PLANT UTILITY KPIs
NEED FOR ONGOING IMPROVEMENT, OPTIMISATION AND SUSTENANCE

Yashasvi Sahajpal
Leadership Team - Digital Business
Digital Sustenance Service
Forbes Marshall

Abstract
In today's volatile industrial landscape, maintaining consistent Key Performance Indicators (KPIs) is crucial. This paper explores the challenges and opportunities in energy management across Pharma, Chemical and Associated industries. We highlight the significant gap between desired and actual performance across KPIs and propose a Digital Sustenance Service to address this issue. By leveraging decades of domain expertise, real-time data, preventive-predictive-prescriptive analytics, FM Digital Sustenance Services aims to first improve, then optimize and sustain operational efficiency, reduce energy costs, and align with industry and plant's own benchmarks.

Keywords
Energy Management, Digital Sustenance Service, KPI Optimization, Process Efficiency, Conversion Cost, Plant Performance Variations

Introduction
The dynamic nature of the industrial sector presents challenges in maintaining consistent KPIs. Fluctuating raw material costs, workforce competency, and product demand fluctuations contribute to this volatility. Energy management, which accounts for 30-55% of the plant's product conversion cost (Cost incurred for raw material converts to finish product), is critical to industry profitability. Despite awareness and efforts to optimize utility usage, a significant gap remains between desired and actual performance levels.

Materials and Methods
This study is based on interactions with thousands of plants and analysis of real time data from hundreds of across various industries. Data on process efficiency, uptime, safety, energy efficiency, and environmental impact were collected. Observations revealed that plant performance deteriorates over time, showing substantial deviations between desired and actual KPIs.

Results and Discussion

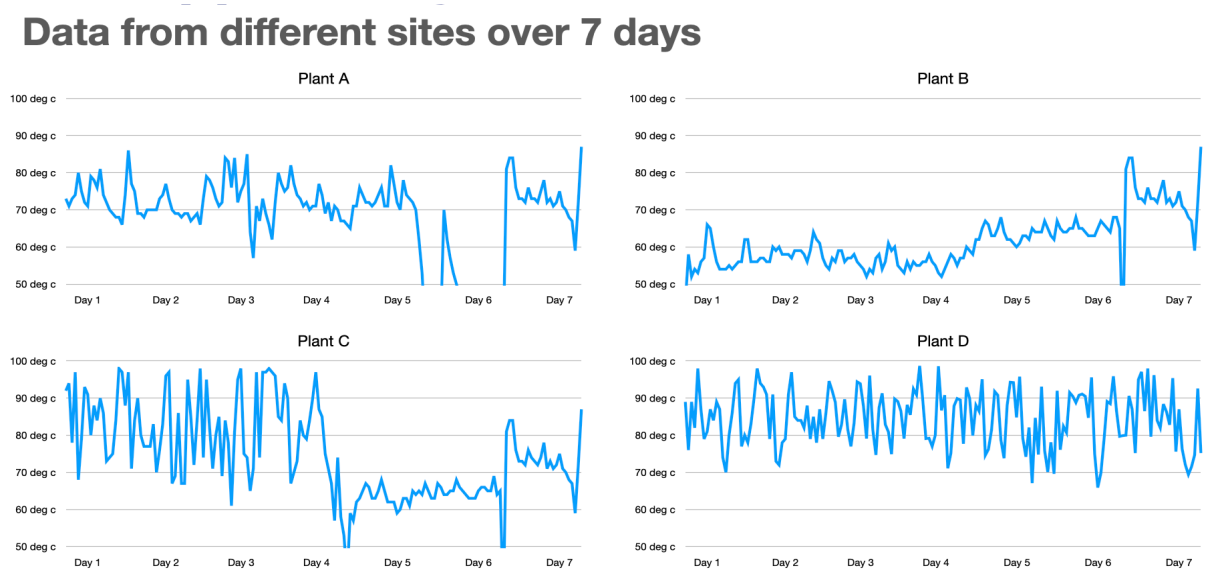
The table below illustrates the discrepancy between desired and actual performance across key areas:

	Desired	Actual
Process Efficiency	Consistency in process parameters, productivity and quality	Variations in process parameters, bottlenecks in productivity and varying rejection rates
Uptime	>95% uptime at the device, system and plant level	<60% uptime at the device and system level
Safety	Zero accident steam system	Safety hazards prevalent across the steam system
Energy Efficiency	Benchmark specific energy consumption	21% average energy reduction potential across plants
Environmental Impact	Low emissions, effluent and water footprint	Potential to reduce water consumption, effluent and emission discharge

