VIEW POINT

KRTI 4.0 - A DIGITAL FRAMEWORK FOR OPERATIONAL EXCELLENCE

Abstract

As Industrial IoT and Industry 4.0 increasingly influence strategy across industries, enterprises will begin to locate smarter ways to improve asset performance, reduce downtime and optimize costs. However, many enterprises are still grappling problems of obsolete technology, lack of real-time data, and little or no connectivity between equipment, assets and systems in the operating environment. This point of view outlines an innovative solution framework developed by Infosys and Pöyry that helps organizations enhance their decision support system and run their plant through a combination of RAMS modeling, artificial intelligence, machine learning, IoT, prescriptive analytics, knowledge modeling and enhance decision-making across plant operations.

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Introduction

Over the past few years, industrial enterprises have been trying to integrate information technology (IT) and operational technology (OT) systems to enhance operations visibility and efficiency. Unfortunately, many of these efforts fail to deliver the desired results as they lack the predictability and reliability of solutions designed in an unidimensional space. While some solutions such as condition monitoring and predictive maintenance help maintenance teams manage their schedules better, these are still unable to offer comprehensive prescriptive recommendations along with an impact analysis for the complex 'system of systems' landscape.

Drawbacks of current solutions

There are broadly three main reasons for the gap in current solutions:

- Solutions are deployed only on critical capex-intensive equipment to assuage the fear of failure and its impact
- Most solutions are developed by OEMs who layer these on top of their own products, thus making it difficult for the system to work with products from different OEMs
- Even if the system is able to predict failure, it is difficult to identify the impact of the failure and determine when the action needs to be taken or what could happen if actions are not taken

Statistics show that over 80% of unplanned shutdowns are caused not due to problems in large equipment but by failures in smaller equipment. In many cases, such equipment is not monitored or not even instrumented for monitoring. For instance, in a waste water management pumping unit, it was noticed that the check valve clocked the highest number of failures, which led to shutting down of the line to replace the faulty valve. This indicates that it is important to understand the relevance of every component in the system in order to effectively deliver a prescriptive maintenance solution.

Thus, it is very important to model the equipment relationship in an operating plant. The failure and impact of the failure on the overall plant, and on any other plants connected upstream or downstream. The model in a combination of real-time data flowing in from sensors, which help define current reliability of the plant and its corresponding assets.

KRTI 4.0 - AI framework for operational excellence

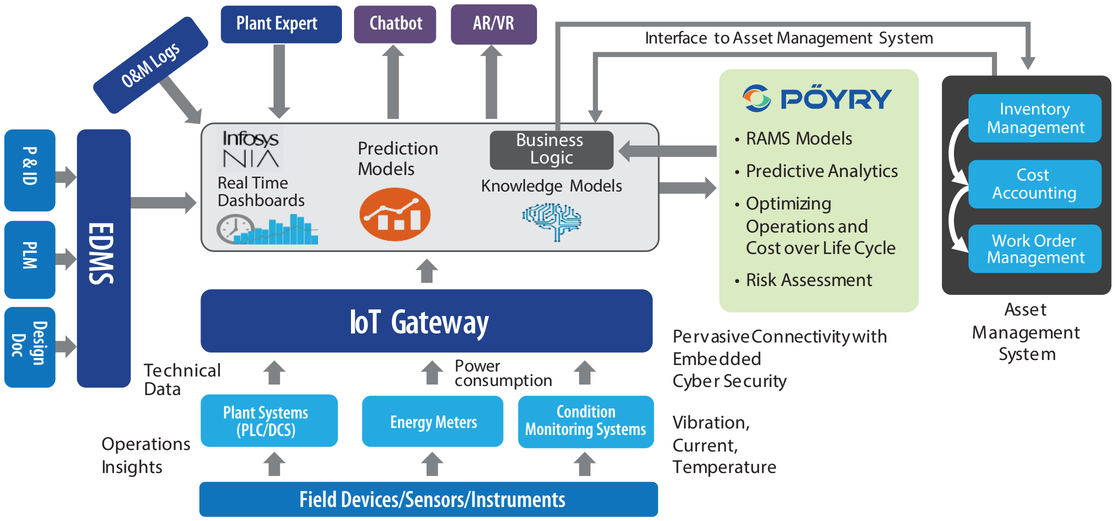

Fig 1: Architecture of KRTI 4.0 framework

Infosys and Pöyry have collaborated to develop a digital framework that overcomes the inherent challenges in existing solutions. This multi-dimensional framework, called KRTI 4.0, is a fusion of Reliability, Availability, Maintainability, Safety (RAMS) models for analysis and data-based statistical forecasting. Designed to help customers manage their production systems, KRTI 4.0 combines Industry 4.0 technologies, RAMS models and predictive analytics to enhance the reliability of the plant and shorten maintenance timelines. The implementation involves a multi-stage journey that achieves 360-degree coverage for the customer across plant operation management from RAMS modeling, sensor selection and deployment to connectivity, analytics, prediction, and support.

