



## Key enablers in a production sharing contract operatorship transfer exercise

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### ARTICLE INFO

#### Article history:

Received 24 May 2017

Received in revised form 28 August 2017

Accepted 2 September 2017

Available online 20 September 2017

### ABSTRACT

Production Sharing Contract (PSC) is one of the petroleum agreements mode that are being utilized in many parts of the world in enabling exploration, development and production of the petroleum resources at the respective locations. It was first introduced in Indonesia in 1966, and followed by Malaysia, Vietnam, Thailand, and Brunei. One of interesting aspects of PSC management is the operatorship transfer handling when a PSC is nearing its expiry. When the time come, the current PSC contractor as operator has the option to relinquish it to the host authority to be handed over to other operator, farm it out to the other PSC contractor to reduce the risk exposure or continue operating under a new PSC terms. The most challenging will be to relinquish the operatorship to another operator whereby several complexities will need to be adequately addressed to ensure benefit preservation to the host authority, incoming operator and outgoing operator. Therefore there is a need to adhere to key factors or enablers to administer the operatorship transfer exercise if it occurs in the near future. The key enablers would be able to address the operatorship transfer exercise effectively with the objective to alleviate complications to the host authority, outgoing operator and incoming operator. With the emphasized in the PETRONAS Procedure & Guideline for Upstream Activities together with three case studies, this paper proposed several key enablers to be considered for a PSC successful operatorship transfer which is human resources, data management, asset reliability and integrity management, supply chain management and good relationship between parties. With identified key factors, it is hoped that any PSC operatorship transfer will be able to be managed smoothly and will ensure benefits to all parties concerned.

#### Keywords:

production sharing contract; authority; operatorship; contractor; competency

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## 1. Introduction

Most of the world petroleum reserves are found in developing countries where petroleum industry is considered as an engine of growth for the country economy. In many instances, prudent management of these reserves enables these countries to leverage on its wealth to prosperously grow, bringing benefits to its citizens. Due to the global energy needs and since oil and gas are well known as main components of the energy sources, the exploration, development and production of these finite resources will be continued in the near future.

It is a specific feature of the petroleum sector that exploration, development and production of these resources must take place where the resources are located. Ventures in this sector are of high risk in nature from the aspect of physical, commercial and political sense as it is difficult to determine in advance the existence, extent and quality of petroleum reserves as well as production costs and the future price in the world market [1]. Profitability is uncertain, and furthermore since the resource is finite, it is imperative to have a continuous acquisition of new petroleum deposits. After the earlier process of exploration and development took place, there is always the need to sustain the production for as long as possible to maximize the resources that are recoverable at the production stage given desirable economic return. At the end of the well or field life, there is abandonment, a stage whereby the production area need to be safely decommissioned, with permanent structures to be removed and production wells to be plugged to prevent the oil and gas from migrating to the surface overtime and possibly contaminating other formations and or fresh water aquifers.

Most of the time, the exploitation of these resources were carried out with the cooperation of international oil companies (IOC) and the host authorities. The IOCs which have access and technology know-how to extract and exploit these resources usually will have to work closely with the host authorities, the owner of these resources. The host authority can be represented by their special ministry that governs and overseeing these activities or it can be in the form of a national oil company (NOC). To enable this symbiotic relationship, petroleum agreements were put in place. Basically, there are four basic petroleum agreements or contract, namely concession, production sharing contract (PSC), service contract and joint ventures [1]. The major differences between them are mainly conceptual with regards to the level of control granted by the host authority and acquired by the IOC, compensation arrangements and level of involvement of the host authority or its representative.

Concession was introduced around 1900s. The first recorded concession was between William D'Arcy and Shah of Persia for a right to explore 500,000 square meter of land for a period of 60 years [1]. Basically, in a concession, oil companies were granted exclusive right to explore, develop, sell and export oil or minerals extracted from a specific area for a long period (usually 75 or 60 years) against the obligation to pay some bonuses, annual sums and royalties, the latter being tied to minimum annual payments [2].

Persons wished or obliged by regulation to undertake petroleum operations on a joint basis will have to negotiate and enter into an agreement which sets out the rules and procedures governing their co-operation [2]. In a joint venture, two or more parties are mutually agreed to participate actively in any specific business activities pursued. Joint venture offered the advantage in term of the decision making process. But, since the agreement is concluded on the basis of sharing, it means risks and costs must also be shared, making the host government a direct and responsible participant in the natural resource extraction. In terms of responsibility, the government also has to look at the potential liability it has to bear.

