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BUSINESS CASE 2: PHILLIPS 66 WOOD RIVER COKER AND REFINERY EXPANSION (CORE) PROJECT

The Phillips 66 Wood River Refinery (WRR) has been a strong member of the business community for the last century employing over 800 workers. WRR is located in Southwestern Illinois near St. Louis, MO. The facility has overcome the cyclical business nature of the petroleum industry and invested in growing its refinery facilities throughout the years. As one of North America's largest refineries, Phillips 66 has partnered with Cenovus Energy, a Canadian Oil Company, on the $3.8 billion dollar Coker and Refinery Expansion (CORE) Project to gain an advantage as new opportunities arose in the energy production industry. The CORE Project significantly improved the competitive position of WRR in processing heavy Canadian crude oil. The project leveraged WRR's size and location to increase total crude throughput, doubled the processing of price advantaged, heavy crude, significantly increased coking capacity, and improved clean product yield. The driver for this expansion was the availability of heavy Canadian crude via the new Keystone Pipeline running through the Wood River area.

The CORE Project built new units, as well as affected nearly every existing unit in the refinery. The complexity of this project was quite high as it involved major and minor revamps, unit re-starts, new grass-root units, upgrades to utilities and other infrastructure, and new off-site facilities. The project was classified as a "mega-project" in terms of size with over 22 million site work hours and $3.8 billion dollar investment in new refinery equipment, processing technology, and other enhanced capabilities.

In March 2006, the Phillips 66 team began engineering design and scope development for the CORE Project. In December 2007, the project received full funding approval to move forward with the detailed engineering, procurement, and construction phases of the CORE Project. Construction began in September 2008 with multiple large projects being built simultaneously within the refinery. All construction was completed in November 2011 with the commissioning and startup of the new Coker. There were no significant impacts to refinery operations or environmental performance during project execution and start-up. The start-up of the units went extremely well with zero safety incidents.

This project also benchmarked very favorably with five other refining industry mega-projects executed during the same time period. It was the safest, experienced the least cost growth, and was the second fastest in project completion in comparison to other mega-projects within the refinery industry.

This was one of the largest projects of its kind within Phillips 66 and to provide overall perspective, key project facts are listed below:

- 175 miles of new pipe = St. Louis to Indiana
- 104,000 cubic yards of concrete = 2 Empire State Buildings
- 22,000 tons of structural steel = 1/2 Empire State Building
- 3 million feet electrical cable = St. Louis to Dallas

PROJECT SCOPE & EXECUTION

The CORE project was split into three areas to facilitate the project management and control all aspects of each project component. The three areas are listed below:

New / Grass Roots Units

- Coker Complex (Coker, Coker Gas Plant, Coker Naphtha Hydrotreater, and Vacuum Flasher Unit)
- Sulfur Complex (Sulfur Recovery, Tail Gas Treating, Amine Treating, and Sour Water Stripper)
- Hydrogen Plant

Revamp / Re-start Units – Modifications to existing refinery process units

- Distillation Unit #1 Upgrades
- Lube Crude Re-start
- Catalytic Cracking Unit #1 and #2 Upgrades
- Ultra Low Sulfur Diesel Unit Upgrades
- Hydrocracker Unit Modifications

Offsites and Infrastructure (OSBL)

- Interconnecting piping and piperacks
- WWTP upgrades to handle higher solids loading and flow rate
- Fire water system upgrades for the new Coker Complex
- New refinery air compressor
- Crude tank farm modifications and connection to the Keystone Pipeline
- Diesel system upgrades
- Expanded rail loading for sulfur

The CORE project required significant pre-planning to prepare for each of the construction phases. For example, the Phillips 66 team worked diligently to enhance a nearby Mississippi River dock facilities for offloading of very large modular construction components. Additionally, the entire roadway from the river dock facility to the refinery construction site required significant enhancements to allow for the large equipment to be transported effectively. This process required building new heavy access roadways, widening and strengthening other roads, moving utility electric lines, and working extensively with Illinois Department of Transportation (IDOT). The transport process also required significant assistance from local municipalities and the Illinois State Police to ensure safe movement of the large equipment modules.