RAMS modeling and engineering design

The core component of the KRTI 4.0 Framework is the RAMS model. It performs specialized tasks such as identifying assets, failure modes, impact of failure at the system-level as well as potential risks at the enterprise-level arising from asset failure.

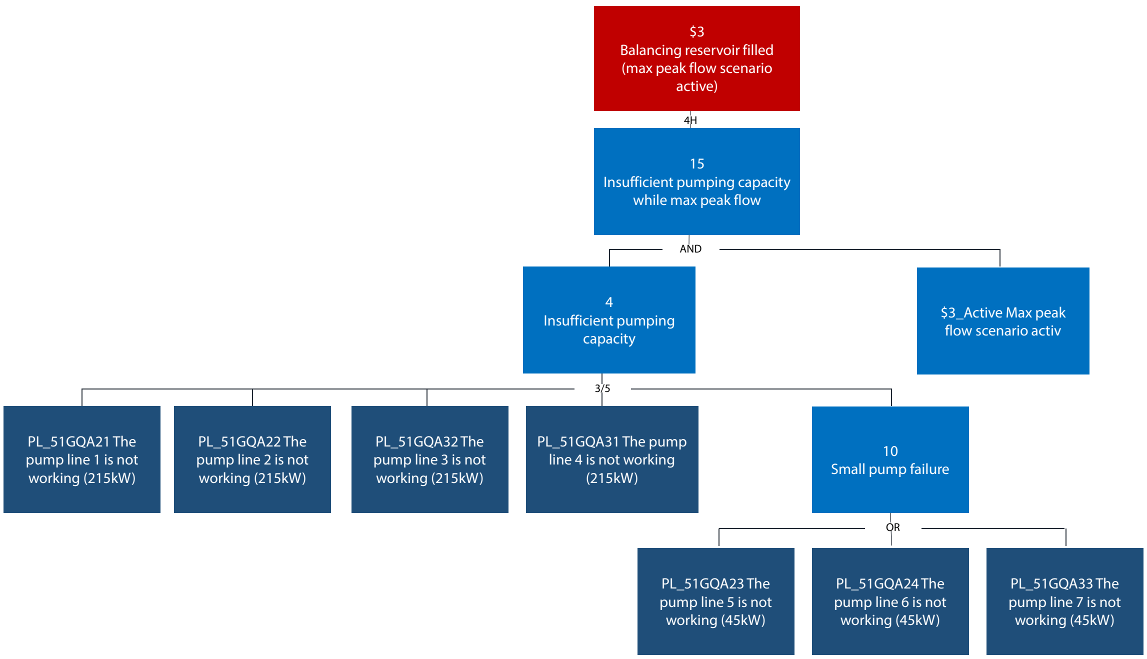

Fig 2: RAMS model for a pumping station

Gap and sensor identification

Based on the RAMS modeling output, the KRTI 4.0 Framework selects the right sensors and conducts a benefit analysis by connecting the right signals for analysis.