The use of service contract is driven by the concern of host governments with regards to sovereignty control over their natural resources. Under a service contract, countries maintain field

ownership and in most cases produced crude ownership rights as well, and do not have to allocate them to the oil companies [3]. Oil companies are the sole bearer of the financial risks and engaged in the exploration and development for an agreed fixed fee or other form of compensation [1]. The oil companies supply services and know how, but did not hold any equity in the venture. One main driving factor why many countries are interested in adopting service contracts is because of their concern for maintaining their sovereignty over their natural resources [4]. In other words, it enable them to give up less control over the field and over the produced crude to oil companies while enjoying the expertise offered by these companies. Proper oversight from the host government over the oil companies' operation also can be maintained. While some forms of service agreements bear similarities to production sharing contract, pure service agreement differ significantly from the latter. The IOC is the sole bearer of the financial risk and engages in exploration and development for an agreed fixed fee or other form of compensation. Due to the combination of risk and services these contracts are now frequently called risk services contract. While a service contract can be seen as better at addressing sovereignty concerns, the framework is prone to huge potential losses in profit as shown for Iran's buyback service contract and Iraq's producing field technical service contract respectively [3,5]. Generally PSCs need higher investment level than buyback agreements and the investment level increases with IOCs share under buyback [6].

Production sharing contract (PSC) was first used in Indonesia in 1966. Before its independence in 1945, foreign oil companies have already engaged in exploration and development activities which were based on Indische Minjwet, the mining law of the Dutch colonial period [7]. This concession arrangement agreed prior to 1966 was discredited as a legacy of Dutch colonial periods and then the government refuses to award new concessions and introduced the "Indonesian formula", now widely called production sharing contract [1]. The host government would retain the resources ownership and negotiate a profit sharing system. The oil company or operator will carry all related activities and financial risks of exploration and development of the PSC contract area. At the beginning of its inception, foreign oil companies resisted this significant change in the arrangement of petroleum exploration and development as they are afraid this would create a precedent that would affect their concessions elsewhere. However, independent companies preferred this arrangement and entered into PSC. Other oil majors had no choice and followed the decision made by their competitors afterwards. Since then, this type of contract spread globally and is now a common form of doing business, especially in Asia and the Caucasus [7].

PSC generally become the choice of petroleum agreement for the countries in the South East Asia region. After Indonesia, Malaysia, Vietnam, Thailand and Brunei utilized the same mechanisms. From those PSCs, there were some operatorship transfer who took place in Thailand, Malaysia and Indonesia. For example, in Thailand, the Bongkot gas field was undergoing operatorship transfer in 1998 [8]. In Malaysia, the transfer of operatorship was for Field A, which took place in 2012 [9]. In Indonesia, for example, the Bawean PSC had experienced two operatorship transfers since it was brought on stream in early 1991 [10].

The operatorship of Bongkot field in Gulf of Thailand was transferred from Total Exploration and Production Thailand (Total) to PTT Exploration and Production (PTTEP), the E&P affiliate of the Thai National Oil & Gas Company (PTT) [8]. This concluded a very aggressive development program, which brought up Bongkot Field production from 150 million standard cubic feet per day (MMSCFD) in September 1993 to 550 MMSCFD in July 1998 after 3 successive phases of accelerated development. The whole exercise is considered a success in the sense it was a completion of a original process involving the initial and the current operator in a true "Operatorship Transfer Project (OTP)" initiated right after Participation and Operating Agreement (POA) was signed back in 1990 and culminating with the transfer ceremony on 1 July 1998.

The Bawean PSC, located Offshore Java, incorporates the Camar field, which is split into two distinct parts. North Camar lies entirely within the Bawean PSC, and South Camar straddles the boundary between the Bawean and West Madura PSCs. The Field complex was brought onstream in early 1991, but production has suffered from a series of reservoir and facility issues [10].

Medco Energi took over operatorship in 2004 has carried out a series of well workovers, including the installation of electrical submersible pumps (ESP). Production has fluctuated around 1000 BOPD and is expected to stay at that level until further development. In return for being granted the PSC extension in 2010, Medco committed to carrying out a seismic survey and drilling at least one exploration well on the Bawean PSC. A two dimensional seismic survey was shot in 2011, and an exploration well is planned for drilling in 2016/2017. Medco is seeking farm-in partner to assist in the drilling. There is a small amount of undeveloped gas on the block which is currently not yet a target for development in the near future. The operator also is planning to evaluate the potential for producing the heavy oil in the block which require further studies for determination of potential recoverable reserves.

