Crown Paper Mill LLC.

ISO 50001:2018 Case Study

CPM PM 3 Machine

Case Study Snapshot	
Industry	Pulp and paper
Product/Service	Tissue paper jumbo rolls
Location	Abu Dhabi, UAE
Energy performance improvement percentage (over the improvement period)	8% improvement over 3 years
Total energy cost savings (over the improvement period)	USD 404,502
Cost to implement Energy Management System (EnMS)	USD 130,000.00
Total energy savings (over the improvement period)	6747 MWh
Total CO_2-e emission reduction (over the improvement period)	1821 Metric Tons

Organization Profile / Business Case

Crown Paper Mill (CPM) is a manufacturer of prime quality tissue paper jumbo rolls, located in the Industrial City of Abu Dhabi III (ICAD 3). It was founded in the year 2005 and has continued to strive and attract customers from all over the region and beyond, extending its clients list to reach Europe, East Asia, and Africa.

Tissue paper is being produced from 100% virgin pulp in various grades such as facial, toilet, kitchen, towel, napkin, and C-fold. Along with the normal manufacturing process, CPM has a de-inking plant in its premises, allowing for the process of recycling used paper to diminish waste and help in the fight against global warming. With the use of a multinational team of employees, and their diverse set of skills, CPM has continued to thrive and improve to become one of the largest tissue paper manufacturers in the area and is continuously looking forward and working hard for greater development and enhancements in the future.

The key activity of this Company is Manufacturing of “Prime Quality’’ Tissue Paper in Jumbo Rolls from 100% Virgin Pulp in various grades Such as Facial, Toilet, Kitchen Towel, Napkin, C-Fold and Carrier Tissue.

Apart from supplying to convertors in the local UAE market, goods are exported to over 20 countries including Middle East, Australia, United Kingdom, Singapore, Indian sub-continent, and Africa.

CPM’s motivations for sustainability efforts are centered on its commitment to responsible environmental practices, meeting the needs of customers, and compliance with regulations.

CPM's sustainability goals include reducing water consumption, minimizing waste generation, and promoting the use of sustainable materials in its products.

ISO 50001 Energy Management System – Case Study

2023 United Arab Emirates

Energy management is an integral part of Crown Paper Mill's business strategy, contributing to its financial performance, sustainability efforts, and competitive advantage.

"I would like to congratulate Crown Paper Mill LLC. management team and all staff on successful certification to ISO 50001:2018 under UKAS Accreditation."

—Essam Hammad, Quality Control Manager

Business Benefits

As a tissue paper manufacturing company, CPM understands the importance of reducing energy consumption while maintaining high levels of production efficiency. Implementing an Energy Management System (EnMS) can provide numerous benefits to the company, ranging from cost savings to environmental benefits. In this article, we will explore the various benefits that CPM can gain by implementing an EnMS.

1. Cost Savings: By implementing an EnMS, CPM can reduce its energy consumption, which can lead to significant cost savings. Energy is one of the biggest expenses for manufacturing companies, and by implementing an EnMS, CPM can optimize its energy usage and reduce its energy bills.

2. Increased Efficiency: An EnMS can help CPM identify areas where energy is being wasted, allowing the company to take corrective actions. This can lead to increased efficiency in production processes, resulting in lower energy consumption and improved overall performance.

3. Improved Environmental Performance: By reducing its energy consumption, CPM can also reduce its carbon footprint and contribute to a healthier environment. This can enhance the company's reputation and position in the market as a socially responsible business.

4. Regulatory Compliance: An EnMS can help CPM comply with regulations and laws related to energy consumption and environmental impact. By demonstrating compliance, the company can avoid fines and penalties and maintain its license to operate.

5. Enhanced Reputation: Implementing an EnMS can help CPM enhance its reputation as a sustainable and environmentally conscious company. This can improve the company's relationship with its stakeholders, including customers, employees, and investors.

