DIGITAL TRANSFORMATION OF LNG INDUSTRY

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Abstract

A troubled industry enters the crisis- *To tackle climate change and greenhouse gas emissions, countries and organizations thrive towards generation and utilization of clean and green energy sources whilst abolishing the usage of fossil fuels like coal, oil etc. LNG is one such cleaner fossil fuel which is 95% methane and some ethane percentage. Global demand of clear and green fuel drives rapid growth in LNG, with global demand rising by 27 million tons to 319 million tons. Repercussions from Russian- Ukraine conflict, Russian-Saudi Oil price war and Covid-19 crisis are causing unprecedented stress and price fluctuations in Oil & Gas industry. Financial and structural health of the industry is worse than ever. Supply is much greater than the demand of the product and price is lowest in thirty years. Amid global Covid-19 crisis, free falling LNG prices wreak havoc as traders rush to explore alternative locations for Cargoes with Chinese buyers rejecting shipments. Concerns that Chinese companies can back out of contracts due to Covid-19 has slowed down LNG sales into China and LNG suppliers face cargo diversion, delays, or force majeure declarations. Asian spot prices for LNG have already tumbled to troughs of $3 per million British thermal units (MMBtu) - less than half of what they were at the same time last year. Liquefied natural gas (LNG) projects are on the cusp of having to halt output as mild winter weather and the coronavirus cut into demand for the fuel. This solitary situation of over-stocked Oil market and a massive decline in demand has shaped up test of resilience and organization's flexibility.*

Index Terms: *Liquefied, fossil, Digital*

1. LNG INDUSTRY OUTLOOK & CHALLENGES

1.1 Rising Demand
LNG market is expected to register a Compound Annual Growth rate of about 6% by 2023

1.2 Demand Supply Gap

LNG imports in Asia are expected to grow from 420 BCM to 820 BCM by 2035 that is almost twice as high. The existing LNG supply in operation stands at around 320 MTPA only with another 53 LNG supply facilities under construction

1.3 Competition
About 318 MT of Global LNG production was seen in 2018. LNG producers want to increase their production capacity, enhance storage, and optimize logistics to stay ahead of their peers

1.3.1 Limited Connected Assets & Declined Plant Utilization
Primary hurdle most LNG producers are facing is the lack of integrated and intelligent information facility. Furthermore, inadequate connected assets and disconnect between Level 2 and Level 4 system i.e., absence of (Manufacturing Execution System) creates a challenge to exchange information and data standardization across LNG value chain. Several systems operate in silos and their data is not integrated with RTDM. Also, limited usage of IT tools and lack of applications in the areas of Planning & Scheduling, Marine Operations, Performance optimization, Leakage detections, environmental emissions monitoring, gas flaring and inspections etc. actively declines the Plant Utilization.

The plant utilization has the potential to grow up to 95 % from current 72.15%, as per McKinsey

2. IMPLICATIONS FOR THE INDUSTRY
Global LNG market in 2020, a year which saw losses to global GDP of several trillion dollars as economies large and small struggled to contain the COVID-19 outbreak. It is approximated that global gas demand will peak in the late 2030s as electrification of heating and development of renewable may erode long-term demand.

3. DIGITAL STRATEGIES IN TIME OF COVID-19

In a European survey, 70% of executives from Austria, Germany, and Switzerland said that the pandemic is likely

to accelerate the pace of their digital transformation. The technologies of social media, cognitive computing, and analytics combined with machine learning and IOT are key drivers for Digital Transformations. It will enable organizations to digitize and automate operational practices. Above challenges and outlook provides an excellent opportunity to transform traditional LNG production into digitally enabled operations. Digital technologies and IOT must induce into LNG value chain and improve cost of data processing and data quality to enhance insights into the plant operational practices. Digital technologies can be applied in the entire LNG value chain enabling Safety, Environment, Plant and Marine Operations, Gas Production.

Digital Use- Cases- Perfect Opportunity to overcome current crisis

3.1 Supply Chain Digitization

Strong demand for cleaner burning fuel in Asia continued to drive rapid growth in LNG even during the pandemic. Shell expects the demand to reach approximately 384 metric MMT from 319 MMT in 2021. To meet this demand more than 100 plus LNG plants are at various stages of planning. Many LNG facilities are at remote or harsh locations which makes them more challenging and expensive to develop, operate and sustain. The role of supply chain becomes extremely significant to be cost effective, safe and competitive in this dynamic market. Below are the areas wherein Digitalization can assist LNG organizations

3.2 Bridging the gap between OT and IT systems (MES Layer introduction)

It is observed that many organizations lack IT involvement in their operations which creates silos in operations and hence it becomes extremely difficult to consolidate scattered data across the organization. Introduction of MES layer and IT/OT integration will eliminate the gaps like manual planning and scheduling, isolated quality, and maintenance practices, which creates erroneous and incomplete data. Analysis is performed manually and inefficiently.