The operatorship transfer of the field from Fortune to Medco Energi opened up new opportunities for the field to be rejuvenated. Prior to this, the field was shut in for a long time due to the previous operator financial difficulties. However, the new operator came in and breathe in new life for the field. Although the production is fluctuating at 1,000 BOPD level since 2011, further development and field rejuvenation work will ensure production can be sustained.

In order to bring production back on stream after a lengthy period of shut in, Medco had to either modernize or replace the Single Buoy Mooring (SBM) system at the field. It has been assumed that the new operator has overhauled the existing SBM and obtained the necessary inspection certification to ensure tankers can dock safely. There is also some well reactivation and well workovers carried out to bring production back to levels achieved prior to being shut-in.

Medco was awarded with the PSC extension until 2031. Following the PSC extension, granted in October 2010, work on the field restarted, and operator began a program to install ESP and conduct well workovers. Medco brought in a new FSO, MT Success Total XXXI which entered service in late 2012. Further development drilling will be required to raise output, and as mentioned earlier, Medco is looking for a partner to farm out the venture to assist with the development drilling.

Field 'A' located offshore, Malaysia was relinquished to PETRONAS as the host authority and resource owner after the expiry of the production sharing contract (PSC) at the end of 2012 after 15 years in production. At that point of time, as seen on other mature fields, Field 'A' experienced many subsurface and operational challenges that needed to be overcome in order to realize the field full potential. The challenge for PETRONAS is to identify new operator with proven track record of field redevelopment and mature asset management expertise to assume the operatorship. The new operator is expected to maximize hydrocarbon recovery by significant capital investment, optimize production cost via operational efficiency and mature the upside potential. It is imperative for PETRONAS to incentivize the operator to continue opportunities to grow the asset through innovative Petroleum Arrangement [9].

Successful collaboration efforts between the host authority, the operator and the partner to overcome various challenges to add value to this mature asset through smooth operatorship handover, field redevelopment plans and operational synergies between operators in the area. Role played by host authority was highlighted in incentivize and influence the operators to execute the field rejuvenation effort. Key challenges and integrated operating model to facilitate an efficient and effective utilization of existing and planned infrastructure were also developed. The success realized from the operatorship transfer breath a new life to the field. It is also a significant milestone for Malaysian oil and gas industry as it is the first time that the asset and the operatorship was

transferred from one IOC to another IOC. An innovative Petroleum Arrangement (PA) was adopted to incentivize the PSC operator to grow the asset.

From review of three successful case studies it is clear that when the PSC is near its expiry date, the IOC as the production sharing contractor or operator will have three options, i.e. divest the equity it holds to minimize risks, relinquish the holding and the operatorship of the contract area to the host authority or sign an operatorship extension under a new PSC arrangement. For the host authority, in the relinquishment of contract area, it has the power to dictate whether it wants to handover the operatorship to other contractor or open negotiation of new PSC term with the outgoing operator with the intent to continue as operator.

Among these three options, the relinquishment of the contract area to the host authority for a new operator to take charge would take the most complication for several reasons. First, the facilities available and producing at the expiring contract area are at mature stage and hence require a lengthy and thorough due diligence audit to assess its current state. For the host authority to award the contract area operatorship to the new operator, they must ensure the outgoing operator to close the findings recorded from the due diligence audit performed before. Further agreement need to be in place between the outgoing operator and the host authority if the findings are not closed by the time of the PSC expiry. This can be in the form of commercial settlement whereby the outgoing operator would pay an amount of money agreed upfront for the host authority to conduct the closure of the due diligence findings by other means.

Secondly, the operatorship transfer exercise from the outgoing operator to the new operator will have to be conducted while the facilities are producing. Complication will arise in the aspect of its operations management. The outgoing and incoming operator must be committed in ensuring production and revenue to the host authority are not affected, and any production commitment can be met while ensuring health, safety and environment (HSE) aspects of the whole contract area are preserved.

Thirdly, there is a need for the host authority to allow for the outgoing operator to complete all its commitments and planned activities for the contract area since the outgoing operator has allocated significant amount of resources for these activities. If the planned commitments or activities are actually planned to be executed beyond the expiry date of the contract area, complication arises in the area of responsibility of performing the said activities and its liabilities.

