated.
TAPPI drying rate:	Lb. water/h/ft ²
Bone-dry weight profile total variation:	%
Moisture profile peak to peak:	%
Water consumption:	1000 gal/ton