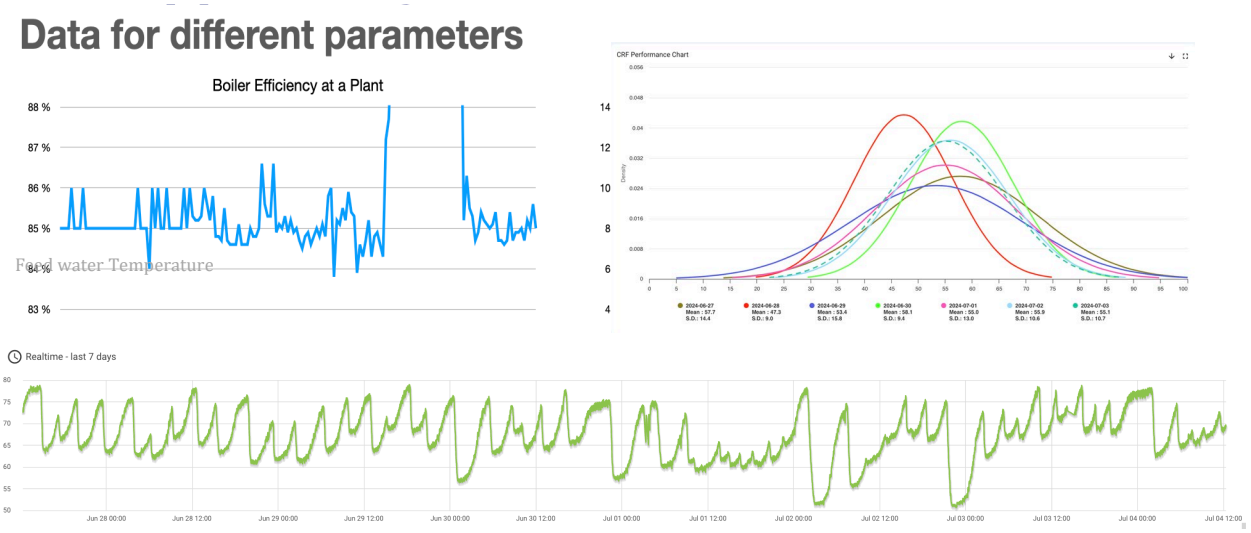
This gap is attributed to dynamic process variations, equipment downtime, operating practices, and lack of expertise. Traditionally, plant KPIs are monitored as static numbers, but digitally connected sites reveal that these parameters vary minute by minute. This variation is both a problem and an opportunity for optimization.

Understanding Dynamic KPI Variations

Conventionally, all plant KPIs are monitored as static numbers. However, digitally connected sites have demonstrated that these parameters and KPIs vary not only day to day but also hour to hour and even minute to minute. Trends in simple parameters like feed water temperature (see image below) of boilers in different plants visually depict this variation.



This variation is not confined to a single parameter but applies to various KPIs, including boiler efficiency, moisture in a product, specific steam consumption of a paper machine, and emissions from a boiler stack exhibiting significant variation, as shown below.



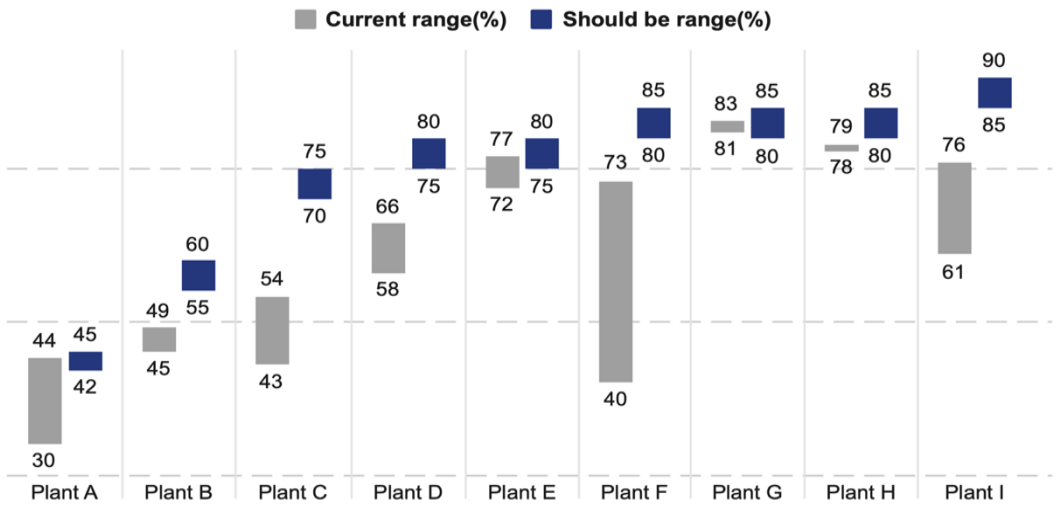
Such variance presents both a challenge and an opportunity for optimization and improvement. Traditionally, most measurements and logs have been manually collected or stored locally in spreadsheets and SCADA software.