Lastly, commercial negotiation pertaining to the main terms of the PSC would be imperative to the outgoing operator and the host authority. As previously mentioned, the contractor can negotiate for the contract area operatorship extension by negotiating for a more favorable term with the host authority. This rather strategic move is made based on its assessment of the contract area during its earlier exploration and resources appraisal stage that there is much more reserves can be monetized from the contract area. Since this situation placed the host authority at a very advantageous position, it has the liberty to impose the terms that it desired to maximize the return on resources available at its expenses. The negotiation of these terms can be expected to be prolonged since both parties are working towards maximizing values that can be created from the PSC for their own benefits. The negotiation may affect the smooth running of the operations of the contract area if both parties did not converge to the agreed decision. Uncertainty arises from the prolonged negotiation could affect the morale of workers as there were concerns with regards to job security and their livelihood post expiry of the PSC. Local negative community sentiment also could be flared when local contractors servicing the current contract area did not know about their current contracts. This will somehow tarnish the good reputation earned by the outgoing operator if not deal with effectively.

Based on the reviewed case studies, it is clear that in an operatorship transfer of a PSC from the outgoing operator to the incoming operator, governed by the host authority, there are various

complications that may arise from the exercise. Knowing that there will be many complications that will arise in the event of a PSC operatorship transfer, there is an opportunity to propose for a guideline to manage these complications. For this, the paper reviewed a general PSC terms and identified key success factors enabling a successful operatorship transfer. In doing so, a proper reference on how to receive, manage and operate any facilities within the expiring PSC from the outgoing operator to the incoming operator can be established.

The study reviewed what is stipulated in PETRONAS' Petroleum Procedures and Guidelines for Upstream Activities (PPGUA) with regards to relinquishment of PSC at production stage of the contract area in coming out with the solution. For the reference on operatorship transfer exercise, the study will look into how the operatorship transfer exercise was done previously at other locations and critical enablers of both exercise will be reviewed. Search performed on available references unearthed three separate operatorship transfer as previously mentioned as the case studies. It is acknowledged that there are not so many operatorship transfer exercises that were shared as academic papers probably due to fact that many of these operatorship transfer exercises were sensitive in nature to all the parties concerned. In fact, any announcement made in the media on updates of any PSCs were made after the information have been verified a thorough vetting process by the parties that hold the authority to release such information to the media, (normally the host authority). Nevertheless, these three examples of operatorship transfer exercise will provide the basis where the solution is derived.

Due to these reasons and from what has been emphasized in the PETRONAS Procedure & Guideline for Upstream Activities [11, 12] together with three case studies previously mentioned, several key enablers are proposed to be considered for a PSC successful operatorship transfer. The key factors are human resources, data management, asset reliability and integrity management, supply chain management and good relationship between parties.

## **2. Enablers**

### *2.1 Human Resources*

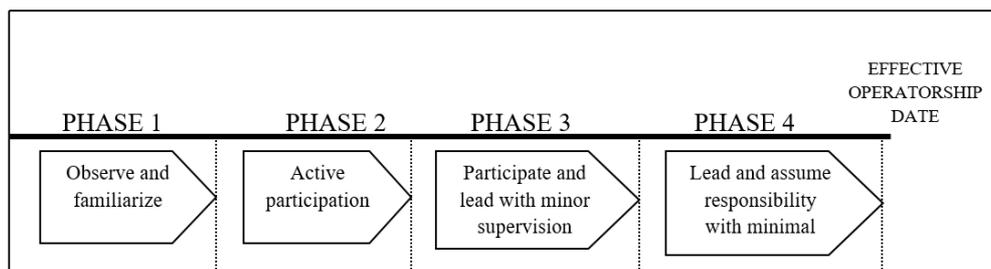
The importance of having capable human resources in operating the PSC contract area cannot be over-emphasized. In Bongkot Field Operatorship Transfer exercise for example, it was obvious that a clear human resources strategy and action plans were developed and tracked in such a way to prepare the local engineers and operators to take over the positions that will be left vacant by the expatriate staff post operatorship transfer [8]. In Field "A" Operatorship Transfer redevelopment plans at all phases mentioned [9] would require inputs from outgoing operator personnel that will provide in depth understanding and tacit knowledge for smooth operations post operatorship transfer.

For an incoming operator to the PSC contract area, taking over the PSC operatorship from the outgoing operator, it was only natural to draw many of the technical know-how from the outgoing operator personnel. In Bongkot Field Operatorship Transfer for example [8], great emphasize was seen in the area of training, manpower planning, and competency profile and skills assessment. For training, Total as the outgoing operator went a great length in preparing local operators to operate the field by opening a training center within a local college which is situated nearby the field logistics base. An agreement was signed with the Department of Vocational Education to allow for diplomas issuance by the center for the petroleum technicians and subsequently gained accreditation from the government. It is now part of Thailand vocational curriculum and it open up the doors for further opportunities to the locals. Such tacit knowledge will be helpful for the incoming operator to understand the operations of the PSC contract area. As the operatorship transfer normally occurred

during continuous production, it is important for both incoming operator and outgoing operator to ensure the production from the PSC contract area is not halted due to the operatorship transfer activities. To prepare adequate manpower level, competency and recruitment philosophy will be the key components in equipping the PSC contract area with people that have adequate skills to operate the PSC area.

