

## **Industrial IoT Solutions from GreenField Software**

GreenField Software (GFS) is a privately held Indian company specializing in Industrial IoT.

Industrial Internet of Things (or briefly Industrial Internet) is the application of Internet technologies in the industrial world. However, Industrial Internet technologies extend beyond manufacturing to transportation, energy, smart cities and even farming: wherever there are machines and Sensors communicating over an IP network. Combined with that are sensor analytics, control functions and more.

Early adopters of Industrial Internet are deriving deep insights from machine data to achieve highest uptimes/minimize failure rates, maximize machine utilization, reduce energy costs and maintain highest levels of security of their infrastructure asset base.

As an Industrial IoT Solutions provider, GFS provides Advisory Services from understanding customer's business objectives to conceptualizing and architecting a solution. GFS Advantage lies in the fact that it extends conceptual frameworks to actual implementation, either with its own GFS Crane Industrial IoT platform or partner solutions. Two case studies:

### **Case Study 1: Advisory Services to an Engine Manufacturer**

A global industrial grade engine manufacturer was aiming to achieve JIT goals for their spare parts inventory in addition to providing superior customer service through reduced component or sub-assembly failures, and better turnaround time in fixing the problem.

GFS Consultancy scope was to analyze the failure rates of different sub-assemblies and components for each engine category and design a solution to (a) improve MTTR and (b) determine optimal EOQ and spares inventory for each category per location. The objectives were to improve uptime of engines, customer satisfaction and reduce costs – in maintenance and working capital arising out of holding excess inventory.

GFS Consultancy designed an analytics platform, which has two modules:

- A. Predictive Analytics on failures
  - B. Prescriptive Analytics on Spare Part Management, that would integrate with customer's current ERP.
- A. The failure analytics module will have the following:

- Relationship map (called a Device Chain) of all sub-assemblies and components (parts) of an engine that defines the interdependencies
- A computing unit called Fault Analyzer (FA): based on sensor data, failure of components could be analyzed and tracked. Historical data on failure rates of every relevant component would enable them to stock spare parts adequately. In addition, they would be able to flag component suppliers with higher rates of failures and replace them with components from alternative vendors.

B. The Spare Parts Management module will be integrated with customer's ERP system to compute the optimal:

- A. Economic Order Quantity (EOQ): Based on results of FA, an EOQ for each part will be determined for individual categories of engines.
- B. Location: to avoid a stock-out in one location while there is excess inventory of the part in another, since operating conditions of a locale are determinants of part failures.

### **Case Study 2: Advisory & Implementation Services to a Mobile Operator in South Asia**

Operating in regions with high power outages, this company was dependent on high priced imported diesel for running back-up power DG sets. It also suffered from pilferages.

GFS was called to architect and deliver a Fuel Automation Management System, which could accurately monitor fuel usage, determine inventory levels and arrest pilferages. GFS Consultancy provided an end-to-end solution. Starting with a reference architecture, GFS implemented a complete solution around the GFS Crane IIoT platform with fuel-level sensors and software to monitor and analyze data along with necessary alerts to prevent failures (like fuel overflow), ensure that DG sets run when needed and generate reports and trend graphs to analyze fuel costs versus DG run hours.



GFS Crane is a vendor-neutral Industrial IoT platform developed by GreenField Software.

- ❖ Provides advanced monitoring, analytics and management capabilities for mission critical physical infrastructure systems
- ❖ Supports multiple protocols to connect with heterogeneous devices & sensors
- ❖ Provides centralized automated monitoring, control & management of distributed facilities of manufacturing plants, telecom towers, buildings, and smart cities.

GFS Crane is built for customers with distributed capital-intensive infrastructure. The common business purpose served by GFS Crane across all these verticals are:

- Mitigating risks of failures of a site infrastructure
- Reducing operating costs through improved energy efficiency and higher productivity
- Controlling capital costs through better capacity planning and asset management
- Maintaining highest levels of security of the site infrastructure.

After GFS Consultancy designed the Reference Architecture (figure 1), GFS Crane formed the core of our implementation of the Fuel Automation Management system (figure 2).

