WHITEPAPER

Seeing sustainability in pulp and paper

Executive summary:

The forest and paper products industry is resource-intensive and, as a consequence, is heavily scrutinized for its sustainability performance. Investors and customers alike are pressuring the industry to be more visible on sustainability performance, and regulations will continue to tighten.

From an operations data perspective, the industry has to measure before it can manage performance. Rather than invest in new data infrastructure to monitor sustainability KPIs, the industry can leverage existing technologies. Operations data can be used to cut resource consumption, optimize energy use, better manage sustainability risks, and improve business practices. Operations data creates transparency with major stakeholders and makes it easier to react to new regulations. This paper discusses how an operations system of record can easily be used for sustainability monitoring. Both rely on the same set of inputs because sustainability monitoring is just a different lens through which to view operational KPIs.

By deploying a mill-wide system of record, enterprises can merge traditional operations, maintenance, and quality functions with sustainability management. This single version of the truth enables visibility into sustainability KPIs across the mill. It enables a data-driven approach to sustainability management, and it places data in the hands of the entire workforce, empowering them to innovate and improve sustainability performance.

Sustainability issues in forest and paper products

Because forest and paper products are resource-intensive, the industry attracts significant attention from regulators, customers, investors, analysts, and environmental campaigners. Over the past 20 years, the industry has made significant improvements to its environmental impact. In North America, according to the UN Food and Agriculture Organization, the net forest area grew between 1990 and 2020. This growth is due to sustainable forestry management and close regulation of US and Canadian forests. For years, paper mills have actively reduced their carbon footprint by burning renewable biomass waste products, which accounts for around 65 percent of total energy consumption by the industry.

According to the AF&PA, since 2005, the industry has improved its safety incidence rate by 38 percent, increased procurement of wood fiber from certified forests, improved purchased energy efficiency by 13 percent, reduced CO_2 emissions by 23 percent, reduced water use by 7 percent, and increased paper recycling rates from 51 to 66 percent.

However, the scrutiny it currently faces shows no sign of abating. Rather, it will likely increase. For example, the dramatic and rapid shift to online shopping in the pandemic caused a huge spike in demand for paper packaging, which may remain a long-term trend well after the pandemic is over. Many will demand the industry ensures that this growth is sustainable. Additionally, an increased focus on sustainable investing places a greater onus on the industry to provide visibility into the entire supply chain, from forest management through finished paper products.

Keeping mills clean

Most expect regulations to tighten and for the industry to reduce raw materials, energy, and water consumption and to minimize carbon emissions, other air contaminants, waste products, and water discharge. The challenge for the industry is to do this while retaining a competitive edge.

Keeping mills transparent

While regulations are tightening, there is additional pressure on the industry to improve its sustainability reporting. Customers are demanding better visibility into their providers' supply chains as part of their commitment to sustainability. Investors are scrutinizing the industry's sustainability credentials. Investors are factoring in environmental risk into their risk modelling. Sustainable investing has become a mainstream approach by asset managers and pension funds. Ratings agencies are developing increasingly sophisticated sustainability ratings. The industry must meet this increasing demand for data on sustainable performance.

Embracing sustainability reaps rewards

Some in the industry may well approach sustainability management as a tick-box exercise, where the focus is on doing the minimum to conform to sustainability regulations. But complying with minimum standards can be short-sighted. Sustainability management should not be viewed as an onerous barrier to do business. Rather, as we will discuss in this report, it can create value and bring competitive differentiation.

Measuring so you can manage

The good news is that most companies in the forest and paper products industry already have many of the tools needed to better monitor key sustainability KPIs. These companies do not need to spend significant capital on new sensing and monitoring equipment to start measuring sustainability performance, particularly in a mill. Many KPIs can be monitored using existing operations systems: process-level energy use, carbon emissions, water use, cooling, thermal waste, water use, and water discharge. These can all be measured directly or inferred from existing control system data.