The construction work environment was extremely complex. Four of the largest US construction contractors were employed to execute the work with over 4,600 construction workers at various construction sites at the same time. This required extensive coordination, such as on-site badge approvals, staggered interval shifts for start/lunch/end of work scheduling, supervision of on-site workers, building additional parking lots, etc. The site also required extensive materials management and inventory control to ensure all of the needed components and equipment was ordered and on-site when needed for construction.

For construction of each of the primary scope areas, a prime contract was awarded to the following national contractors:

- **Bechtel Oil, Gas & Chemicals, Inc.**
  New Units
- **Cherne Contracting Corp**
  Revamped and Restarted Units
- **URS (Washington Division)**
  Sulfur Units
- **Fluor Daniel Illinois, Inc**
  Offsite and Infrastructure Modifications

In addition to the prime contracts, the WRR CORE Procurement and Contracts Team at site issued more than 1,500 service agreements to local contractors (e. g., MCI, Widman, Helmkamp, JF Electric, Wegman, GRP, etc.) for work managed directly by the WRR CORE Construction Management Team.

On site, construction was performed by union contractors under the General President's Project and Maintenance Agreement (GPPMA) that covers site policies and work conditions. Additional general contractors and the direct-hire service contractors provided services for the WRR CORE Construction Management Team. Using the Tripartite approach, monthly job progress meetings provided the foundation for a good work environment with a high level of cooperation from all parties. The monthly meetings included members from WRR Core Construction Team, the construction contractors, and labor represented by Dale Stewart of the Southwestern Illinois Building and Construction Trades Council. Additional site-wide safety leadership teams and construction management teams met on a monthly basis. WRR CORE Construction Management

team emphasized how critical it was to the overall project's success to have owner representation at every meeting, so key decisions and follow-up could be made to demonstrate Phillips 66 commitment to safety, quality construction, and productive work environment with all stakeholders. **Larry Sicking**, Phillips 66 Senior Project Manager, stated, "We learned quickly how impactful meetings were using a true tripartite approach to the overall success of our project. We openly discussed real problems and proactively solved those problems without blaming each other. It was critical to have the Business Managers, Contractors, and the Phillips 66 leadership involved to overcome any project challenges on such a large construction project."

What is the tripartite model?

Tripartite is used to define a trilateral or three-way approach to organizing a construction project by first agreeing on the terms of collaboratively working together per the GPPMA. The "lateral" part of the term indicates a move from vertical, hierarchical relationships to more team-based horizontal ones. The hallmark of such agreements is a high level of cooperation and collaboration among the three parties, especially labor and management. The concept includes planning, teamwork, implementation and execution of mutual project goals and objectives. There is recognition that the tripartite model promotes increased communication and coordination central to the way things get done right. Such arrangements have been shown to improve quality, safety, productivity and on-time cost savings, particularly on large complex projects with the required pride and professionalism of the working professional, but most of all, it insures trust and open lines of communications between all tripartite partners and at the end of the day, it is a mutual success story for all parties involved.

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> *-Tom DeClue III, GRP Mechanical Company*

The WRR CORE Construction Management Team stated that the Tripartite approach provided a strong foundation of cooperation, trust, safety, and productivity. This led to the creation of an overall positive work environment where WRR CORE Construction Management kept the focus on safety for all workers, which resulted in building a stronger team effort across all stakeholder groups because everyone was looking out for each other. According to **Tom DeClue III**, President of GRP Mechanical Company, "It is the quality of people sitting around the table that makes the difference. Whether you are an owner, contractor, or member of labor; everyone treats each other with great degree of respect that just builds long-term relationships of trust and communications, so there is a high level of cooperation and everyone is there to enhance project outcomes - safety, schedule, costs, and productivity." This aspect was further supported by **Terry Buhs**, President of Wegman Electric Company. Buhs stated, "We have been doing

electrical work at the refinery since 1960's and we believe strongly in this approach. Everyone comes to the table and discusses any concerns leading to a quick resolution. We installed over 68 miles of high voltage electrical lines in this project without an lost time accident enabling us to stay on schedule and within budget. I am proud of this project and especially how everyone came together to make this mega-project a big success!"

