

## SPE Thailand Annual E&P Award 2014

**Company:**

PTT Exploration and Production PCL

**Project:**

Arthit Asset

**Title:**

Minimum Facility Platform for Gas Field in the Gulf of Thailand

**Project leader:**

Vuthiphon Thuampoomngam (SPE 3265847)

**Project team members:**

Supamittra Danpanich (SPE 3578163)

Pichet Sangjan

Ratchada Lertwanichwatana

Wiwit Sumritwatchasai

Lawan Thiendhavorn

Warakorn Kunnathep

ChoosakKokanutranont

Saran Umpuch

Pongpat Hongtong (SPE 3516641)

Suthasinee Jinarakpong

Nisit Rungrujirat

Chao Trithipchatsakul

Pheerasak Phanichtraiphop

Thitinun Sillapacharn

Natthawadi Limsaguan

Chanwith Buntoengpesuchsakul

Tanadcha Therdwikrant

Taweepong Maneeanekcoon

Penporn Sirilatthaporn

Suchada Punpruk

Yossaran Pichiansoontorn

Wanvisa Suranarongphan

### Minimum Facility Platform for Gas Field in the Gulf of Thailand

**Innovation Feature:**

Arthit gas field, in the Gulf of Thailand, is developed using 4-legged conventional wellhead platforms (CWP) those are designed to cater for 16 wells, 120 MMSCFD and equipped with all-inclusive systems for well production and testing, draining, and process utility. The CWP can accommodate Jack-up and Tender Assist Drilling (TAD) rig for drilling and well abandonment operations, also a booster compressor unit to reduce backpressure for selected low-pressured wells those selectively routed to the unit to gain higher hydrocarbon recovery efficiencies. Arthit asset has installed 32CWPs since 2008, involving a huge capital investment required to ensure a constant delivery of the contracted petroleum supply to Thailand. A more reasonably priced platform than the CWP is required to develop more geological prospects with small (marginal) hydrocarbon volumes economically; the CWP exposes a too high cost for these small prospects.

The concept of Minimum Facility Platform (MFP) was studied to identify the most optimized platform design that can match functions of the CWP nevertheless with a significantly reduced cost. The MFP aims to improve the project economics for the prospects those are sub-commercial with the CWP.

The MFPs designed to cater for 9 wells, and 40 MMSCFD with 35 CGR and 50 WGR. The topside facilities are designed for 5 years production life while the design life of platform structure is maintained at 15 years. The major designs for the MFP are as the followings;

- Integrated system containing a booster compressor unit and a separator (well testing and well unloading); thus combining the well testing and gas boosting manifolds
- Newly configured flow lines i.e., 3 commingled flowlines to reduce the number of actuated compact ball valves and piping
- Relocatable platform's crane and mobile pig launcher
- 100% green power supply by solar panels
- Optimization of equipment specification and material selection to fit for 5 years operating life

Design of utility systems i.e., fluid drain, gas instruments and power supply are also optimized in order to reduce number of facilities and therefore cost, however the functionalities of the MFP are matching CWP. The MFP can accommodate only Jack-up rig. The weight of topside and jacket for the MFP can be expected to further reduce by >10% and the simplified process flow diagrams of CWP and MFP are shown in Fig.1.

