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SIGNED, SEALED, DELIVERED

The chemical process industry in North America is undergoing a rapid transition, brought about by the recent discovery of shale gas and the sudden collapse of crude oil prices.

The price of crude oil and natural gas is widely publicised in the media since it affects almost every aspect of human activity. Crude oil and natural gas are essential raw materials for the production of transportation fuels, fertilizers and a wide range of petrochemicals and polymers. These products are eventually converted into everyday products including plastics, packaging materials, textiles, fibres, paints, solvents and a host of speciality products. Since the early 2000s, supply and demand of crude oil has fluctuated widely, resulting in a high degree of price volatility (Figure 1).

By contrast, the 1990s were a period of relative price stability. This allowed large corporations to develop projects to achieve the desired outcomes. However, in the current environment, when the price of crude oil has declined by a factor of four from a high of US$142/bbl in July 2008 to a low price of approximately US$30 – 40/bbl, it is very difficult for corporations to remain profitable and develop successful projects. Major corporations are being restructured and large capital projects are being re-evaluated in a market where supply, demand and

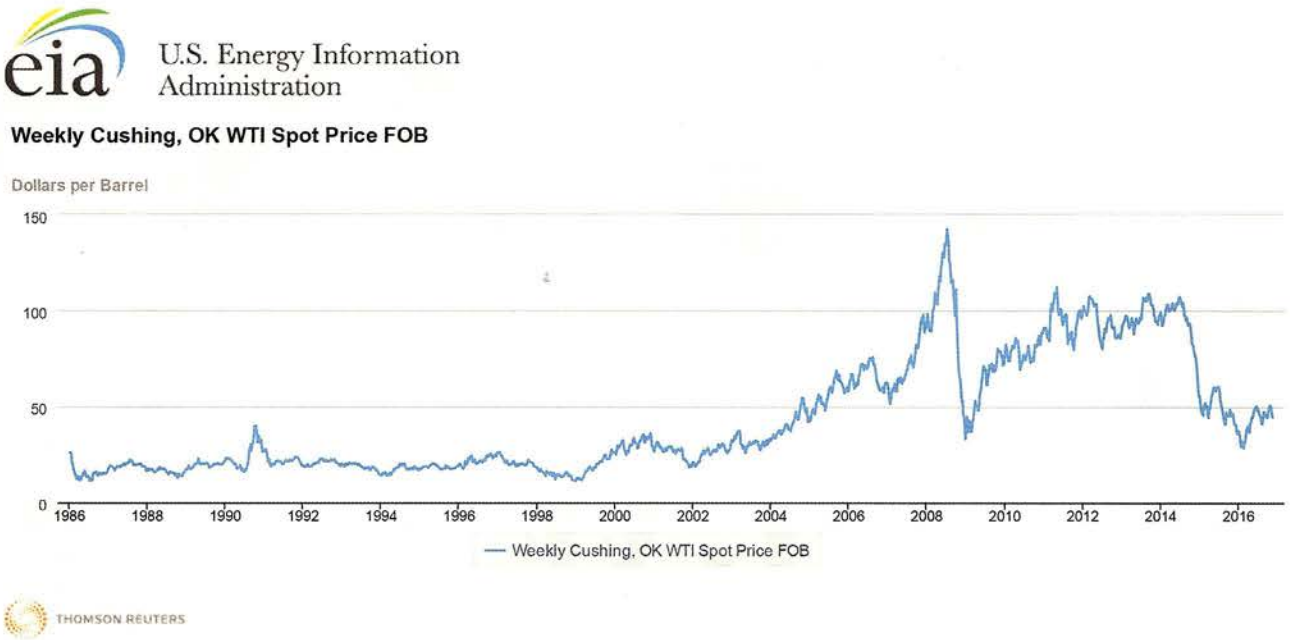

Figure 1. Spot price of crude oil.

pricing have suddenly become very unpredictable. In this environment, only the very best projects are able to move forward. This article will describe an example of such a unique approach for the successful construction of fast paced projects to meet business deadlines and capitalise on market opportunities.

Integrated solution

Today, successful projects tend to be smaller with very stringent cost parameters and extremely tight project schedules, with incomplete scopes of work, at times. In order to meet quality, schedule and cost targets, a paradigm changing approach must be embraced for a successful project. By having a single point of contact for all project needs, including design, civil, structural, mechanical and electrical, it is possible to streamline the entire process. In addition, using the latest design tools and methodologies, it is possible to meet accelerated project schedules. Finally, having in-house fabrication capability for all disciplines ensures high quality and complete control over the entire project outcome.

Such an arrangement does not mean that the owner or operator has to give up on competitive bids. It is possible to offer a design/build bundled package for maximum overall efficiency, speed and cost savings. In addition, another option can also be offered. This would be to provide only the design service with the ability to obtain competitive bids for equipment, fabrication and installation. Naturally, by breaking up the entire process into two steps, there will be some delay in schedule and additional administrative costs. These costs cannot be avoided initially. However, once a relationship is built up over successful projects, the owner or operator may consider an 'open book' arrangement with the design/build contractor. Such an approach is expected to deliver the best overall results and represent a true 'win-win' for both parties.