Efficient and secured IT/OT integration and MES tools will enable organizations to go beyond the traditional operating procedures and provide insights into the operational practices which in turn enhances business process, safety, and sustainability and eventually business decisions could be taken accurately, quickly, and efficiently.

3.3 Intelligent Safety Programs

Safety of the employees being the topmost priority in every organization. Introducing smarter safety observation technology can eliminate manual checks and quickly respond to safety incidents. Real time monitoring combined with enhanced communication and precise employee positioning technology whether indoor, outdoor, remote, or movable can greatly assist in quickly responding to any safety incidents or natural calamities. Usage of Digital Responders coupled with RFID and positioning technology can not only locate outdoor position but also the exact floor and room an employee is located if indoors. It also enables real time selective object identification.

3.4 Intelligent Environment Monitoring System

Global Industrial pollution is primarily responsible for climate change. Stringent measures are taken gradually to tackle it. One of the measures is to monitor and control pro-actively. Environment monitoring is a complex activity including components of natural environment, natural ecological system, processes and phenomenon in them, assessment, and changes in the environment. Using brainy environmental monitoring and forecasting system will enable elimination of manual procedures to gather data from scattered sources and analysis for exceptions and root causes. It would gather information about the intended object and its activity real time, which will alert proactively to control and adjust. Real time analysis of the data gathered will enable diagnostics, genesis and forecast of the environment so that processes can be adjusted accordingly and achieve a cleaner operation which in turn will adhere to global environmental emission norms.

3.5 Usage of Drones

Usage of Drones enables enhanced safety and faster, real-time communication with the command centre which makes it one of the leading smart technologies around. Dangerous operations like inspections in confined areas, remote areas, high temperature and pressure zones etc. can be easily carried out using drones. Drones fitted with water hose can be used to extinguish fire in plant premises. Also, drones fitted with altimeter which can be used to determine precise altitude from where inspections can be done easily and accurately.

3.5 Smart Sensors, Data Integration coupled with Data Analytics and AI

Usage of low-cost sensors in the areas where data has not been captured yet, integrating all scattered data (Marines, laboratory, Train) on real time. These combined with AI and ML can help in early detection of process abnormalities, impurities in gas, equipment malfunction to avoid unplanned plant shutdowns, slow production and unplanned equipment failures.

(i). Applying Predictive and Prescriptive analysis to understand historical weather pattern which can be used to predict weather conditions in advance which can potentially avoid unplanned shutdowns and slow production. For example, with the increase in ambient air temperature the efficiency of turbine decreases which drives the liquefaction and eventually causes slow gas production. Normally, 0.7-1.2% drop in turbine efficiency per rise in degree Celsius.

(ii). Early detection of gas impurities like CO_2, H_2S and other acid gas provides an opportunity to treat them and produce high quality LNG.

(iii). Enhanced measurements and applying AI/ML & Data analysis for equipment maintenance, environmental emissions and operations can assist in pro-actively alerting operators for any equipment malfunctioning and process abnormalities. It can enable predicting events based on the captured historical data and even prescribe operators what to do next using prescriptive analysis.

(iv). AI based bots which can be used during plant start up and shutdowns for smooth functioning and avoiding any unwanted safety incidents.

This will certainly improve Train availability, quality of LNG produced, enables equipment baseline performance, enhances productivity and reduced maintenance costs. Eventually it can assist in enhancing customer delight and helps retaining them

4. CONCLUSION

Since the duration of the crisis is unknown, it is very necessary to bring some fundamental changes in this sector to generate attractive profit. The oil and gas industry will remain a multi-trillion-dollar industry for decades. Therefore, the companies who will restructure will survive this crisis and others will waste away. Digitalization is increasingly emerging as a key driver for competitive LNG industry. LNG producers must adopt to industry specific digital applications to stay ahead of their peers. For this they need to invest both time and money to upscale their existing workforce to be able to seamlessly adapt to the digital transformation in future. Using AI to increase accessibility at work is one of the Gartner top 10 strategic predictions for 2020 and beyond.

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