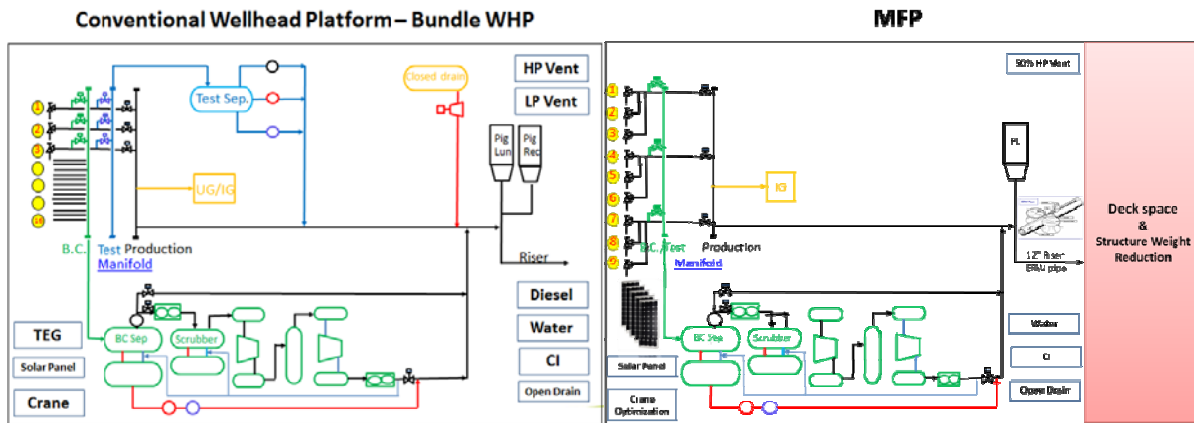


Figure 1: Simplified process flow diagrams of CWP and MFP

### Thailand E&P industry impact and values:

As Thailand's natural gas demand keeps increasing gradually, the capability of domestic gas supply will become limited since many petroleum prospects in the Gulf of Thailand are with small volumes (marginal & sub-commercial) hence are not developed. Some of them are located far from central processing facilities, so high development cost is expected. The MFP could help improving the development project economics and ultimately supporting natural gas supply in Thailand.

The MFP is believed to be able to assure commercial features for the development of marginal fields, not only in Arthit but also in Thailand. The MFP is fitting for marginal fields where platform's gas capacity is not high (circa 40 MMSCFPD). Apart from the innovative features mentioned earlier, the cost for the MFP can be further reduced due to the following aspects.

- Cost reduction due to a smaller pipeline size (10") is used in MFP as opposed to 16" in CWP
- Cost reduction due to a quicker transportation time from a smaller derrick barge requirement and a quicker installation time as the size of topside and jacket is reduced in MFP
- Cost reduction to achieve with the correct procurement strategy such as a direct purchase of major equipment by company

The expected percentage of cost reduction from the MFP (and its associated pipeline) in comparison with the CWP is summarized in Table 1 while Table 2 shows summary of the major changes contribute to the cost reduction in MFP.

	<i>Cost Reduction in MFP (%)</i>
Wellhead Platform	23.2
Pipeline (10 km)	28.4

Table 1:- Cost reduction in MFP (from CWP)

<i>Description</i>	<i>Cost Reduction (%)</i>
Removal of receiving facilities	3.7
New flowline-configuration and combining manifolds	3.4
Transportation optimization plan	2.8
10% Structure weight reduction	1.7
Integrated gas boosting, well testing and well unloading separator	1.5
Change power supply to full solar system with 15% load reduction	1.2
Relocatable platform's crane	1.0
Pig launcher size reduction (16" to 10") with mobile concept	0.6
Miscellaneous optimizations	2.1

Table 2:- Summary of major changes and cost reductions for MFP

It is conceivable that the MFP may be implemented as the new generation of wellhead platform for prospects with small to medium size gas volume in the gulf of Thailand. It has been proved that many topside facilities can be optimized to fit the technical and commercial requirements in the development plan. The study indicates there is a provision to increase number of well slots in the MFP to 15, support drilling operation by TAD rig, and install gas receiving facilities and link it to other remote platforms, thus the MFP can become a hub platform. In this example, the overall cost reduction that can be achieved by the modified MFP is 15 to 20% and, therefore, this MFP concept provides a significant efficiency improvement to the economic aspect of Thailand's E&P industry.

### **Why should this project win the award?**

The benefit of Minimum Facility Platform (MFP) is not only at the cost reduction but also at the optimization of the E&P operating standard. This new operation philosophy may not be the most convenient practice; however, it maintains major functionality and safety of production platform. This concept is a trade-off between operation flexibility and commerciality and it becomes necessary as number of large reservoirs is limited, and conventional production scheme with CWP does not seem to be the best solution for marginal fields. Thus, it is inevitable that E&P personnel has to put high efforts and step out of a comfort zone to overcome these difficulties.

The Minimum Facility Platform team has intensely devoted to this project in order to sustain Thailand's energy security. The team has challenged the conventional thinking and operation practices. We have an awareness of the limited energy supply problem in the near future and, therefore, try to stress the importance of this development. The project has been performed thoroughly by multidiscipline engineers with collaboration from many support

functions including facility engineering, well and drilling engineering, operation and maintenance, and safety from the feasibility study stage since 2013. Hence, it is considered an achievement of synergy between surface and subsurface teams. Currently, the project is in Front-End Engineering Design stage and will be moving to an execution phase in 2015. The project team wishes that theMFP will be another important stepping stone of Thailand's E&Pindustry to extend the capability of domestic petroleum supply from every available resource.

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