6. Improved Employee Engagement: An EnMS can create a sense of ownership and responsibility among employees, leading to increased engagement and motivation. This can improve overall productivity and employee retention rates.

7. Enhanced Energy Performance: By monitoring and measuring energy consumption, an EnMS can help CPM identify areas where energy efficiency can be improved. This can lead to continuous improvement in energy performance and cost savings.

8. Better Resource Management: An EnMS can help CPM optimize its use of resources, including energy, water, and raw materials. This can lead to cost savings and reduced waste, improving overall resource efficiency.

9. Improved Financial Performance: By reducing energy consumption and costs, CPM can improve its financial performance and profitability. This can lead to increased investment opportunities and growth potential.

10. Improved cost and staff: The team associated with the EnMS implementation gained higher development and improved upon their knowledge and awareness, which would include benefits on multiple levels for CPM along with the employees.

Plan

Commitment from the top management was gained through a series of communication and engagement strategies. Firstly, the benefits of implementing an EnMS were clearly communicated to top management, including the potential cost savings, improved efficiency, and environmental benefits. This helped to build a business case for EnMS implementation.

The top management was involved in the EnMS implementation process from the outset, with regular progress updates and feedback sessions. This allowed them to provide input and direction for the EnMS implementation, ensuring that it aligned with the company's overall strategy and goals.

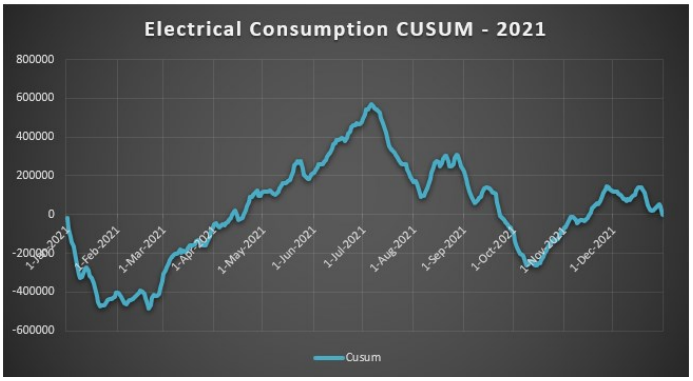
When creating the EnMS implementation plan, it is taken into consideration that it would be primarily consistent with the energy policy and will lead to continual improvement in the energy performance. When planning for the EnMS, CPM considered the issues and the requirements of the UAE laws and regulations, and reviewed the organization's activities and processes that can affect energy performance. Planning was consistent with the energy policy and led to actions that resulted in continual improvement in energy performance. CPM determined the risks and opportunities that needed to be addressed to:

- Give assurance that the EnMS can achieve its intended outcome(s), including energy performance improvement.
- Prevent or reduce undesired effects.
- Achieve continual improvement of the EnMS and energy performance.

An action plan to address the risks was developed below as each number represents the mitigation plan for the respective addressed risk.

- Actions to address these risks and opportunities.
- How to integrate and implement the actions into its EnMS and energy performance processes and evaluate the effectiveness of these actions.

"ISO 50001 and the EnMS team are working hard to ensure a successful implementation of the proposed projects, which would save energy and improve the efficiency of our production."
—Hasan Jadallah, Energy Executive



Obtaining financial commitments and resources is a critical aspect of implementing an Energy Management System (EnMS) successfully. To ensure the effective implementation of the EnMS, CPM obtained financial commitments and resources through various strategies. CPM conducted a thorough analysis of its energy consumption and costs, identifying areas where energy was being wasted and where cost savings could be made. This analysis helped to

build a business case for the EnMS implementation, demonstrating the potential financial benefits of reducing energy consumption.

CPM conducted a comprehensive energy audit to determine the current energy usage and identify areas where energy could be saved. This involved collecting data on energy consumption, production processes, and equipment usage. This data was analyzed to identify energy waste and areas where improvements could be made.