Instead of approaching sustainability KPIs as a project that is separate from operational KPIs, it is easier and cheaper to align sustainability KPIs – such as energy demand, carbon emissions, water and raw material use, and waste – with traditional operational metrics. After all, sustainability is just a different lens to view overall operational performance. This holistic approach to KPIs simplifies reporting because it uses the same toolset. The same sensors are used; an operational system of record can also be a sustainability system of record; the same analytics software can create insights from the data; and the same dashboards can provide management reports.

Most companies recognize the value generated by an operational system of record. However, many are yet to recognize that sustainability is an increasingly important value driver. It makes sense to use the same system of record for the two. These are complementary, not competing, processes.

Drivers of sustainability management

Energy
Global energy consumption, EJoule per year

Metals	Petro-chemicals	Cement	Pulp and paper	Chemicals	Food and beverage
15	9	9	8	8	7

Water
Input water used globally, bn m³ per year

Pulp and paper	Mining	Food and beverage	Chemicals	Petro-Chemicals	Textiles
46	44	36	36	27	26

Source: IEA, water business roundtable, World Resources Institute, U.S. Geological Survey, Shilomanov, UNDP, Pacific Institute, McKinsey analysis

Once data is collected from across the value chain, it can be used to measure – and better manage – resource consumption.

Reducing energy and water consumption

A recent McKinsey study showed that the paper industry consumes more energy and water than other industries, such as chemicals or food & beverage. Energy use constitutes a major component, between 10 and 40 percent, of total production costs, depending on producers and country of operation. Improvements in energy efficiency bring down costs and – alongside increasing use of sustainable energy sources – reduce the industry's carbon footprint.

Given such high costs, an energy efficiency program could single-handedly generate sufficient return on investment to justify investment in new metering, sensing, control, and an operational system of record. Although, once in place, the challenge remains to identify new areas to improve sustainability and cut costs. Monitoring energy consumption can identify the most energy-intensive processes; analytics can help optimize energy consumption. With end-to-end visibility of energy consumption, energy managers can use models to optimize energy use. Managers can make informed decisions about when to self-generate power, burn biomass, buy power from the grid, or sell excess generation to the grid.

Because paper and pulp mills are also major water users, mills are increasingly turning to data to help them better understand their water consumption. Water is used to move fiber around, in the cooking process, to wash the fiber in between stages or to prepare the stock for the paper-making process, in the steam that is used to heat up the process, in the dryers, etc. Water is also contained in waste products, such as evaporative discharges from cooling and pressing, and black liquor (the discharge from digesting pulpwood into paper pulp). As a result, mills are identifying ways to reduce their use or improve water recycling. Knowing where water is used within each process can identify potential solutions, such as steam recovery.

The majority of the water used is treated and recycled. In the past, mills could use up to 300 liters of water to produce each kilo of paper. There are now some mills – although not many – that have implemented water capture so effectively, they have reduced effluents to virtually zero. The only excess water required is to replace that lost through evaporation. While not every mill uses such little water, today the volume of water has been reduced to around 20 liters. However, with global production of over [400 million tons of paper produced each year](#), 20 liters per kilo adds up over 8 billion liters. This presents a huge opportunity to reduce water consumption.

Risk management

Risk management practices are broadening beyond traditional areas of regulatory compliance and health and safety to incorporate sustainability. Sustainability management is now part of how the industry approaches regulatory, reputational, and operational risks. But sustainability management is not just about managing external pressure to improve operations. Many in the industry have proactively embraced sustainability management and have their own internal sustainability targets. Many companies have set carbon-neutral or carbon-negative targets over the coming years.

There are many benefits to making these commitments to more sustainable business practices. While improved transparency regarding sustainability performance is great for corporate communications and corporate social responsibility reports, it also helps external sustainability analysts rank companies' performance.