Competency can be achieved through a comprehensive training and attachment programs whereby the incoming operator personnel shall be placed at the PSC contract area facilities for familiarization and on the job training of the facilities. For the recruitment approach, it would be appropriate if the manning of the PSC contract area facilities are to be filled in with some of the personnel recruited from the outgoing operator together with senior operator personnel of the incoming operator who have been operating other similar facilities within the vicinity. This will ensure a good start to the new operations and to be complement with recruitment of fresh talent from training institutes or universities.

For any incoming operator, competency development program should be considered to enable its personnel to operate the PSC contract area. The program can be in the form of formal trainings (internal/external) supported by a structured competency assessment to ensure competency has achieved the minimum pre-determined level to operate these facilities. To complement these two elements, a transition plan also can be utilized in place for the incoming operator personnel. Transition plan is derived as the following phases in Figure 1.



**Fig. 1.** Phase during the Transition Period

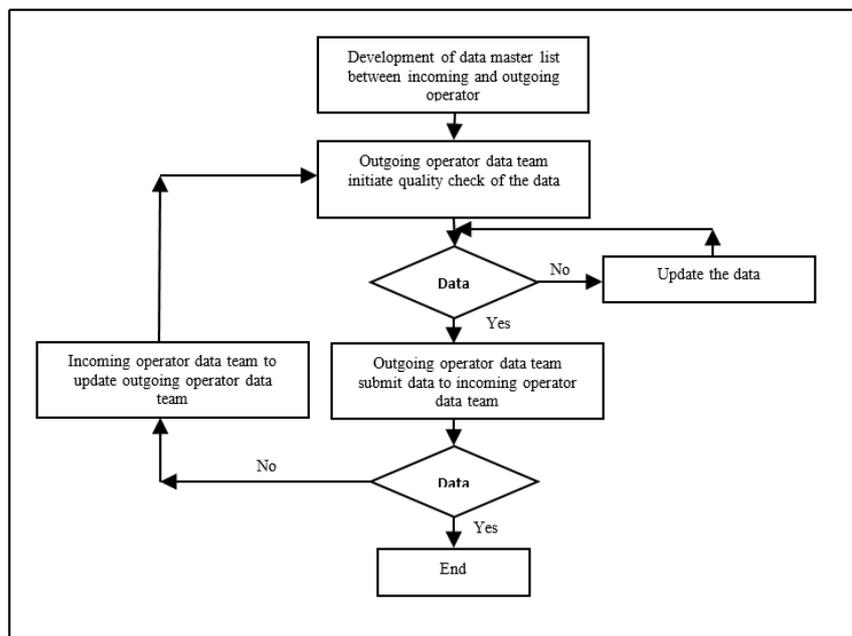
Phase 1 is for the incoming operator personnel to just observe and familiarize with activities on site the facilities of the PSC contract area. Procedures associated with the activities also are to be reviewed. Phase 2 involving the incoming operator personnel participation with outgoing operator personnel supervision on site the facilities. In this phase, the “observe and familiarize” part will be slowly replaced with active participation once the outgoing operator personnel satisfied with the skills acquired by the incoming operator personnel before. Phase 3 is when the incoming operator personnel lead the activities under close supervision of outgoing operator personnel. He or she is to assume certain roles and make certain decision with endorsement under the outgoing operator personnel supervision. Phase 4 is when the activities being executed under incoming operator personnel responsibility with outgoing operator in tow to provide minimum coaching. Phase 4 is suggested to take place near the agreed operatorship transfer date.

## 2.2 Data Management

Data management can be considered vital in an operatorship transfer exercise. PETRONAS Procedure & Guideline for Upstream Activities [12] made specific reference on this with regards to the management of data for any PSC contract area. Between the incoming operator and outgoing operator, the two parties would need a benchmark that would set the scene for the initiation of data

transfer. First of all, considering the huge magnitude of data that involves in the operatorship transfer exercise, an agreed data transfer protocol which includes a well-defined process to close data gaps and resolve disputes would need to be established. Secondly, there is a need to assign dedicated focal personnel to manage and administer the whole process to ensure single reference point and effective tracking is achieved. Thirdly, adequate and sufficient resources including sufficient time, adequate tools and infrastructures to support the review process, analysis and matching process of the received data must be put in place. These imperatives were critical to ensure that both parties can reach a comfortable level of data transmission of the asset and for incoming operator to receive operatorship from outgoing operator in a transparent manner.