Types of Variations Observed in Plants

Three types of variations typically observed in any plant are:

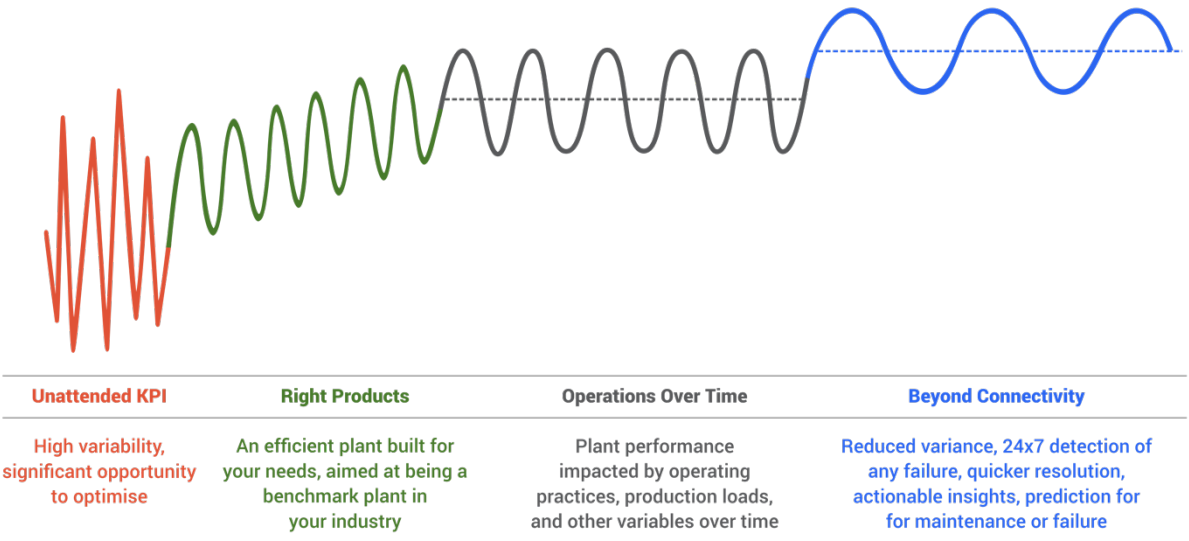
- **Performance Varying When Plant Load Varies:** Changes in plant load can significantly affect performance metrics.
- **Performance Varying When Product Mix Varies:** Different product mixes can lead to variations in KPIs due to differing process requirements.
- **Performance Varying Even With the Same Load and Product Mix:** Variations can still occur due to losses, operating practices, and personal competency. This type pertains to the highest variation and fortunately can be optimized.

The graph below depicts the variation in plant's with almost same load and product mixes, one of the KPI (Condensate Recovery Factor) across nine plants, showing variations in present level ranging 20 to 50% which potentially improve from current level and further reduce its variations as well.



FM Digital Sustenance Service

Real-time data from various industries indicates that merely installing a product or solution does not guarantee the sustained KPI performance. Variations in plant performance arise from changes in plant load, product mix, and operational practices. DSS addresses these variations through a combination of credible domain knowledge, real-time data collection, predictive analytics, and direct engagement with plant teams.



Unattended KPI	Right Products	Operations Over Time	Beyond Connectivity
High variability, significant opportunity to optimise	An efficient plant built for your needs, aimed at being a benchmark plant in your industry	Plant performance impacted by operating practices, production loads, and other variables over time	Reduced variance, 24x7 detection of any failure, quicker resolution, actionable insights, prediction for for maintenance or failure

The red curve in the graph shows the highest scope for improvement and reduced variation when the right product is installed. However, to achieve benchmark performance with optimized variation, continuous improvement through domain knowledge and handholding of plant teams is essential. DSS provides a comprehensive approach to managing and optimizing dynamic KPIs, enhancing plant productivity, profitability, and sustainability.

Conclusion

Dynamic KPI management is essential and survival going forward for productivity, profitability and sustainability in the industrial sector. Forbes Marshall, with its seven decades of domain knowledge, offers Digital Sustenance Service for long term association. This Service begins with designing or redesigning utility keeping plant process at a centre, Provides technology which meets the need of application, Establishing right O&M practices and ensures adherence and by understanding the variations of KPIs, start systematically improving and sustaining. This approach leads to enhanced operational efficiency, reduced energy costs, and sustained KPI levels, aligning with industry and plant-specific benchmarks and best practices.

Acknowledgment

The author acknowledges the contributions of plant teams and industry experts in the development of this paper.

Tables and Figures