Figure 1: Reference Architecture for Fuel Automation Management

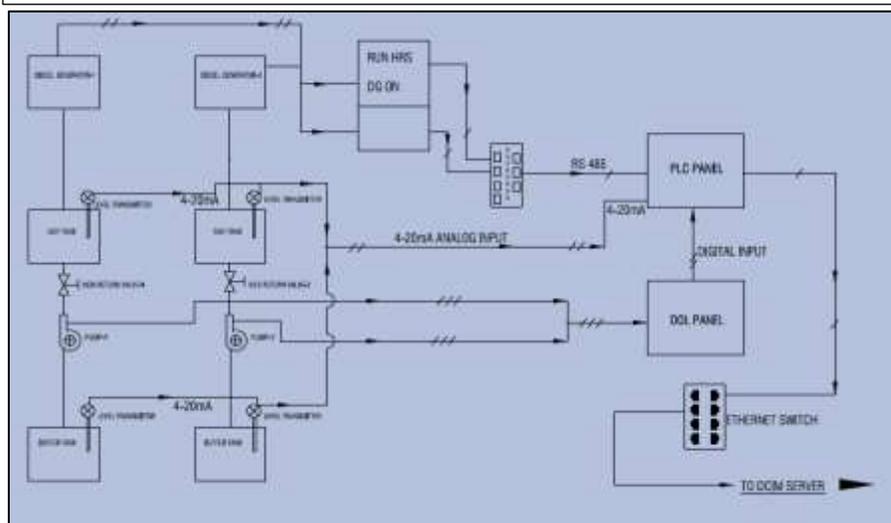


Figure 2: Fuel Automation Management Solution

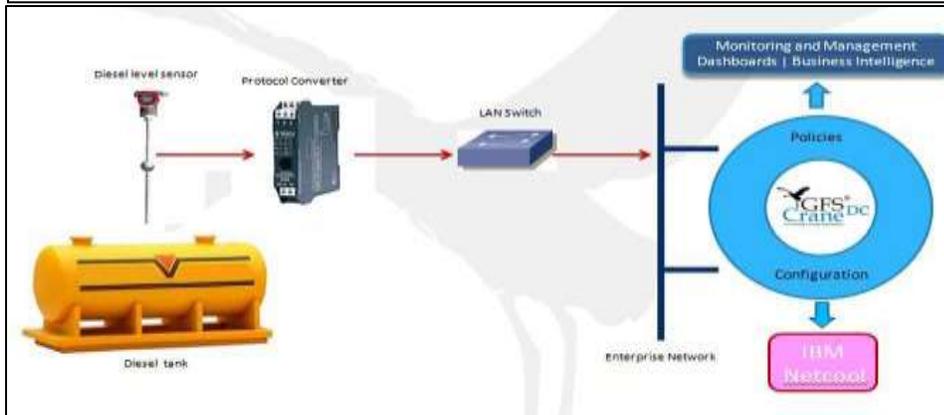


Figure 3 is an example of sensor analytics in GFS Crane: it provides a report of DG run hours captured from the DG set and compares with diesel consumption. Variances from normal are highlighted for necessary management action.

Figure 3: Fuel Efficiency Report

Device Name	Date	Total Run Hours (Hours)	Fuel Consumption (Liters)
DG-3_800_KOMAROLI_EKT	26-Sep-2018	0.2	388.82
DG-1_1016_JARSON_EKT	24-Sep-2018	0.8	58
DG-2_1016_JARSON_EKT	24-Sep-2018	4.28	532
DG-3_800_KOMAROLI_EKT	24-Sep-2018	0.7	7.28
DG-4_500_KOMAROLI_EKT	24-Sep-2018	0.35	539.18
DG-1_1016_JARSON_EKT	23-Sep-2018	0.39	524
DG-3_500_KOMAROLI_EKT	23-Sep-2018	0.34	531.38
DG-2_1016_JARSON_EKT	22-Sep-2018	0.20	248
DG-4_500_KOMAROLI_EKT	22-Sep-2018	0.28	404.88
DG-1_1016_JARSON_EKT	21-Sep-2018	0.25	321
DG-3_800_KOMAROLI_EKT	21-Sep-2018	0.31	477.48

### GFS Advantage

Promoted by an industrial engineering group from Kolkata, GFS leadership comprise of industry veterans from Oracle and Siemens. Our customers span across South Asia and Europe from diverse verticals: Automotive, Financial Services, Government, Media, Oil & Gas, Power Utilities and Technology.

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