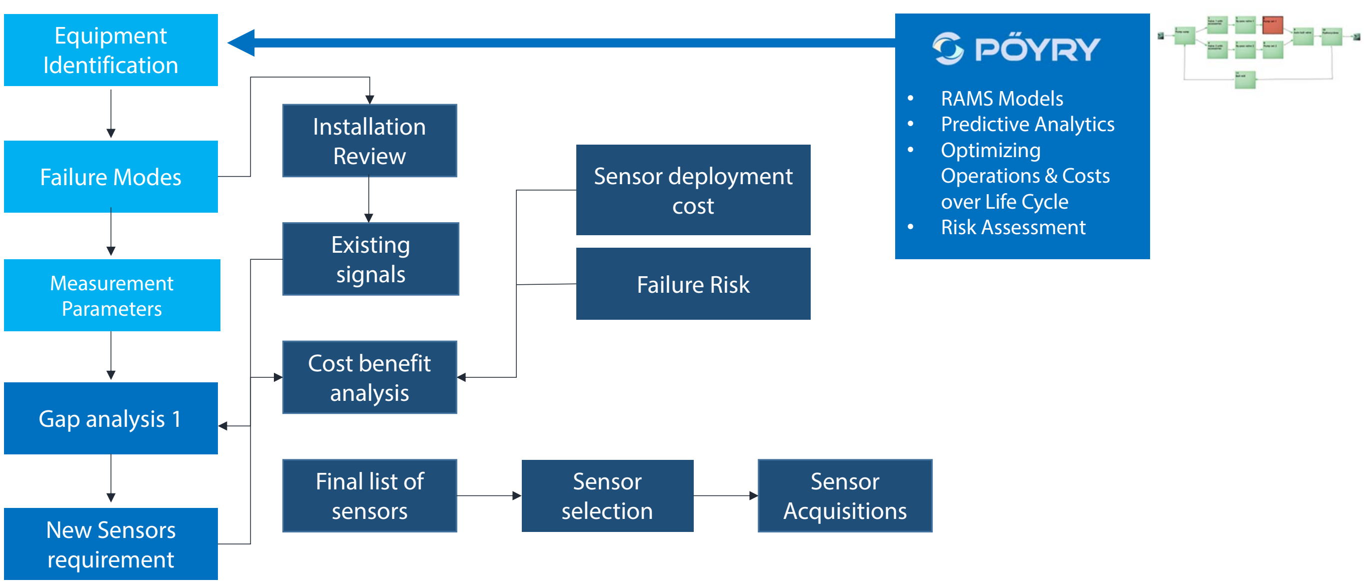

Fig 3: Workflow for sensor identification

Connectivity

The KRTI 4.0 Framework differentiates itself by ensuring that data from the plant is transferred through a reliable and secure network. The Framework leverages capabilities from different connectivity partners to manage device security and data transfer across geographies. Depending on the existing connectivity in the plant, various options for interfacing assets can be adopted, thereby empowering KRTI 4.0 with the right data at the right time. This enables the Framework to develop and build an AI model that predicts system anomalies. Seamless connectivity also supports the use of the 'Smart Hands' app, thus enabling operations teams to harness augmented reality capabilities powered by knowledge models when undertaking maintenance activities.

Analytics and knowledge modeling

The KRTI 4.0 Framework is supported by Infosys Nia, an open-source big data platform that leverages multiple forecasting models and ontology-based knowledge models, which use natural language processing to extract data from technical documentation, logs in the plant and tribal knowledge of the workforce.

Predicted anomalies from the analytics model interface with the RAMS model to forecast failure date of assets and generate a comprehensive view into the risks associated with failures. The Framework also pinpoints the overall impact of failure at the system and enterprise level. The Framework also has a built-in 'risk index' bar that gives decision-makers a probabilistic view of when a failure is likely to occur. Proactive recommendations generated by the system are based on AI and deep learning algorithms that are built natively into the Framework. It also uses adaptive learning from past incidents as well as the physical condition of the asset to diagnose and detect anomalies that can lead to failure.

KRTI 4.0 uses ontology-based learnings and AR/VR interfaces to help maintenance teams quickly identify root causes of anomalies. It also provides resolutions based on past learnings by capturing and reusing knowledge, particularly tribal knowledge that may be lost owing to a retiring workforce.

Benefits

KRTI 4.0 enhances operations by:

- Leveraging RAMS and AI to simplify decision-making
- Providing insights into anomalies, risks and impact of the risks on the system, which can comprise any number of connected assets
- Locating the root cause and providing resolutions based on past knowledge gathered across the enterprise, thus reducing the mean time to repair
- Reliably managing security and connectivity to improve workforce productivity without disruption

Conclusion

Effective asset management is a key priority to enhance plant operations. However, existing solutions often lack in-depth visibility into equipment health, surveillance for failure, and impact on systems. KRTI 4.0 – is a combination of models and data-driven framework and designed to overcome these challenges by leveraging the best of Industry 4.0 technologies. The Framework offers high performance and secure connectivity, advanced engineering, and reliability-centric design practices to deliver a solution that fills current gaps in plant operations. Developed by Infosys and Pöyry, this Framework offers deep value to large enterprise in utilities, paper and pulp, chemical, and other asset-intensive industries.

About the author

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Ramji has over 18 years of diverse industrial experience in product management, business development, product marketing, project management, engineering, and

deployment in the field of Industrial automation, process control, MES, and Industry 4.0. He has worked closely with various global clients to solve complex problems related to improving plant operations, production management, and energy management, while integrating and providing asset performance visibility across disparate systems. Ramji worked with GE Intelligent Platforms and Schneider Electric before joining Infosys.