Tracking of data acquisition by incoming operator is important. It must be done thoroughly. Any gaps or disputes then can be resolved amicably in full spirit of cooperation between outgoing operator and incoming operator. One would have expected that some data might not be available or lost due to many factors. In this regards, host authority will have the total discretion on coming out with the mechanism to address the unaccounted for data volume. The whole data transfer process is executed as shown in Figure 2.



**Fig. 2.** Simplified Data Transfer Process Flow [7]

In Figure 2, first step that needs to be taken is to agree on the data master list between incoming and outgoing operator. After this has been agree, the work plan of data transfer begins with the outgoing operator team performs quality check on the data agreed to be transferred to the incoming operator. Any updates required will be done internally if it does not meet the requirement from the incoming operator.

After that, the data that has passed quality check is then handed over to the incoming operator. The incoming operator team itself will perform their internal quality check on the data received. If it is alright, they will notify that the data is good for acceptance. If not, they will further inform the outgoing operator team on which part of the data set is not yet completed. The process is repeated until data quality is satisfied.

### 2.3 Asset Reliability and Integrity Management

In a PSC operatorship transfer, this area is deemed to be critical for all parties concerned, namely the host authority, incoming operator and outgoing operator as observed from the three reference operatorship transfer exercises. For the host authority whereby the assets ownership is under its jurisdiction, the management of the mature asset would be vital to the government coffers to ensure continuous income resulted from the operations of the PSC contract area by the operators can be enjoyed for the sake of economic development of the nation. For outgoing operator, it is important to project to the host authority that they have maintained the asset to the best of their ability and preserved their reputation as a capable and prudent operator of the asset as they have been operating it for so many years under the expiring PSC term. For the incoming operator, they are obliged to show that they are in full understanding of the mature asset and ready to rejuvenate it to recover additional hydrocarbon for the benefit of the government and likewise, to preserve its reputation as exemplified in Field "A" Operatorship Transfer [9] and Bawean PSC Operatorship Transfer [10]. Both incoming operator and outgoing operator should put plant integrity assessment and plant maintenance management system aspect on higher attention.

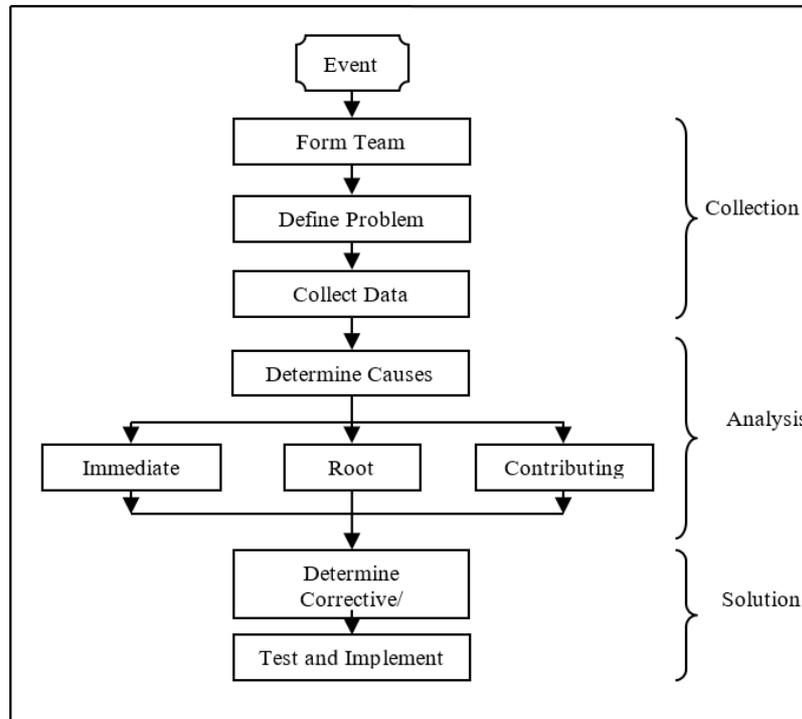
With reference made to the Field 'A' Operatorship Transfer [9] and Bawean PSC Operatorship Transfer [10], there is a real need for a proper plant integrity assessment to be given utmost priority. Early understanding on this would enable the incoming operator the opportunity to devise any improvement proposal, as exemplified in Field 'A' Operatorship Transfer with the inception of early rejuvenation plan. In this example, it was intended to increase the production to 10,000 barrels oil per day utilizing the existing field facilities and capacities by the infill drilling of three wells from the existing platform. The subsequent effect of this was the total fluid production exceeding the 40,000 barrels fluid per day threshold of the current neighboring facility fluid processing agreement, whereby the full well stream fluid from Field 'A' was delivered for processing. Based on this, the incoming operator came out with the initiative to modify the current functionality of the process separators and choking back higher water cut wells.

