

New Manifa CPF Expansion—Challenges and Mitigations

▲ By Naif Almarri, Wael Alamri and Nezar Malibari

Project objective - Preface

In line with the Kingdom's direction to increase its maximum sustainable capacity (MSC) from 12 million barrels per day (MMBD) to 13 MMBD, Saudi Aramco has initiated the Safaniyah & Manifa Oil Increment Program. It will include a new Central Processing Facility (CPF) to be built in Safaniyah, and the existing Manifa CPF will be expanded, increasing the company's MSC by 1 MMBD by 2030. The expansion of Manifa CPF will be responsible for 300 MBD of the MSC increment, through the processing of additional oil, to be produced from the Upper Ratawi offshore reservoir. This article will shed light on the foreseen challenges and risks in expanding a live production facility (Brownfield Project), such as Manifa CPF, and how to address and mitigate them.

New GOSP and CPF Expansion

To handle the additional 300 MBD production, Manifa CPF will be expanded by adding a new oil processing train (GOSP). Utilities and supporting facilities within the CPF will need to be expanded to support operation of the new GOSP.

Work inside a live facility:

No doubt that working inside a live facility

will be challenging, especially when it comes to safety precautions and work permits, which are usually considered one of the main contributors toward construction delays.

The challenges in Manifa expansion is that there will be work to be done in the form of modifications and upgrades in the brownfield, in addition to the main GOSP construction outside the fence in the greenfield area. This might sound easy, however there will be a huge effort required in terms of coordination, site visits, reservations and integration with the existing facilities and process areas.

For the EPC contractors to avoid unforeseen delays by working in both Brown and greenfield areas, proper planning must be developed ahead of time. In addition to availing of all the required training resources — in terms of safety and engineering standards — to ensure smooth construction activities and avoid unneeded delays. This will happen after coordination with all concerned stakeholders, including the proponent, Loss Prevention, Inspection and the Project Management Team.

Scope Integration

Due to the project's nature, where a lot of work must be done in the brownfield, the

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project team will face many challenges, especially in process calculations, choosing the tie-in points and locations with minimum impact on plant production, and with shortest shutdown periods as applicable. If the total shutdowns can be replaced by line isolations and any other alternatives, it will be the project team's first choice. The contractor for this kind of scope needs to have enough experience to realize the magnitude of work, since this contractor will act as an integrator for the whole project, including the brownfield upgrades and the new expansion. This contractor has to immediately verify and update all the developed process calculations, adequacy and other studies, as it will be the contractor's sole responsibility to verify these studies and start construction accordingly. Any errors might impact the overall quality of the projects and result in rework.

Scope Freezing

The project scope needs to be determined from the beginning of the project and to be frozen within the end of the Design Basis Scoping Paper Stage (Pre-FEED). This freeze is to avoid scope creeps and last-minute changes, which usually have considerable impact on the project's cost and schedule performance. A clear and defined scope contributes towards the success of the project. In Manifa, the scope from day one was under definition, and

continuous verifications supported by multiple site visits and detailed reports.

Interface & Interdependency

Another major challenge currently facing the project team and contractor is the interface between this project and another project's part of the Safaniyah & Manifa Increment Program, in addition to interface with governmental projects or other local companies. A very high level of coordination needs to take place in this case. Manifa has assigned an interface manager and interface coordinator to manage all such interfaces in all disciplines. Besides what was already conducted, with every stage of the projects there will be a global interface meeting to include all the stakeholders, SMEs and representatives from interfacing projects, to agree on all the interface points and monitor progress. This will ease handling of all interfaces and minimize any risk that might arise from forgetting or ignoring such an important task. In addition, the interdependency is also being considered with other projects or disciplines, such as the water injection projects need to be ready for operation before the process areas, while the process areas need to be operational before the GOSP mechanical completion.

Early Work and Relocation

Due to the fact that the expansion came beside an existing facility, there are many

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above ground and underground utilities in the area that need to be relocated, to avail the site location for the EPC contractor to start construction activities smoothly, without any obstacles and delays. It happened before that many projects suffered from major delays, due to unexpected utilities, especially underground ones that needed to be relocated before the main work started. These utilities include, but are not limited to, overhead power lines, underground water lines, underground cables for different systems and other facilities, such as evaporation ponds or even governmental facilities that cannot be touched without official approval.

To address these challenges, multiple detailed site visits need to be conducted by the awarded EW contractor, to do the required topographic and underground surveys to detect any live utilities in the area. A close coordination — between the contractor and all Aramco stakeholders — needs to take place to ensure avoiding any issues during the actual work. The early work is considered to be the key to a smooth kickoff for the official construction activities.

Stakeholder Engagement

Mega-projects or programs always face difficulties and challenges when it comes to stakeholder engagement, as every stakeholder with different background and

interests needs to be always engaged and updated about all project progress, time-lines and concerns. Sometimes as part of the acceleration of the projects, the project team might forget to involve one or more stakeholders, and discover later on that they have to re-do meetings or the workshop as no decision can be taken without involvement of all concerned stakeholders. This kind of lack of coordination and communication usually results in delays and disturbance in the project flow and progress. An effective communication plan is always the key to success to get buy-in from the stakeholders and allow for easier and more effective decision making.

In Manifa, we have agreed on a detailed communication plan based on the IPT members list. All the members involved in the progress and disciplines meetings, in addition to submitting to them the project deliverables — based on member specialty — for review and comments, which will ensure member engagement with all changes and decisions being made, in addition to minimize the risk of scope creep or rework. This plan has shown success so far and the project team is planning to continue at the same pace.

Manpower

Currently and after the major impact of COVID-19, the global construction market is suffering from a shortage in manpower,

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after the lock-downs impacted all of the world's companies, when some were forced to reduce their expenditures by terminating employees or decreasing salaries. Both the client and the contractors are now suffering from this worker shortage, including all disciplines in engineering, document control, secretarial, admin staffing and construction labor. Many employees now will accept the risks of job stability and security for an increment in salary to keep up with the ongoing global inflation. These companies have to look seriously into the employee benefits and revise their guidelines for salary increments and bonuses to attract and keep experienced employees. In the future, some companies might go out of business or refuse projects or withdraw their bids, due to the shortage in manpower.

In addition, the construction industry is highly dependent on physical manpower who will do the required work such as excavations, pipe laying and quality/safety inspections. It has become a major challenge for all the future and ongoing projects to find the required skilled and unskilled manpower. It is highly recommended for big companies to start exploring options in agreements with manpower suppliers, generate new agreements and memorandums of understanding with current or newly established companies to refresh the market and avail the required resources. This is not an easy task,

especially with the Kingdom Vision aiming to increase Saudization levels in all industry sectors and disciplines. Part of the solution is to avail the training centers and development opportunities for Saudis.

Localization

Manifa, as part of the Safaniyah & Manifa Increment program, is participating in the localization effort based on the company direction and Kingdom vision 2030. The effort being made started from the early stage of the Design Basis Scoping Paper Development (DBSP), where some disciplines such as security, ISF and telecommunications were chosen to be designed and scoped in Kingdom, to ensure knowledge transfer and engineering experience to the Kingdom. In addition, there are internship agreements for Saudis to visit the OOK designer offices and get engaged in the technical discussions for enhancing knowledge transfer. Moreover, Manifa, as part of the program, is mandating in its contracting strategy at a higher level of Saudization and IKTVA compared to the previous years. Localization also will be promoted during construction, due to the ongoing exercise for modularization, utilizing 100% of the local vendors and manufacturer yards in different locations within the Kingdom, such as Dammam, Jubail, Ras AlKhair, Jiddah and Yanbu', which will increase the market exchange in this sector, and

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increase the employment rates and Saudization levels. MAC agreement will also help in promoting the localization due to either the ongoing purchase agreements with local vendors, or by establishing new agreements capitalizing on 100% local manufacturing for the required equipment and cabinets.

Risk Management

After all risks mentioned earlier, there might be still other challenges and risks related to project execution, market condition and others. During the different project stages, Project Risk Management (PRM) sessions will take place to initiate and update the risk register. The risk manager should be nominated from both the contractor and the client, to work hand in hand, closely monitoring all the identified challenges presenting risks to the project or the company. It has been crystal clear that all the projects that monitored their own risks and challenges were able to reach to their targets without issues or delays.