

TCS IP2™

Internet of Things



With a meteoric rise in renewable capacity, increasing cost of fuels, and rising penalties for emissions, thermal power producers who constitute more than half of global power generation are facing immense challenges to operate their plants flexibly and at competitive costs. Utilities are grappling to enhance operations efficiency, control emissions, improve asset health, and reduce the overall operating and maintenance costs. Thermal power producers are increasingly leveraging AI and digital twin-based technologies to make their operations environmentally sustainable and commercially viable.

TCS IP2™ is a cloud-based PaaS solution that combines AI, ML, IoT and digital twin technologies into a pre-built industrial analytics platform. Purpose-built use cases have been developed and deployed on top of this platform to transform operation and maintenance of power plants to enhance their reliability, improve flexibility, cut emissions and reduce operating costs.

Overview

Guided by the three mega trends of decarbonization, decentralization and digitalization, the utility industry is looking for a digital transformation to improve their monitoring, operation, maintenance, planning and forecasting processes. With high renewable capacity having higher merit order dispatch, large-scale thermal generators are forced to operate at low capacity with partial and cyclical loads. Cyclic operations put undue thermo-mechanical stress on assets, which can further lead to reduced reliability, reduced efficiency, high emissions and unexpected plant outages. This makes thermal power generation unviable, thereby jeopardizing the stability of the grid. TCS IP2 addresses this problem using a unique AI, digital twin-based approach.

TCS IP2 is a modular, cloud-based PaaS solution that acts as an intelligent advisory system for power plant operators, managers and owners to take optimized data-backed decisions in real-time to improve the operation and maintenance of power plants. With various use cases on control tower, diagnostics, prediction, optimization, planning and scheduling, the solution helps the power plants to operate at optimum levels even with dynamic constraints and load patterns.

The intelligent, scalable, modular cloud-agnostic digital solution recommends optimization set points to improve efficiency, reduce auxiliary power use, cut emissions, and derive more value. It is extendable to the renewable power generation fleet and to renewable power plants such as wind, solar and grid- scale batteries. The solution collects historical and real-time data from plant historian, and DCS and EAM systems, to analyze 3,000+ sensor inputs and 20,000+ combinations in real-time to provide action advisory to operators for partial and full-load operating conditions.

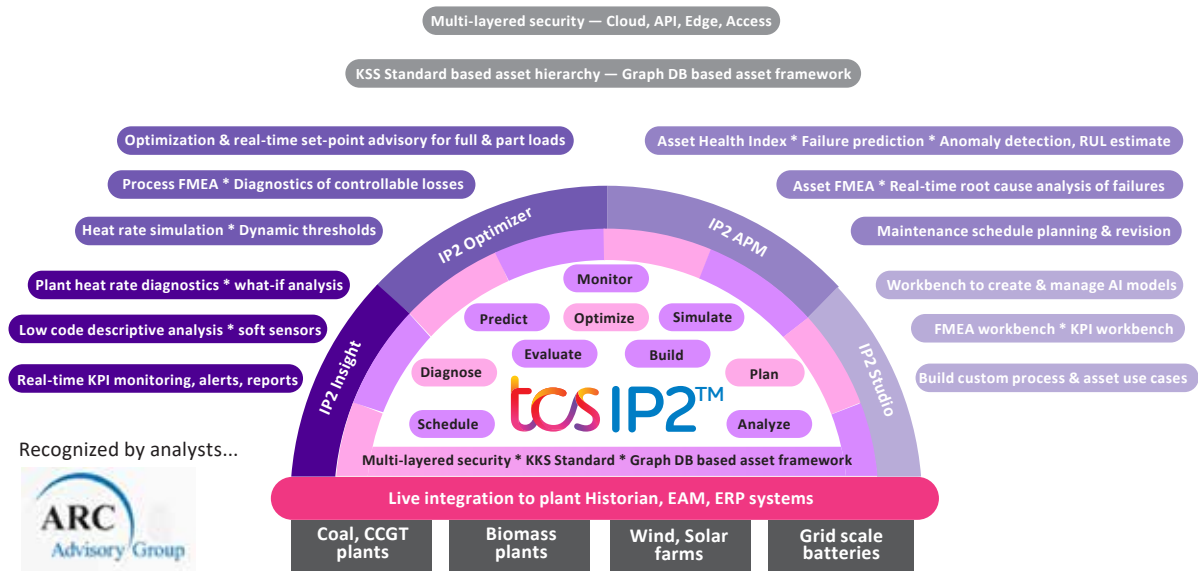


Figure 1: TCS IP2™ SaaS solution on cloud

Our Solution

TCS IP2 offers the following pre-built modules to cater to the needs of various customer stakeholders (see Figure 1):

