Introduction:

This project aims to transform **Paleesuwari's groundnut oil manufacturing** process into a smart, energy-efficient operation by integrating **Azure IoT-based monitoring and incident response systems**. With five manufacturing locations, the company **seeks to monitor and respond to anomalies that occur across all production and non-production operations**—improving performance, reducing downtime, and enhancing sustainability.

Industrial IoT components—including **Schneider iEM3255 energy meters**, **Siemens IoT2000 gateways**, and **Modbus RTU protocols**—are deployed to collect real-time power consumption data from critical machinery such as seed cleaners, dehullers, oil expellers, filter presses, and packaging systems. This telemetry is **securely ingested via Azure IoT Hub**, processed using **Azure Stream Analytics**, and routed through the **hot path** to **Azure Data Explorer** for **storage**, **Real-time energy insights** are visualized using **Azure Managed Grafana**, **enabling plant supervisors, operators** to monitor key metrics.

For anomaly detection and automated alerting, the data flows through a parallel **alerting path**. **Stream Analytics** triggers **Azure Functions**, which execute predefined logic and route alerts using **Azure Logic Apps** to notify specific operators responsible for affected machines. This ensures prompt issue resolution and minimizes energy-related downtime.

The **system empowers decision-makers with centralized dashboards**, **machine-wise energy monitoring**, and **real-time anomaly detection**. It enables identification of peak consumption hours to optimize operational schedules, detection of inefficient or aging equipment, and prevention of circuit or transformer overloads through accurate load distribution tracking.

In addition to improving operational efficiency, the captured energy data supports **ESG initiatives**, carbon audits, and green certifications—advancing the company's sustainability objectives. With real-time visibility, Kaleesuwari can compare energy performance across plants, benchmark best practices, and replicate successful strategies across all five manufacturing sites—driving operational excellence and strategic energy optimization.