Business Requirement Document (BRD)

Project Title- IoT-Enabled Fuel Supply Chain Optimization for IOCL(Jabalpur Division)

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1. Project Overview –

The IOCL marketing division faces challenges on a regular basis for transportation and optimization of fuel products available at retail outlets (Petrol pumps) mainly XP-95 , XP-100, MSD and HSD- wide range of petrol and diesels. The aim of this project is to enhance supply chain of these products by introducing a Fuel replenishment system focusing on stock outs, demand prediction, dispatch scheduling, thermal regulation and beyond preventing current losses and developing an advance regulatory system.

2. Business Objective-

- Reduce fuel stock out issues at petrol pumps.
- Regulation of transport delivery products from depots/terminals.
- Real time integration of communication between depots, pumps and RO tank levels.
- Region-wise visibility of fuel needs and status.
- Reduce engineering issues like temperature variation, contamination risks , sludge accumulation etc.
- Inventory dashboards for predictive analysis and precise decision making.

3. Current Background –

- Delivery/ Business flow
    a. Petroleum fuels arrive at depot / terminals via pipelines, rail tracking and road tracking system from refineries.
    b. Storage in large tanks usually at depots separated by fuel types.
    c. SAP used for PO generation and scheduling loading of fuel in trucks for delivery to pumps.
    d. Dispatch demand based on consumption trends, RO managers needs and Depot managers 'gut feeling'.
    e. Final data entry by RO managers on SAP upon receiving.

- Chemical Engineering mechanisms
    a. Mild-steel equipped depots used for storage of these fuels with great care to XP-95, 100 variants due to their high octane strengths and additives.
    b. Activated carbon filters form vapour recovery systems to minimize hydrocarbon emissions during transferring.
    c. Traditional methods like valves etc regulate thermal losses / vaporization losses in tanks due to temperature differences of fuels .
    d. Manual Sludge prevention via periodic cleaning in carbon based tanks for contamination avoidance.
    e. Depot labs perform **ASTM D methods** (e.g., D86 distillation, D93 flash point) ensuring quality compliance.

Thus, the current replenishment process faces challenges both across logistics and chemical engineering domains. Manual reporting leads to delayed replenishment or overfilling of fuel in

pumps, also no system forecasts future demands. And, engineering problems ask for tanks having high contamination and corrosion limits along with systems to reduce thermal losses.

4. Proposed Solutions-

1. High level IOT integration at tanks and depots – alerting at a range reducing issues of stock outs and overfilling.
2. Dashboards predict tracking of fuel flows, briefing about product demand , sales and KPI information increasing dispatch efficiency, by advance analytics.
3. 'Gut feeling' replaced by real time factors including historical, seasonal, festivals, traffic etc by real time monitoring.
4. GPS based delivery time tracking to update delivery and receiving times.
5. Using ML algorithms like time-series forecasting e.g- ARIMA, LSTM etc for dynamic predictions.
6. Track maintenance of Vapour recovery system(VRS) filters and alert whenever degradation peaks.
7. Again IOT, ML based trackers for alarming against sludge contaminations and corrosions , increasing fuel quality.
8. A digital or mobile interface regulating entire supply chain optimization.

5. Business Requirement –

ID	Requirement	Priority
BR-01	System should monitor real-time tank levels and trigger alerts for low stock, IOT based trackers.	High
BR-02	Scheduling dispatch between pumps and depots, timely.	High
BR-03	Regulating orders per ROs for transparent transporting.	High
BR-04	Dashboard displaying fuel delay statistics per pump	Medium
BR-05	Rank pumps by sales and criticality for prioritizing dispatch	High
BR-06	Month-wise and location-wise fuel-type-wise sales summaries	Medium
BR-07	Scaling by owner, fuel type, and region for clear analysis.	Low
BR-08	Predictive modelling for accounting seasonal, festivals and weather patterns.	High
BR-09	PO auto-checking and verification via digital/ AI-based integration .	Medium
BR-10	Tank temperature linking and VRS filter to volumetric loss model .	Medium
BR-11	Sludge cleaning alerts based on tank functioning and throughput.	High
BR-12	Digitize ASTM test results and link to PO/batch	Medium
BR-13	IOT-triggered emergency shutoff system, in cases of accidents	High

BR-14	Implement sensor-based UGT leak detection + real-time monitoring.	Medium

6. Key Performance Indicators (KPIs)-

Success of the new system can be measured by the following KPIs-

- % Fuel Stockouts (Target: <10%)
- Track average dispatch time (<48 hrs)
- % POs Delivered on Time (Target: >90%)
- Tank temperature alerts (Eg: 45°C for MS)
- Sludge accumulation rate <=7%
- Tank cleaning scheduling smoothly.
- Surveys for new system interface adaption clearance.