In Bawean PSC Operatorship Transfer, the incoming operator has introduced second FSO into the processing system of the facilities when they obtain a new extension of the PSC. This is to cater for the expected additional production that will come on stream from the ESP installation and pending execution of infill drilling. The improvement would not be possible if the incoming operator did not have in depth knowledge of the facilities they are receiving. In order to perform this, one useful tool can be employed, which is called root cause failure analysis (RCFA).

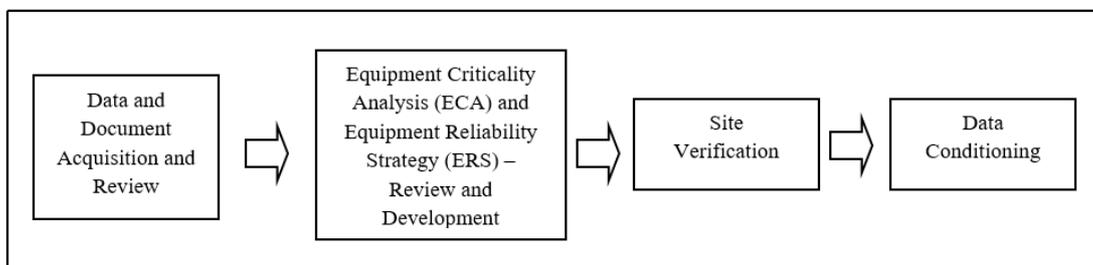
Root cause failure analysis is a process for identifying the true root cause of a particular failure or drawback and using that information to set a course for corrective or preventive action [13]. From a technical standpoint, it is usually a multidisciplinary problem, typically focused on the traditional engineering field such as chemistry, physics, materials, statics, dynamics, fluids and others. In the case of Field 'A' Operatorship Transfer, steps undertaken to reach to that conclusion that it is required to modify the current functionality of the process separators would have been possible by employing the process flow of a RCFA. Figure 3 depicted the RCFA flow chart that may be taken to reach to the final decision of process separators modification.

Based on what is currently being practiced worldwide among the oil and gas operator, the management of maintenance to sustain the reliability of their operating assets is done via utilization of computer software that runs on multiple user desired analysis that can be set by the operator. For any two different operators, it can be said that most of the time the system employed within the respective operator organizations are different in nature. Therefore, for the incoming operator, the maintenance strategy of the facilities they are receiving from the outgoing operator would have

needed to be matched with what they have already in place in their system. The establishment of plant maintenance management system for the incoming facilities into their current system must be performed. Thus, a simplified process flow is proposed to achieve this, as shown in Figure 4.



**Fig. 3.** RCFA Flow Chart [8]



**Fig. 4.** Establishment of Plant Maintenance Management System

At data and document acquisition review stage, relevant maintenance data and documents held by the outgoing operator are to be acquired. Further review is performed to ascertain its validity with the equipment of facilities operating regime with the outgoing operator team. This step is intended for the incoming operator to build understanding of the whole facilities.

At Equipment Criticality Analysis (ECA) and Equipment Reliability Strategy (ERS) stage, which is a norm in reliability engineering discipline, it is initiated to review and align the criticality category of the equipment attached to the facilities with the equipment operated by the incoming operator elsewhere and draw new specific maintenance strategy to sustain its reliability.

At site verification stage, the activity is performed to enable the incoming operator to verify the inventory of equipment with the data obtained earlier. Any disputes arise then can be address amicably with the outgoing operator. At the final stage of data conditioning, all data were updated with the current input from the new ERS and also from the site verification perform on site. After

conditioning process is completed, the data now is ready to be uploaded to the respective software tool used to govern the maintenance management system.

## 2.4 Supply Chain Management

In any petroleum operations environment, Supply Chain Management (SCM) of the whole operations is key in enabling many activities corresponding to the operations of any PSC contract area. It would have been imagined that all three reference operatorship transfer exercises would require such comprehensive SCM strategy to enable many critical path to take place during the operatorship transfer exercise. Furthermore, all PSC contract areas involved are matured stage and change of operatorship transfer would mean change of the whole supply chain philosophy which requires massive resources allocation to be executed. As an example in Field 'A' Operatorship Transfer [9], many of the planned activities associated with the early rejuvenation initiative would require contracts for the materials needed are in place, even more critical it may have been supported from contracts available with the outgoing operator. In Bawean PSC Operatorship Transfer [10], some of the services required to support the newly acquired FSO vessel could be riding on the existing contract from the first FSO which was managed by the previous operator (Fortune). Based on this, the services could be made available and optimized as the contractor can leverage on the magnitude of work available from the two FSOs and could charge its services at lower rates.

