

Case study: China

Total Chemical Management ensured operator rapidly met objectives and reached full production in three months

An operator developing a new offshore production field in north China needed to partner with a reliable and experienced production chemical services provider. The project was in the largest offshore field in China and produced heavy oil. The first phase of the project had 14 producing and two injection wells on a single platform. The produced fluids were transported to a floating production, storage, and offloading (FPSO) vessel. The second phase included five platforms, central processing facilities, and a new FPSO with a handling capacity of 510,000 BFPD and a processing capacity of 190,000 BOPD.

Baker Hughes was chosen as the partner because of our global resources, proven successes on similar projects, and our established commitment to our customer's success. Our first task was to thoroughly understand the customer's key issues and concerns. In collaboration with our customer, experienced Baker Hughes staff developed a plan that would meet the customer's objectives by facilitating a fast startup and implementing a production process that would rapidly produce on-spec oil with only one pass through the limited treating facilities.

Our global experience in offshore startup operations was critical in anticipating and solving the inevitable startup challenges. Once in production, Baker Hughes worked closely with the customer to improve processes while streamlining and optimizing operations.

Keys to our success were establishing a local warehouse to ensure a timely and adequate chemical additive inventory and delivery program, continuous testing of produced fluids and chemicals to optimize production and ensure equipment integrity, and an effective corrosion and contamination monitoring program.

Baker Hughes experts were transferred from other locations to provide on-site technical support during startup and production. Customer staff was trained in monitoring and testing procedures, as well as in relevant HS&E issues. In addition, Baker Hughes and customer staffs developed a plan to efficiently bring more wells on line.

During the first months of production, true teamwork, constant collaboration, and a proactive approach to problem solving resolved all operational problems in a timely manner. Within three months of first oil, all major operational issues were resolved and production was in full ramp-up mode.

After commissioning and startup, Baker Hughes focused on continuous improvement in chemical services to keep costs down. Regular in-depth reviews of treatment performance helped to maintain operational excellence as the produced fluids changed over time.

Baker Hughes also ensured full compliance with HS&E requirements and took additional measures to ensure site safety and operational

Challenges

- New production field, offshore China
- Heavy produced oil (21° API gravity)
- FPSO with capacity to handle 510,000 BFPD
- Limited processing capabilities
- Develop reliable chemical supply and delivery
- Establish cooperative partnership to maximize operational effectiveness

Results

- Reliable supply chain
- Proactive partnership with effective collaboration
- Smooth and efficient operation during production startup and beyond
- Fast and effective problem identification and response
- Successful, long-term partnership
- Developed thorough understanding of project objectives, potential problems, and customer concerns
- Delivered consistent production with limited processing facilities
- Established robust inventory and delivery system
- Implemented monitoring and mitigation program

efficiency. To prevent erroneous and potentially hazardous chemical injection errors, tank valves were labeled in the local language. In addition, we recommended that all valves and couplings be color coded and installed to prevent accidental pumping of the wrong chemical.

As part of the partnership, Baker Hughes produced daily, monthly, and annual activity and progress reports on specific customer concerns. In addition, Baker Hughes regularly welcomed site visits by customer account managers to make sure that the partnership was operating efficiently and productively.

This customer entrusted Baker Hughes to ensure smooth startup and production ramp-up operations in the first phase of field development—over the course of seven years.

Baker Hughes has delivered on that trust by anticipating and resolving new problems. This long-term partnership has delivered unquestioned value to the customer and helped prepare for their successes in future project development phases.

Key customer objectives at startup	Actions taken
Smooth startup, on-spec oil, and rapid production ramp-up	Continual, locally sourced Baker Hughes personnel on FPSO and wellhead platform (WHP) during first six months of startup. Continuous on-site US- and UK-sourced tech support for 30 days prior to startup and 120 days during startup
Security of chemical supply	Full coordination of chemical delivery process. Warehouse established. Weekly inventory to ensure supply.
Maintenance of equipment integrity	Evaluation of fluids and selection of production chemicals. Corrosion, H ₂ S, and bacterial monitoring and mitigation
Preparation for seawater injection	Identification of product storage location. Arranged chemical injection and performed initial system cleanup.
Production chemical startup and optimization as water cut increases	Continual testing and optimization for the first two months of startup with regular review of chemical programs
Customer personnel training, including relevant HS&E issues	Provided personnel training for monitoring and lab testing
Preparation for additional well commissioning	Developed a process for new well addition. Provided additional support during new well startup.

Challenges and issues encountered	Actions taken
FPSO was relatively small—no room for reprocessing	Close, dedicated monitoring of crude oil processing. Highly effective fluids separation products identified and deployed.
Individual well startups causing processing difficulties due to completion fluids	Identified source of problem. Worked to develop effective treatment solutions.
Supply chain for offshore products encountered obstacles due to weather, on-demand needs, varying production levels during startup, and equipment problems	Developed an efficient supply process with the customer for on-demand product delivery and QC system for products and delivery
11 of 14 capillary systems for downhole injection not operational at startup	Baker Hughes quickly assisted with commissioning of all capillaries
Electrical dehydrators off-line at startup	Worked with the producer to provide a treating program as a work around until the equipment was repaired
Chemical injection pump's size and location	Managed this challenge and worked through lengthy supply issues to provide correct pumps and injection locations
Crude oil sampling difficulties at offloading due to water that had dropped during storage and giving errant water-in-oil readings	Baker Hughes designed procedures for water removal from crude storage tanks prior to sampling and offloading
Corrosion in fuel gas supply line	Rigorous and timely corrosion evaluation and mitigation program was implemented
Tank level and switching hardware as initially installed led to supply challenge	Reconfigured tank usage protocols to ensure continued supply of production chemicals to processing streams