Safety performance during project execution was exceptional in comparison to other mega-projects. The project achieved a Total Recordable Incident Rate (TRIR) of 0.38 and a Lost Time Incident (LTI) rate of 0.02 with over 22 million field work hours. The project finished strong the last 24 months without a lost time injury with over 15MM work hours completed.

According to Larry Sicking, "The areas achieving the best safety performance had excellent craft engagement and were able to win the "hearts and minds" of the crafts. The proper balance of positive recognition and personal accountability to follow safety procedures also proved important to success in safety." **Dale Stewart** commented, "There was a strong emphasis on safety from the beginning of this project with everyone looking out for each other. If any concerns existed, we openly discussed and the issues were promptly addressed. For a project of this size, I am so proud of how everyone work together and communicated openly."

With so many construction workers coming into the area from different union halls, the WRR CORE Construction Management team recognized varying degrees of experience and work backgrounds; therefore the team strongly believes it is critical to have the right people with the right attitudes in leadership positions who can motivate the workforce and inspire trust through good communication and management. Dale Stewart stated, "We recognized that everyone needed to have consistency, so we addressed this challenge directly when it arose with strong training and production oversight and measurement. Construction trades strived to reduce any need for project rework and increase project productivity. It is critical to have open communications and willingness to work together across at all levels on the job."

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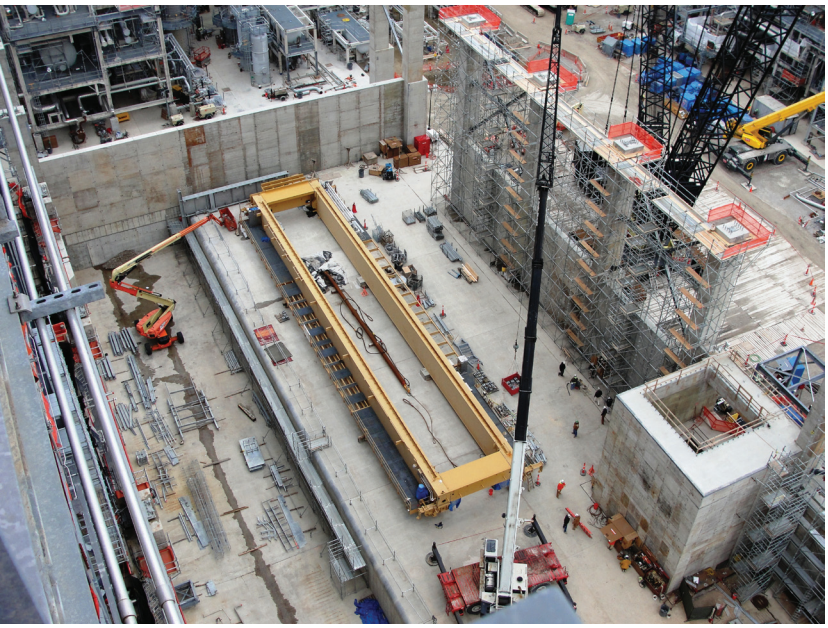
In the final project phases, the commissioning and start-up activities encompassed approximately 27 different units, other existing process equipment, new utility systems, and new refinery interconnecting pipe racks in a safe and timely manner. A dedicated Prepare to Operate (PTO) team planned and executed the commissioning and start-up activities. The organization had significant refinery experience both in leadership positions and at the individual project levels. The PTO team coordinated the interface with the existing refinery to complete over 500 tie-ins without impacting refinery operations.



Overall, the start-up effort for all areas of CORE from 2007 to 2011 was highly successful with no safety incidents in operations or start-up personnel and no significant environmental incidents. Larry Sicking stated, "We had a very good relationship with all of key construction stakeholder groups; including union labor, contractors, and WRR Construction Management team; on this project and we continue to build those long-term relationships of trust and communications. As this project clearly documents, these types of working relationships really do payoff in terms of completing this mega project on-time and within budget. We learned a lot along the way that will help Phillips 66 on future projects. "