Sustainability management also makes a company better able to react to new legislation regarding carbon emissions. It can use that data to model different scenarios to most efficiently meet new regulations.

But sustainability is not just about monitoring and managing a company's environmental impact. The social aspects of sustainability are rising up the corporate agenda. Health and safety, inclusion, and community involvement are no longer pet projects for corporate social responsibility departments. Investors are actively assessing companies' performance in these areas, and regulators are increasingly demanding improvements.
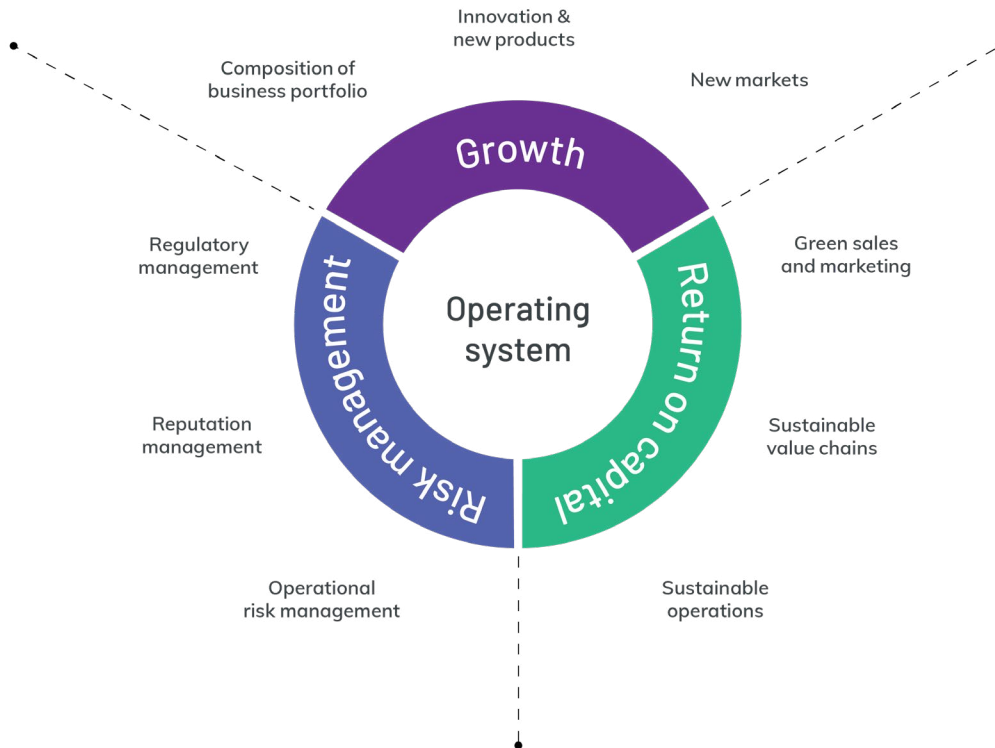
Defining future growth strategies

Overlaying a sustainability lens over your operations data does not just give insights into current sustainability performance. A sustainability lens can be used to assess new product or expansion strategies.

With sustainability KPIs in place, it is far easier to assess the potential impact of an acquisition, new supplier, or new product line could have – both positive and negative – on sustainability performance. For example, many expect the industry to increasingly collaborate with energy and chemicals companies, to exploit the growing demand for biomass in generation, bioethanol, and cellulose-based biochemicals. These include products as diverse as cellulose-based optical fiber, cellulose concrete reinforcement, and bioplastics.

All pulp and paper companies' research and development efforts are investigating new packaging products. The success of these products will rely on how well-integrated they are with current and future sustainability goals and the growing demand for greener options.

Data siloes in pulp and paper

A sustainability monitoring system is enterprise-wide. One of the biggest barriers to using operations data for sustainability management is that this data is often locked away in functional silos. An enterprise-wide system of record makes the data collection process more efficient, real-time, and available to more members of staff.

