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When Longer Production Hours do not Translate into Higher Productivity and Capacity, What Went Wrong?

WHITE PAPER

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Executive Summary

In the manufacturing industry, one of the top Key Performance Indicators (KPIs) is to fulfil customer orders On Time and In Full (OTIF). With ample planning and scheduling of production operations and resources, meeting this KPI seems viable, however, there remain several pain points that may hinder efficiency, resulting in a setback in meeting delivery commitments. In these situations, manufacturers often turn to the immediate remedies such as adding production overtime and delaying or shortening planned maintenance in an attempt to make way for more production capacity. However, do added resources necessarily correlate to an increase in profitable output? Which factors are at play when longer production hours do not translate into higher productivity and capacity? We explore the possible causes and discuss mitigations in this whitepaper.

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Introduction

A 2013 McKinsey report[1] describes how a fast-moving-consumer-goods multi-national aimed to save up to $10 billion in three years by optimising its production process. With such high numbers involved, it is no wonder that companies in the food and beverage and consumer packaged goods sectors are working hard to review and benchmark the performance of their plants.

The report highlighted how companies gathered and focused only on high-level data that obscured deeper insights on specific processes involved in the production line. Poor metrics and lack of transparency were among the factors that drew a challenging picture for the organisations involved. Improvement actions and internal best practices needed to go hand-in-hand to get the best out of the production lines.

Identifying these gaps and the root causes of low productivity in time-critical production processes can help companies realise how to get systems and operations on the right track. In this age of digital transformation, it is only logical for production plants to get onto the digital bandwagon with goals that reflect the dynamism of the industry in a constantly evolving market.

Causes and Impact of Poor Productivity

According to the known Total Productive Maintenance (TPM) and lean manufacturing programs, the most common causes of poor productivity have been identified and categorised as the Big Six Losses which affect the availability, performance and quality factors of the overall efficiency of the operations:

- **Availability:**
  - Unplanned stops (equipment failure)
  - Planned stops (setup and modifications)
- **Performance:**
  - Small stops (idling and minor stops)
  - Slow cycles (reduced speeds)
- **Quality:**
  - Production discards (process flaws)
  - Startup rejects (reduced yield)

In order for food and beverage and consumer packaged goods manufacturing plants to be efficient, information such as production operations, quality, asset health and inventory status are essential for monitoring, analysing and continuous improvements. Data collection in a timely and effective manner is the first critical step to ensuring this information is accurate, meaningful and in time to support data-driven business decisions.

Manufacturing plants that are using spreadsheets for data handling often find their personnel buried in paperwork on a daily basis. The impact this has on personnel includes:

- Operators spending a considerable amount of time and effort to record production data
- Supervisors manually assigning jobs and consolidating data
- Engineers reaching out to various sources to obtain data for analysis
- Plant Managers struggling to make operational decisions that may impact production targets without access to up-to-date or current information

In time, all these excessive manual processes lead to low supervision with minimal feedback on what is happening at the production lines. With a whole lot of possible faults that may cause line stoppages, the plant floor could be a firefighting zone through the day.

The ensuing low productivity is an indication of time wastage and effort with non-productive activities such as:

- Spending time to find information to help make critical decisions
- Spending time to understand the cause and impact of production losses so that corrective actions can be taken
- Inability to efficiently plan production and operational activities based on available resources and capacity
- Inability to efficiently respond to unplanned events

Poor production performance and unplanned losses lead to low productivity. Broadly speaking there are three main unplanned loss categories:

- Equipment failure or stoppages (due to shortage of materials or downstream operations)
- Process failures (unable to reliably produce with the expected throughput, rate or speed)
- Quality failures (the finished product is not in line with the specified or required quality)

Low productivity impacted by these production performance losses leads to lower production capacity, unmet production targets, quality issues, waste and lower yields among other critical points.

The Vicious Cycle of Production

Some immediate remedies manufacturers tend to take is to add production overtime and delay or shorten planned maintenance. Although these actions may open up more production capacity initially, they can lead to a higher probability of human error due to worker fatigue and equipment breakdown, which may eventually negate those initial improvements in production capacity. Such decisions also fail to address intrinsic process issues, such as material availability at the line.

Stretching the limits of workers may also distract them from working on value-adding activities and continuous improvements that eventually result in more efficient processes and add to the bottom line of the business.

With this shorter-term view, production performance eventually takes a dip and the pressure on production operations increases. This forces manufacturers to open up more production capacity and so the vicious cycle of production goes on.

Getting the Most Out of Production Hours

Continuous improvement of equipment effectiveness and operational efficiency is a competitive requirement today. This is where manufacturers can take advantage of new technologies and look to digital transformation of operational processes for lower cost of operations, optimised productivity and capacity.

But with so many available technologies on the market, where should businesses start in their digital transformation journey?

Determine Current Maturity and Readiness

Manufacturers must first assess where they currently are in their digital maturity journey. There are broadly three phases:

- **Fundamental Phase –** manufactures are digitising operational excellence practices on the plant floor
- **Site Phase –** manufacturers are addressing specific operational issues at-site and applying model-driven MES based on industry best practices
- **Enterprise Phase –** manufacturers are driving reduced cost and revenue growth through operational best practices, agility and standard score cards, and applying multi-site model-driven MES based on a line of business templates

Once manufacturers determine where they are currently, the next step is to evaluate solutions that match their business objectives and readiness. There are ROI opportunities for manufacturers at every digital maturity level, and no "one size fits all" solution due to the varying needs of each individual business.