These extraordinary results are achieved through partnering and by using the latest computer aided design (CAD) tools, along with the best project software used by many of the top Fortune 500 engineering and construction firms. This can be applied to a multitude of chemical processes and industrial applications, resulting in the following benefits:

- Real time material, labour and equipment quantities and values throughout the duration of the project.
- Value engineering during the planning and design phase to optimise constructability.
- Multi-discipline interactive model reviews to minimise interferences and obstructions.
- Intelligent 3D models produce accurate design deliverables, such as automatic isometric production that facilitate reduced project schedules.

Instead of invoking the clause 'Contractor to Field Verify All Dimensions Prior to Construction', which is a common practice in the construction industry, ShureLine stands behind its dimensional quality. This provides a total solution including design and installation in a timely and cost effective manner. The single step dimensional quality approach also means the owner or operator will not pay twice for the same design service, whether it is realised or not. From design, procurement, fabrication and installation, an array of design services can provide the basis for a successful project. The following services streamline project development and execution:

- Front end loading (FEL) services: these services include scope development assistance, detailed

Table 1. Butane blending schedule

		Jun 14				Jul 14				Aug 14			
		1	2	3	4	1	2	3	4	1	2	3	4
1	Initial site visit and scope review - 11/6/14	◆											
2	Project approved - 19/6/14												
3	Civil, structural, mechanical and electrical design start - 23/6/14												
4	Civil mobilisation - 28/7/14												
5	Structural supports and bridge fabrication start - 21/7/14												
6	Pipe fabrication start - 21/7/14												
7	Install steel - 11/8/14												
8	Install piping and electrical - 13/8/14												
9	DOT tie-in - 27/8/14												
10	Turnover - 29/8/14												★

Figure 2. Butane offloading station.

material take-offs, miscellaneous lists and tabulations, schedules, as well as project cost budgeting and estimates. Having a thorough and detailed scope definition is important to solicit a lump sum firm price, and avoids change orders, which invariably adds cost and delays execution, in addition to causing misunderstanding and conflict.

- Design services: by utilising AUTOCAD-based software, such as CADWorx Plant Professional, this brings the ultimate experience in interactive design model walkthroughs for pre-fabrication approvals prior to any construction activities. Each design deliverable for the project is extracted from a single intelligent 3D model. The flexibility of the software also allows customisation for any project type or size. Again, this minimises cost and accelerates the schedule. Visiting the site for extensive field verifications and as-built conditions is a priority for starting and completing the project successfully. There is no substitute for face-to-face meetings; regular and detailed discussion, with frequent field visits, ensures coordination with site operations personnel. It is also important to offer 'as-built' design services, such as piping and instrumentation diagram/drawing (P&ID) and piping system walk-downs, for record updating purposes after turnover to operations. Detailed documentation is critical to the owner or operator long after the project has been completed.
- Quality assurance and documentation: providing the required documentation throughout the project is essential to ensure federal, state and local regulations and codes have been followed and satisfied. Upon completion, a project data book is assembled and transmitted to the owner or operator for record purposes. The book should contain all procedures, specifications, calculations, test reports, recorder charts, calibration records, inspector qualifications and reports. Additional or other miscellaneous documentation may be required depending on the nature of the project.

A key tenet underlying all the design, fabrication and installation activities is an absolute firm adherence to quality and the highest safety standards. Safety is,

and will continue to be, the number one priority for a successful project.

Case study

In 2014, a project to design, fabricate and install two butane offloading stations was completed using a fully integrated approach with a single point of contact. The scope of this project is summarised below:

- Design, fabricate and install two butane offloading stations.
- Provide Department of Transportation (DOT) pump manifold tie-ins to a 113 ft x 60 ft aboveground storage tank.
- Install over 550 linear ft of 6 in. butane offload piping.
- Install over 70 linear ft of 8 in. butane blending piping.
- Design, fabricate and install an elevated pipe bridge, along with individual pipe supports for each pipe run.
- Truck staging, turnaround and containment areas.
- Design, fabricate and install new firefighting and protection capabilities.
- Install over 250 linear ft of 12 in. firewater piping.
- Provide additional firewater cannon and monitors.
- System configuration to accommodate two additional offload stations.

From start to finish, the project was completed in three months, illustrating the benefits of having an integrated project solution. A simplified schedule is shown in Table 1.

Figure 2 shows one of the two butane offloading stations, along with the fire suppression system during validation. This project was designed and fabricated in Delaware when site preparation and civil work was being performed. The structural, mechanical and electrical components were installed on a turnkey basis onsite in New Jersey, US.

Conclusion

Process projects have to be carefully conceived and developed in order to achieve ever more rigorous demands for quality, safety, cost and schedule. Having a single point of contact for design, civil, structural, mechanical, and electrical expertise enables the streamlining of accelerated projects by using the latest design tools and methodologies. In addition, partnering with a contractor with in-house fabrication capabilities, along with design, ensures high quality and complete control over all disciplines. The combination of these features, along with a real commitment to safety and the customer's needs, enables successful project execution in a timely fashion at the lowest possible cost.