Innovation &
new products

Composition of
business portfolio

New markets

Growth

Regulatory
management

**Operating
system**

Green sales
and marketing

Risk management

Return on capital

Reputation
management

Sustainable
value chains

Operational
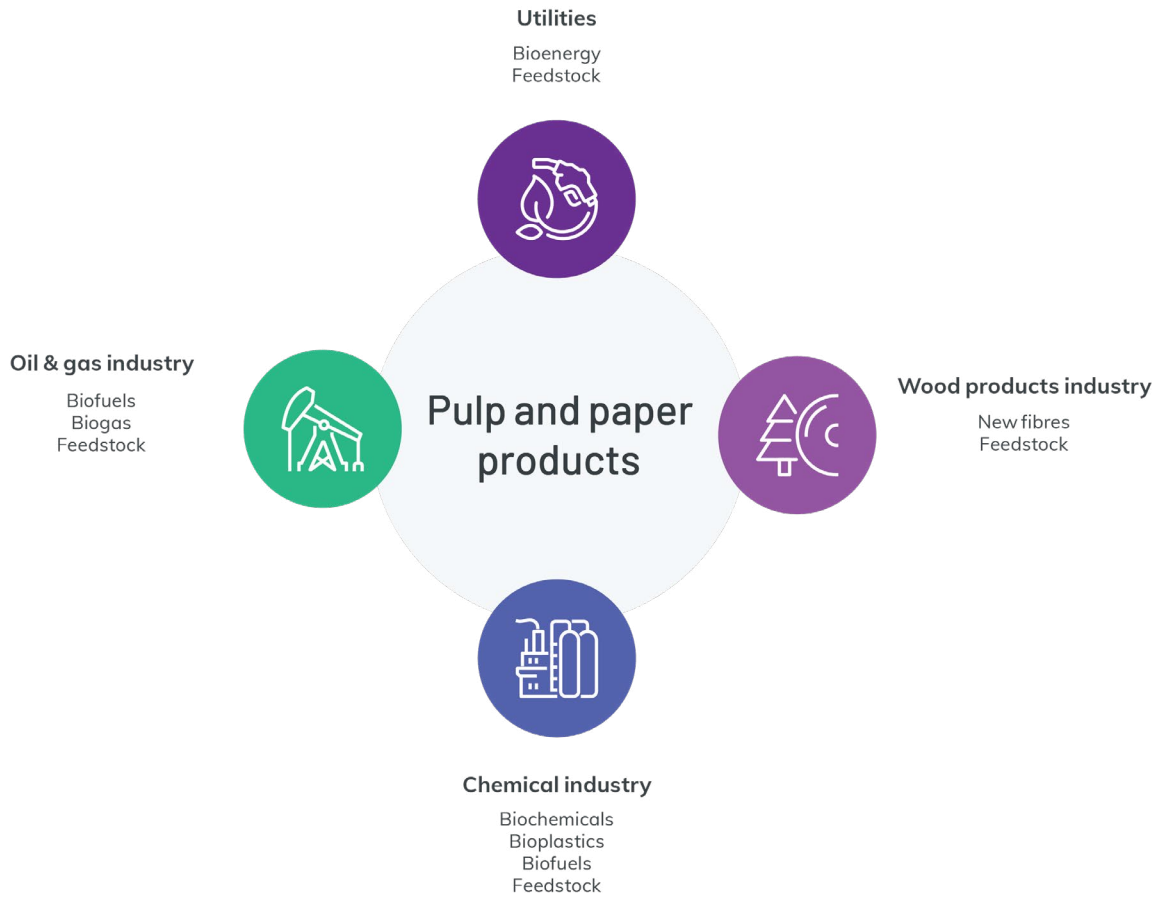risk management

Sustainable
operations

To gain an overview of energy consumption, an analyst would have to collect data from meters, CHP generation, and submeters from all the stages of the paper-making process: raw material preparation, pulping, chemical recovery, bleaching and refining, and paper making. The same process would have to be done for water consumption.