Increase Worker Productivity

Worker productivity related to unplanned outages is best addressed by giving visibility into line operation and production losses.

The implementation of manufacturing operations management systems needs to support production staff to measure, visualise and correct variations to expected efficiencies around labour, quality and equipment utilisation, and waste elimination. The main expectations that a factory with a system-driven production line would look forward to are:

- Data collection - fully automated or semi-automated
- Data categorisation or arrangement - fully automated
- Dashboards for at-a-glance understanding of performance and issues
- Ready reports and analytics for analysis and continuous improvement activities
- Mechanisms to ensure the right action is done by the right personnel at the right time

All manufacturers of any size will have some methods of measuring and decision-making support in place, even if it is based on manual data collection. The crux here is to replace this patch work of manual, partial systems with an integrated single digital system that brings operational visibility to all personnel within a plant and across multiple plants.

An effective manufacturing operations management system is beneficial for optimisation of human resource and equipment.

For workers' productivity:

- Integrating a data management system that can help to minimise or eliminate the paper work or data handling
- Allowing the workers to spend more time on their core duty (which will eventually increase the performance) and minimum time on data handling

Short Interval Control (SIC) is a lean concept around providing feedback to an operator of results within a short timeframe, enabling them to initiate immediate corrective actions. Systems like Line Performance are essentially SIC tools giving visibility into the unplanned losses in a near time basis, via both a "score" (Overall Equipment Effectiveness) and the underlying events that are affecting the current score. This allows operators to focus on what is currently impacting their scores, and increase their productivity.

Improve Equipment Reliability and Utilisation

Improving equipment reliability and utilisation is a two-fold approach:

1. Adopt a maintenance strategy that sustains smooth equipment operations;
2. Deploy a continuous improvement program that analyses loss data, and determines root causes which can be addressed either through maintenance improvements, equipment replacements or other changes, such as upgrading projects.

For equipment reliability and utilisation:

- Automatically categorising and arranging data collected by the system to display details and analytics means that the information is ready whenever the engineer needs it for continuous improvements activities. This includes highlighting where equipment performance issues are and reveals where they should focus efforts. This shortens the time required for investigation.
- Capturing the resolution into the system enables continuous improvements to always be enforced. This ensures that the same issue will not reoccur and performance can be sustained.

Manufacturing execution systems and manufacturing intelligence tools are available to leverage proven industry best practices to continuously improve operational efficiency and equipment utilisation.

Digital Transformation of Operational Process - A Case Study

With clearly defined production goals, an American brewing company had recently ramped up its bottling line[2]. The company was synonymous for its eco-friendly production practices and continuous improvement that helped enhance its brand value as a master craft brewer. However, they soon realised that the upgraded bottling line did not meet its defined production quota, falling short by nearly 150,000 cases of beer production every week. This translated into a huge loss annually.

Key challenges faced included:

- Lack of real-time information on unscheduled downtimes
- Production staff reacting to those equipment downtimes
- The bottling plant lacked the ability to predict capabilities that could help staff reach their production goals.

The implementation of a line performance solution helped achieve high Overall Equipment Effectiveness (OEE), produce quality products, improve productivity, and ensure high production line availability through scheduled maintenance and continuous improvement activities. This resulted in:

- OEE increased from 45% to 65% in just over two years
- Downtime decreased by more than 50%
- Efficiency of scheduled run time increased by 25%–30%
- Achieved record production weeks producing 190,000 to 200,000 cases consistently, successfully meeting customer demands
- Extended packaging area capacity to about 1.3 million barrels each year

In it for the Long Run

It is essential to obtain and sustain cost and productivity targets on manufacturing operations. With the use of digital technologies, manufacturers are equipped to discover and locate process weaknesses, and maintain maximum throughput. Such manufacturing plants need systems that:

- Are easy-to-use
- Have a rich, out-of-the-box functionality that provides faster time-to-value
- Are able to adopt and complement individual operational practices
- Deliver low total cost of operations (TCO)

A model-driven approach that encapsulates industry best practices and continuous improvement methodologies can enable the manufacturing operations management system to go beyond production loss identification including performance sustainability, standardisation and governance, workforce engagement and accountability.

There are many other instances of how digital transformation drives plant optimisation. Approaches vary according to where manufacturers stand in the digital maturity model, but operational processes that are supported by data-driven decisions are an imperative for manufacturers to achieve higher levels of productivity and capacity.

1. My manufacturing plant is better than yours—or is it?; by Shruti Lal, Daniel Rexhausen, and Frank Sänger; McKinsey, 2013

2. AutomationWorld; How New Belgium Brewing Reduced Downtime and Increased Efficiency with Wonderware MES; 2014

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About AVEVA

AVEVA is a global leader in engineering and industrial software driving digital transformation across the entire asset and operational lifecycle of capital-intensive industries.

The company's engineering, planning and operations, asset performance, and monitoring and control solutions deliver proven results to over 16,000 customers across the globe. Its customers are supported by the largest industrial software ecosystem, including 4,200 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 4,400 employees at 80 locations in over 40 countries.

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