Moving forward, an action plan was developed by the EnMS team. The list can be viewed below:

No.	Target Process	Estimated Savings Against Baseline Usage	Risk (H/M/L)	Simple Payback (years)
1	PM 1 MCC Room AC change to package unit cooling	The motor drives will be running in better efficiency.	L	3
2	Mill Compressed air leakage control (All machines)	Quotations are being processed by third parties	L	1
3	Chilled water distribution (All machines)	Quotations are being processed by third parties	L	1.5
4	Steam boiler (All machines)	Quotations are being processed by third parties	L	1.5
5	Hood Area (All machines)	Quotations are being processed by third parties	L	1.5
6	PM 1 DC drives change to AC drives	Pending quotations	M	3
7	PM 2 refiner disks to be replaced	Pending quotations	M	3

These measures were taken into consideration by the EnMS team, and provided to the relevant departments within the company. The risks that would be involved for each energy conservation measure were determined by these departments, and subsequently, the EnMS team provided sufficient mitigation steps, to reduce the risks to an acceptable level.

Do, Check, and Act

A list of energy conservation measures was produced by the EnMS team, after which the team started towards an implementation plan. Firstly, a priority was given to the low/no-cost solutions that can be implemented directly within the organization. Such examples include changes in the production process, as different methodologies were adapted to produce the same quality of tissue paper. After that, a list of possible projects was introduced to the management, from which priorities were given based on a variety of factors.

The level of investment, the impact on the existing plants, and the payback period were all examined in the decision to move forward with the proposed projects. Third party energy experts were brought on, to discuss possible collaborations and implementations that can be performed together. The work of the EnMS team along with the third parties involved led to the initiation of two projects in the year 2022.

The first project was to downsize several motors and pumps in one of the plants, while ensuring that the production capacity would not be affected. The second project was to change several split AC units, to package AC units. Both projects provided potential to improve the energy efficiency within the plant, as well as the added incentive of improved reliability. These projects are currently under progress, and real data is not present during the writing of this report. The positive impact is nonetheless ensured by the EnMS team, as it is estimated that the payback period for both projects would not exceed 3 years.

The analysis for the motor and pump downsizing project is displayed below:

PM 1 Motors Present					
MDB	Description	Existing Power Rating (kW)	Calculated Running Power (kW)	Energy Consumption per Day (kWh)	MDB Consumption per Day (kWh)
MDB 2	Krofta Feed Water Pump	55	45.701	1096.833	1096.833
MDB 1	Pulper Discharge Pump	37	27.261	545.211	2658.313
	HW Dump Chest	22	18.315	293.041	
	SW Refiner Pump	37	27.261	436.168	
	SW Storage Pump	37	27.925	446.807	
	Blend Chest Pump	22	20.931	502.356	
	Machine Chest Pump	22	18.114	434.731	

PM 1 Motors Future				
MDB	Description	Proposed Motor Power Rating	Maximum Energy Consumption of Motors per Day (kWh)	Maximum MDB Consumption Daily (kWh)
MDB 2	Krofta Feed Water Pump	11	264	264
MDB 1	Pulper Discharge Pump	7	140	1076
	HW Dump Chest	7	168	
	SW Refiner Pump	9	216	
	SW Storage Pump	7	168	

	Blend Chest Pump	7	168
	Machine Chest Pump	9	216

$$\Delta p = f_D \frac{L}{D} \frac{\rho V^2}{2}$$

$\Delta p - pressure\ loss\ in\ N/m^2$
$f_D - darcy\ friction\ factor$
$L - pipe\ length\ in\ m$
$D - hydraulic\ diameter\ in\ m$
$V - fluid\ flow\ avg\ velocity\ in\ m/s$
$\rho - fluid\ density\ kg/m^3$

The brief methodology followed to carry out hydraulic analysis in AFT Fathom are mentioned below:

- Hydraulic analysis is performed for the seven pumps and connected piping.
- The entire piping network is simulated in the software based on the inputs.
- Hydraulic Calculation Software and Formula. AFT Fathom utilizes the Darcy-Weisbach loss model to relate the Darcy Friction Factor, the pipe geometry, fluid density, and fluid velocity to pressure drop in the pipe.