Data may be stored in different formats, in systems that may be closed, use different time stamps, and different measurements (e.g., liters, gallons, liters per hour, etc), which makes data collection inefficient. It takes significant time to collect and prepare this data. This inefficiency limits the data's utility. The data is in not real time, so no real-time decisions can be made using the data: it can only be used to analyze what has previously happened. The inefficiency also extends to who can use the data. Having an analyst collect, clean, and analyze data locks the aggregated data into another silo. It then takes additional effort to place this holistic view of operations into the hands of those who can make a significant difference to an organization's sustainability performance – those on the shop floor.

Enterprise-wide system of record

An enterprise-wide system of record simplifies the collection of operations data. And given that sustainability monitoring relies heavily on operations data, it creates a unified database for sustainability metrics. The system of record is a single system that can communicate with all devices, across the entire production process.

There are clear benefits to using a streamlined approach to data collection. The collection of data is consistent. Data of the same types can be collected at the same time, in the same time intervals, using consistent measurements. Data is easier to access, as anyone around the organization – with the right permissions – can be granted access. It can also be analyzed in near-real time, feeding dashboards for operations, maintenance, engineering, plant managers, as well as sustainability managers. The data can be used to create a digital model of the entire mill, which can be used to optimize processes, asset planning, and sustainability management.

Utilities

Bioenergy
Feedstock

Oil & gas industry

Biofuels
Biogas
Feedstock

Pulp and paper products

Wood products industry

New fibres
Feedstock

Chemical industry

Biochemicals
Bioplastics
Biofuels
Feedstock

If the same approach is applied to multiple sites – and a common model for data collection is applied consistently – the same processes could be compared between mills and best practices shared. This common model is vital: different sites will use different equipment and may define data in different ways. A unified standard both within a mill and across all sites gives visibility of data relationships across different processes. This may be a time-intensive process, but it only needs to be performed once. Once completed, the system of record provides powerful insights into an organization's energy and resource demand, in all processes, for every asset.

Sappi optimizes energy use with informed decision-making

As we have seen, improved data collection improves visibility, which can improve processes, and as a consequence improves an organization's sustainability performance. With clearer insights into where and when resources are consumed, an organization will better understand what influences that consumption.

And with this understanding, an organization can begin to manage these influences to optimize consumption. For example, leading pulp and paper manufacturer Sappi reduced energy consumption by nine percent and water consumption by 10 percent using an operations data platform. Centralizing data collection does not mean data is taken away from the workforce. By creating a system of record for the entire enterprise, the entire workforce can be granted access to data.

There are infinite possibilities for the use of this data. Some simple applications include creating dashboards to measure performance or simple rules-based real-time alerts for data exceptions. But much more advanced applications can be rolled out. Staff can innovate using data insights to identify more efficient and more sustainable ways of working. For example, Sappi created an energy arbitrage dashboard to optimize power purchasing. It used power demand data from its assets and optimized energy use decisions such as when it should buy power from the grid, or when to fire up its own power generation.

Leverage vendors

Data optimization does not only include internal data sources. Original equipment manufacturers (OEMs) are deploying increasing numbers of sensors on their assets and building digital services around their asset data. Many will offer their suppliers access to data via interconnectors, which can become important new sources of data that add further value to an internal system of record.

And APIs are not just limited to OEMs. For example, a utility supplier can feed wholesale market information via an API to a customer, which can help better inform electricity purchasing decisions, participation in demand response programs, or make on-site biomass generation available to power aggregators.

Conclusion

Soon, operations and sustainability management will be the same function. It's easy to see how operations management and sustainability management are largely the same processes, viewed through a different lens. As sustainability becomes baked into operational processes, the practices will merge into sustainable operations management, and over time, as sustainability becomes something all companies do, it will become just operations again.

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