7. Stakeholders-

Role	Responsibility
1. Project Sponsor	Approval, Budget allocation
2. Business Analyst	Documentation, Planning ,analysing
3. Technical team	Installation, execution
4. Operations Manager	At Depots & Ros , feedback and reviews

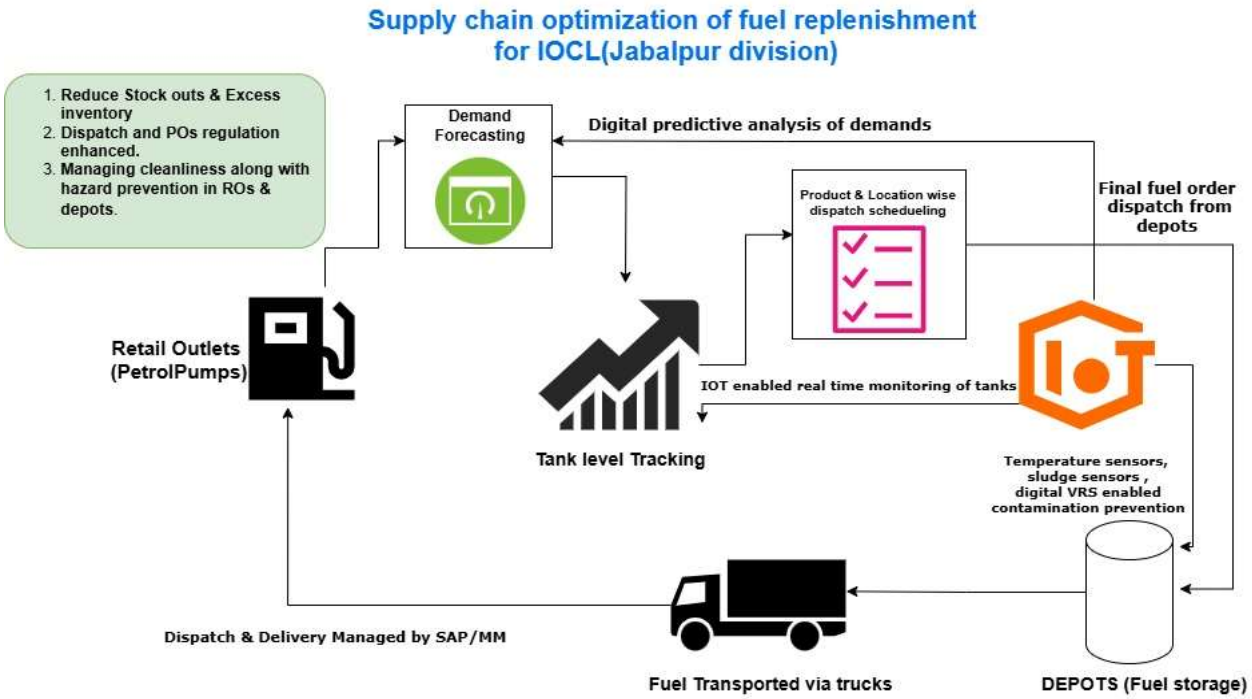
8. Assumptions-

a. Sufficient data available both historical and real time for access.
b. Timely dispatch and updating from depots.
c. Stakeholders transparency during requirement analysis
d. High level technical team access for development.

9. Possible Risks-

a. Market change leading to possible predictive problems.
b. Depot manager's resistance to change adoption.
c. Inadequate data access leading to errors in the system.
d. Change from manual to AI-driven solutions, hindering understanding ability.

Visualization of the plan



Dashboard -Fuel Distribution BRD-Aligned