The following areas can be deemed as critical in SCM of an operatorship transfer exercise, which is also stipulated in PPGUA [11] – readiness of contracts and sourcing and cataloguing of materials, logistics and warehouse requirements. Sourcing for services is one of the major portions of activities to ensure readiness of contract for the operatorship transfer project. It acted as the heart of behind the overall maintenance/rejuvenation work execution before and right after the operatorship handover effective date. The readiness of the contract was the core in order to enable many types of services required to be in place as per plan. The process overarching this includes preparing database for the contracts, preparing the tendering strategy and managing the post award activities.

In preparing the database for the contract, it is required that the incoming operator to analyze number of contracts required to operate the PSC contract area, with the help from outgoing operator team. This is crucial as most likely contracting approach is different between the two parties due to different philosophies applied for many activities (maintenance for example). This will allow the incoming operator to optimize its number of contracts required as some of the contracts can be farmed in or novated. New contracts required will be quickly identified. This is also in line with both parties objective of preserving their own reputation as the respective local contractors that provided services to the PSC contract area would have been informed upfront about the arrangement between both parties and can be prepared for any issues related to contracts later.

In managing the post award activities, it is required to be handled with care so that it is in compliant with the governance rules set by the host authority. It is required for both parties (incoming and outgoing operators) to ensure list of materials for sourcing takeover is identified and all outstanding purchase order/work order area adequately resolved. In supporting the operations of PSC contract area, logistics arrangement with regards to transportation services to move people and materials must be made a priority. It is even more so if the PSC contract area is located in remote area, such as in offshore location. There must be adequate support vessels plying the waters of the PSC contract area to ensure continuous critical support of items such as consumables, food provision, fuel and many others. In addition, strategy to mobilized people around also is important. Be it by land transportation, boat or helicopter, the strategy approach must be to optimize cost without

jeopardizing mobility of personnel. Evacuation plan during emergency would be critical to be considered.

To provide total solution to the value chain of the petroleum operations of a PSC contract area, warehouse management would prepare any operator to operate the PSC contract area efficiently. At any operatorship transfer exercise, there is a need for the incoming operator to secure adequate warehouse infrastructure to receive and store the materials intended for the new PSC contract area. These materials would need to be properly tagged, which is a massive exercise on its own as the list of materials could run to the tune of thousands of line items. This ensures right level of inventory can be maintained, redundancies of materials reduced, wastages are eliminated and cost would be able to be optimized.

### 2.5 Relationship among Parties

Maintaining good relationship is a key towards a successful and seamless operatorship transfer exercise. It can be seen in Bongkok Field Operatorship Transfer that the success of any PSC operatorship transfer relied heavily on the relation of trust and confidence between the incoming and outgoing operator [8]. This can be seen through interactions of both in many instances such as in data management, human resources, asset reliability and integrity management of the PSC contract area and others.

In Field "A" Operatorship Transfer [9], it is clearly seen the role played by the host authority enables smooth operatorship transfer from an operator to another operator. Apart from being the sole administer of the overall process of operatorship transfer, host authority will be vital in setting up the correct scene for the operatorship transfer process to take place from the beginning. Any decision dictated by the host authority will have everlasting effect to all parties concerned to the PSC, be it incoming operator or outgoing operator as both have been and will be continuously in contact with it when they operate the PSC contract area. A high level of trust and confidence environment should be maintained. Hence whenever an operatorship transfer takes place, with trust and win-win mind set, the operatorship transfer exercise will be a success with cooperation from the outgoing operator to the incoming operator. All in all, the good relationship maintained between the parties opens up possibility of future collaboration when the occasion arises.

### 3. Conclusion

As discussed, the key enablers to a successful PSC operatorship transfer exercise will be vital in enabling a successful operatorship transfer. Since PSC is an important component for a country in enabling economic wellbeing of the people with its many economic spillover effects, the management of these activities will ensure values contained in the PSC to be preserved and the hydrocarbon extraction activities within the PSC contract area will give unlimited benefit to the people.

### Acknowledgements

The authors would like to thank the Universiti Teknologi Malaysia and the Ministry of Education of Malaysia for their support and the research grant allocated for this project.

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