- **IP2 Insight:** Provides advanced visibility into plant operations in real-time. Key features include: real-time KPI and PPI monitoring, soft sensors for KPI/PPI prediction, plant-level heat-rate diagnostics, what-if analysis, and more. IP2 Insight provides real-time connectivity to many thousands of tags in plant historians and asset management systems for seamless access to data in cloud for modeling.
- **IP2 Optimizer:** Optimizes performance of power plant for diverse operating conditions, fuel types and load levels. It uses digital twins to simulate, predict, optimize various processes evaluating 10,000+ combinations of set-points to provide real-time advisory.
- **IP2 Asset Performance Management:** Improves asset reliability and availability with a predictive and criticality-based maintenance regime for power plant assets. Key features include: anomaly detection, predictive maintenance, asset health index and cost optimized maintenance schedule advisory.
- **IP2 Studio:** Serves as a workbench for engineers and data scientists to develop digital twin models. It abstracts the AI and domain-related complexities to provide a low code interface for operators to create, manage, and tune ML models and create custom business use cases.
- **IP2 Digital Worker:** Comprises of a suite of use cases to improve worker safety and productivity with technologies such as wearables, AR/VR, mobile devices, etc. Field worker tracking, remote collaboration, 3D modeling, virtual immersive trainings, social distancing and contact tracing are some of the key use cases.

“TCS’ solution, built from individual AI-based digital twins of all equipment and sub-systems of the power plant, integrates both operation and maintenance aspects which enables better analysis of problems and early detection of faults.”

Ralph Rio,
ARC Advisory

Benefits

The solution delivers the following tangible benefits to enterprises:

- **Deeper diagnostics:** Gain deeper real-time insights with low-code descriptive analytics and guide plant operations with predicted optimum KPI targets for diverse operating conditions.
- **Improved efficiency:** Improve net plant efficiency up to 1% and cut operational costs up to 2% in partial and full load operations. Provide diagnostics and remedial advisory in real-time with dynamic FMEA. Reduce auxiliary power consumption and augment power sales up to 2%.
- **Reduced emissions:** Reduce carbon dioxide, nitrogen oxides, and sulfur oxides by up to 10% to comply with existing environmental policies.
- **Reduced O&M costs:** Optimize maintenance strategy to reduce maintenance costs by 20%. Predict plant failures weeks in advance, with up to 85% accuracy.
- **Enhanced flexibility and availability:** Increase plant availability by up to 2% by preventing deterioration of assets and avoiding unexpected plant outages or thermal fatigue in part-load operations.
- **Improved employee management:** Track lone workers in hazardous conditions to reduce total recorded injury frequency rate (TIFR). Capture institutional knowledge in automated processes and analytics to address attrition of older skilled workers.

“TCS IP2 is an excellent example of how new technologies, like digital twin and AI, can support critical plant assets that now are operated in ways that were never anticipated when these plants and their support systems were designed.”

Harry Forbes,
ARC Advisory

The TCS advantage

A partnership with TCS provides the following advantages to organizations:

- **Transparent and configurable:** The solution provides organizations full control over their data to create and edit AI models and configure custom dashboards and reports for enhanced traceability and flexibility. Our solution helps with better load forecasting, planning, and market-linked maintenance practices to enable flexible operations.
- **First time right with proven TCS IPs:** TCS IP2 platform is supported by expert domain consultants specializing in power-plant operations. It uses proprietary TCS IP and patents developed through years of intensive work in data science and the power industry to help you leverage AI/ML model capacities and enhance business operations.
- **Wide compatibility:** TCS IP2 works seamlessly with all models of turbines, boilers, historians, and distributed control systems. The asset model underlying TCS IP2 complies with the Kraftwerk-Kennzeichen System standard to allow users to seamlessly integrate the solution with third-party tools and applications.
- **Modular and interoperable:** Modular and customizable, TCS IP2 can co-exist with existing performance monitoring software and on-premise or cloud-based applications. Our solution has completed the ‘tune-up’ program aimed at promoting Azure IoT solutions to the market, and the Power-up program meant for select top-20 global Azure solutions.

Contact

Visit the [Internet of Things](https://www.tcs.com) page on <https://www.tcs.com>

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About Tata Consultancy Services Ltd (TCS)

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A part of the Tata group, India's largest multinational business group, TCS has over 488,000 of the world's best-trained consultants in 46 countries. The company generated consolidated revenues of US \$22.2 billion in the fiscal year ended March 31, 2021, and is listed on the BSE (formerly Bombay Stock Exchange) and the NSE (National Stock Exchange) in India. TCS' proactive stance on climate change and award-winning work with communities across the world have earned it a place in leading sustainability indices such as the MSCI Global Sustainability Index and the FTSE4Good Emerging Index.

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