

# MATURE WELLS IN ANGSI FIELD FLOW FREELY WITH MULTIPHASE PUMP TECHNOLOGY

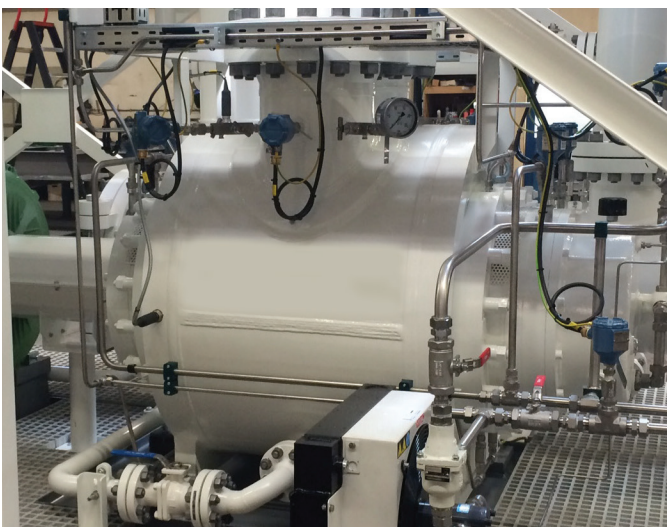
Unmanned offshore wellhead platforms are a singular type of asset for an oil company. In their isolation, everything that makes them up must be rugged and dependable. They are designed to operate remotely, to be visited only occasionally for routine maintenance or well work. Continuous trouble-free operation is the Holy Grail.

## THE CHALLENGE:

### ENHANCING PRODUCTION WHEN PRIMARY OIL RECOVERY CEASES

When Petronas progressed into the infield development and enhanced oil recovery stages of Peninsular Malaysia's Angsi field in the South China Sea, after a decade of primary oil recovery, engineering consultant MMC Corp contacted CIRCOR to learn about its multiphase pump (MPP) systems. As fields deplete and reserves become harder to access and wellhead pressure management more critical, greater pump versatility is a necessity to adapt to the new conditions and maintain and even increase production. But how can that be done while keeping CAPEX and OPEX at reasonable levels for the anticipated return?

An MPP system is a sound approach for such offshore platforms on both fronts. It is a significant advancement for conventional production operations. The complex mixture of unprocessed oil, gas, water and particulates produced by a well during the life of a field (defined as multiphase flow) is typically separated, and then the liquid is pumped and the gas compressed through separate pipelines to downstream processing operations. In certain cases, the gas may be re-injected into the wells to assist in oil recovery, and/or smaller amounts of gas flared to the atmosphere.



## CASE STUDY OVERVIEW

### CHALLENGE:

- › Adapting to shift toward enhanced oil recovery on remote offshore platform
- › Implementing wellhead pressure management in small footprint
- › Keeping CAPEX and OPEX at reasonable levels

### SOLUTION:

- › Twin-screw pump efficiently conveys fluid, maintains excellent suction, accommodates a wide spectrum of gas fractions and flow regimes
- › Single multiphase pipeline from MPP module to central production facility eliminates costly surface facilities
- › Real time control/monitoring module allows local and remote management

### RESULTS:

- › Mechanical integrity of pumps and control system intact after year of operation

An MPP system handles multiphase flow with a wide range of gas volume fractions (GVF) at the production manifold or wellhead and moves it to a central production facility via a single multiphase pipeline. This approach helps to eliminate the costs of typical surface facilities such as separators, gas compressors, gas flaring, storage tanks, separate liquid pumps and field-installed vapor recovery systems at the production module. The resulting footprint needed to operate is substantially smaller, and platform or infrastructure construction, maintenance and inspection costs just as substantially lower.

MPP systems enable active management of wellhead pressure by decoupling wellhead pressure from the pressure required to move production flow through surface facilities or pipelines. This flexibility helps to improve recovery by allowing optimal reservoir management and production stimulation through reduced wellhead pressure.

It may also generate immediate revenue; operating expenses can be diluted through production increases, and long-term revenue can be improved through increased well productivity lifespan. Environmental benefits may also be realized through the elimination of gas flaring, footprint contraction and reduced potential for spills.

## THE SOLUTION

### BOOSTING MULTIPHASE FLOW

The MPP solution presented to MMC following an unsatisfactory experience with the MPP of a competitor gave CIRCOR the opportunity to demonstrate the company's leadership in front-end engineering, packaging and delivery of this complicated technology.

The CIRCOR MPP system technology is a modular system comprised of a twin-screw pumping module, basket strainers, power supply unit with variable frequency drive, power distribution, and liquid recirculation and cooling. There is also a module set up for real time control and monitoring functions both locally and remotely. Due in part to the special screw profiles, in which two pairs of opposed screws efficiently convey fluid to the center of the pump where the discharge port is located, the fluid is efficiently pumped with limited internal slippage while maintaining excellent suction characteristics.

This design helps to maintain proper wetting of the screws without recirculating fluid back to suction, improving volumetric output. The hydraulic forces generated are opposite and equal, so the rotor is axially balanced hydraulically, increasing the mechanical integrity of the pump. Since timing gears prevent the screws from contact, there is minimal or no wear of metal parts over the life of the pump.

The composition of wellhead multiphase flow fluctuates continually across a spectrum of gas fractions and flow regimes – bubble, slug, transition and mist. This variability can be a challenge to reliable system performance but the CIRCOR MPP system is engineered to accommodate it.



To select the appropriate version of the CIRCOR MR series of MPP system, several production scenarios for the operating life of the field were forecasted. MMC selected a MR-250 solution, with redundancy, for the following approximate service conditions:

- › API: 40°
- › Liquid flow: 9000 bpd
- › Gas flow: 25 MMSCFD
- › GVF: 97%
- › Pressure differential: 3 bar
- › Ambient temperature: 15 C to 40 C

## THE RESULTS

### FLAWLESS PUMP OPERATION AND CONTROL SYSTEMS PREVAILED

There have been no reported failures or problems directly related to the mechanical integrity of the pumps or their associated control system in the year since the MPP system was installed. Mechanically, the pumps are robust and the controls are functioning as designed. This has been true even as the system has been tasked with unplanned parallel operations and has overcome an undesirable pre-system piping arrangement.

FOR ADDITIONAL INFORMATION VISIT:

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