The analysis for the second project to replace the existing ACs with new package units was as follows:

Current Cooling Consumption in PM 2					
Description	Number of Units	Power Consumption	Energy Consumption per Day	Energy Consumption per Year	Total Energy Consumption per Year
5 Ton Mitsubishi	6	25.2	604.8	220,752.00	368,883.60
4.5 Ton O General	1	8.8	211.2	77,088.00	
2 Ton AC 1	1	5.25	126	45,990.00	
2 Ton AC 2	1	2.86	68.64	25,053.60	

New Package Unit Calculation					
Description	Power	Number of Package Units	Total Power	Energy Consumption per Day	Total Energy Consumption per Year
New Package AC Units	14,940.00	2	29.88	717.12	261,748.80

As can be deduced from both projects, there will be significant savings in electrical energy consumption. Although real data for these projects have not been collected yet, the analysis shows that the return on investment will not exceed 3 years.

Optimization and low-cost solutions were proposed as well in the past two years, which led to significant savings in the total electrical energy consumption of the mill.

Year	**Power**	**Natural Gas**	**Water**
2020	97,318,653 kWh	4,664,000.00 m^3	477,193 m^3
2021	89,224,599 kWh	4,209,004.00 m^3	498,940 m^3
2022	90,570,824.00 kWh	4,772,241.00 m^3	491,731.00 m^3

The collected data shown above reflect the total consumption of all the factory in the years 2020 till 2022. It can be noticed that the low-cost and optimization processes that were suggested by the EnMS team have led to the reduction of the energy consumption in the power and natural gas sections, compared to the baselines that were determined to be the values of readings in the year 2020. This matches the goals that were first set in the beginning of 2021, by the EnMS team along with the top management, to reduce the consumption by 5%.

These optimization and low-cost solutions were developed by bypassing certain sections in the production line, as well as providing different methodologies to satisfy required customer specifications, without the use of extra electrical power. This can be achieved by adding new chemicals rather than increasing the motor loads in the refining process of the paper. This was verified by the data collected throughout the years.

The data shows that there was an increase in consumption in the year 2022, compared to the year 2021, which was due to external variables that impacted the production process. These unforeseen factors include longer maintenance times, market variations, supply chain delays and covid related problems.

The support of the top management was present throughout this process, by providing the time and resources to start with the implementation, as well as providing necessary support from different departments within the factory to share the load with the EnMS team. Different departments within the factory were made aware of the targets and plans of the EnMS team, after which their support was felt during the implementation of the first set of optimization and low-cost solutions.

Transparency

CPM was officially ISO 50001:2018 certified as of May 2022. The top management along with the EnMS team and all the related departments were proud of this achievement and an official announcement took place during that time. The certificate is available on the label for the CPM brand, and the third-party suppliers and customers were notified of this achievement.

What We Can Do Differently

Expanding the EnMS team to officially involve more employees is one of the targets for the future of the EnMS. Having a larger number of people to perform different tasks would ensure that new and innovative ideas are put forward for the top management to examine.

Before obtaining ISO 50001, CPM had developed an IMS containing ISO 9001, 14001 and 45001. Integrating these management systems could have provided significant benefits, including increased efficiency, improved communication, and better coordination of activities. By integrating these systems, CPM would have avoided duplication of effort, streamline processes, and reduced costs.

Quotes and Visuals

CPM has an energy policy approved by the top management, and the following quotes are included:

1. “Crown Paper Mill LLC. will work towards continuously improving energy performance. We will establish specific implementation plans by 01/02/2022 and will have made significant achievements in this area within 2 years’ time.”

2. “Crown Paper Mill LLC. will endeavor to meet or exceed an energy management target to reduce energy intensity (MJ/unit) by 3 to 5 % in the next two years.”

The following figures showcase the CPM facilities, and the specific electrical energy consumption from January 2020 till December 2022: