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How Brownfield Projects Are Always More Complex Than Expected

Brownfield projects by definition involve the modification of existing facilities. Specific characteristics of those projects lead to an increase of complexity compared to a greenfield project of similar scope. In this White Paper we investigate the causes of additional complexity, how to reduce complexity in this situation, and what additional measures are needed to achieve successful brownfield projects.

Additional complexity factors of brownfield projects

Brownfield projects include the modification of an existing facility, which is often currently being operated. While those modifications may vary significantly in magnitude depending on how much the changes or additions are done separately from the existing facility and how complicated the tie-in to the existing resources is, factors are always at play which increase complexity. Increased complexity always leads to a reduced success rate and a much higher uncertainty of the project outcome (in terms of cost, delay or operability of the final facility). Therefore, achieving success in brownfield projects is often harder than in greenfield ones.

Organisational complexity increase

By definition, a brownfield project will involve an existing, structured operating organisation. This organisation will have established habits and processes over time which have to be accounted for. Unionised workforce issues may have to be addressed, as well as the social consequences of the planned changes. Expectations of the operators will have to be managed which may sometimes be difficult. Processes not directly linked to production may also need to be modified temporarily or permanently (typically: logistics, warehousing, expedition, waste & effluent management, etc.).

A Change Management process needs to be included in the scope of the project to modify operating processes, recruit and re-train operators, even sometimes substantially change the site's culture. This change management process may also need to include subcontractors continuously present on the site for operation and maintenance and should not be strictly limited to the facility staff.

Proper involvement of the operator during the project and specifically during commissioning is also essential and requires operators to be available to support this effort.

The presence of these additional stakeholders who need to be aligned with the project objectives increases the complexity of a brownfield project.

Technical complexity increase

On the technical side, several dimensions of complexity appear:

- Incomplete knowledge of the existing facility. Often records may not have been kept properly in

particular for modifications during the course of the facility's operating history. Even if they are, the actual condition of the facility and obsolescence of its operating, control and monitoring systems will create substantial uncertainties during the design of its modifications and tie-ins with the future facilities,

- On the process side, the informal knowledge of operators will need to be considered before disturbing operating parameters,
- For historical sites, loss of memory on very ancient infrastructure which may lead to surprises and situations that are unacceptable in view of the modern environment and regulatory requirements,
- Control system compatibility and revamp creates substantial complexity issues at the software level.

Project execution complexity increase

Brownfield projects will often include execution constraints for the realisation of parts of the project, which have to fit into planned maintenance and planned shutdown periods of the plant. Those periods are often very packed with numerous activities and any addition to their duration will impact the current profitability of the facility. This leads to very strong execution constraints for critical scopes of project execution. As any intermediate hard constraints in a project schedule, this creates additional complexity.

Other aspects of complexity increase

Other aspects include:

- Exploitation of the opportunity by the regulator to impose updated regulatory requirements to the existing facility at the occasion of its modification, further than would be strictly required by the new project,
- Involvement of the commercial organisation and synchronisation with the needs of the facility clients, both to accommodate limitations of production during the project, and the sale of additional production or new products during start-up.

Aspects that are made easier in brownfield operations

This description would not be complete without mentioning however that brownfield projects are easier on certain aspects. However, these positives by far do not compensate for the increase in complexity:

- Actual knowledge and understanding of local conditions (soil or seabed conditions, weather, extreme events, local capabilities, logistics etc),

Clear project definition and organisational integration are paramount for project success

- Established relationship with local authorities, local acceptance level.
- Established relationships with local subcontractors and contractors.

How to address the additional complexity of brownfield projects

Complexity increases with the number of parties in a project and the need to align them. It also increases with uncertainties on the scope of the project. Therefore, the main actions to manage complexity on brownfield projects will involve a two-pronged approach:

- Organisational integration and alignment,
- Specific attention and effort on the project definition stage.

Organisational integration and alignment

Maximum inclusion and alignment of the operating organisation in the project is essential. There is a limit in that this organisation will typically not have experience in running large projects and will lack the related competencies. However, we typically recommend when possible that the operating organisation plays the role of Owner for the project and be reinforced by relevant experienced project management resources. In case where several departments are involved in the operation of the current facility, it is essential to designate a single leader.

Strong leadership is then required to ensure the entire operating organisation is aligned with the intent of the project. Practically, this means that the leader of the operating organisation may need to have specific traits and competencies related to project execution, and that continuity is ensured throughout the duration of the project.

The project should include a significant component of an organisational transformation project involving all staff and permanent subcontractors of the operating plant who would be affected by the change. The project should not be run confidentially on the side. Even if for practical purposes the project team will operate somewhat separately, a strong interface and information flow needs to be maintained. Ideally the project team should reside at

the same location as the operating organisation. Proper involvement of key operating personnel needs to be ensured. This needs to be anticipated, as substantial involvement will be needed as soon as commissioning planning starts, with substantial impact on the production organisation.

Enhanced project definition stage

To avoid to the maximum all stumbling blocks associated with possible surprises in the existing facilities, permitting issues or other unexpected issues which may derail the project, the project definition phase needs to be reinforced. It needs to include a

specific focus on interfaces with the existing facility and site. Issues need to be anticipated as much as possible even if it involves significant costs for surveys and studies. The project needs to be started with a proper understanding of the complications involved and a minimisation of uncertainty.

In terms of execution plan, a substantial Change Management plan needs to be developed and the resources required budgeted and identified. This will require some work to ensure that this plan is adequate and relevant.

Therefore, the effort to be put in project definition will often be higher in the case of brownfield projects compared to greenfield projects. This is often underestimated or misunderstood on the assumption that knowledge of the facility should rather make it easier.

Conclusion

The additional complexity of brownfield projects is real and is too often underestimated. This additional complexity has a significant impact on the success rate of those projects. Integration with the operating organisation is essential from the start, as is a proper leadership. The project definition phase will generally require more work than in a greenfield project, and this needs to be properly accounted for.

Never forget to include in the project scope the interface with the existing facility and the changes therein!



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