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DYNAMIC POSITIONING CONFERENCE

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Operations and Requirements

DPO Assessment and Improvement

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Abstract
This paper presents the importance of recruitment, properly functioning succession plans and individual development plans; how required training needs are diagnosed; and how a combined simulator and training program is being developed to improve Dynamic Positioning Operator (DPO) understanding of the operation of these complex integrated systems. All are critical to safety, efficiency, and therefore, productivity and profitability. An advanced simulator will have the ability to present the DPO with a wide range of failure modes that cannot easily be duplicated on an operating vessel, but which have caused loss of location numerous times. These failures will be different from the types now used, akin to a thruster or engine tripping off line. They will allow the operator to ascertain that a thruster or engine is about to trip off line by recognizing some precursor to the failure. This same simulator can be used to effectively measure the skill level of DPOs, regardless of experience level.

Introduction
Dynamic positioning operators hold one of the most responsible positions on dynamically positioned drill ships and dynamically positioned mobile offshore drilling units.
They must understand and operate a number of complex systems, often with limited supporting documentation, particularly concerning interfaces between systems. Often, the DPOs only window into the functioning of the active equipment is a bar graph and row of numbers, from which the DPO must verify proper operation, optimize performance, and identify any number of problems. The sophistication level of this technology requires proper training for the optimization of equipment, and more importantly to quickly detect and correct faults.

Much of the DP industry views Nautical Institute certification of DPOs as providing fully trained and competent DPOs. In fact, training specified for Nautical Institute DPO certification is targeted primarily to achieve DP *operating* skills. It is not designed to teach DPOs how to handle the types of failure modes and fault conditions that cause the majority of DP Incidents, nor does Nautical Institute certification provide knowledge of the trainee's aptitude for these skills. Currently, training to handle the failure modes and fault conditions that typically cause DP incidents is accumulated during years of mentoring by a senior DPO on the rig. Aptitude for DP operations is also identified during service, which results in a relatively high percentage of DPOs leaving the position in the first 3 years. Rapid expansion and competition from other industries for limited human resources are thinning the ranks of experienced DPOs, which is reducing on-board mentoring resources and the ability to produce experienced staff. A change in training methods is required to fill the gaps more quickly. The industry must enhance training programs to train DPOs fast enough to meet current and future needs. The current shortage of personnel poses the risk that DPOs will be moved into positions of responsibility before they are adequately trained to handle every situation.

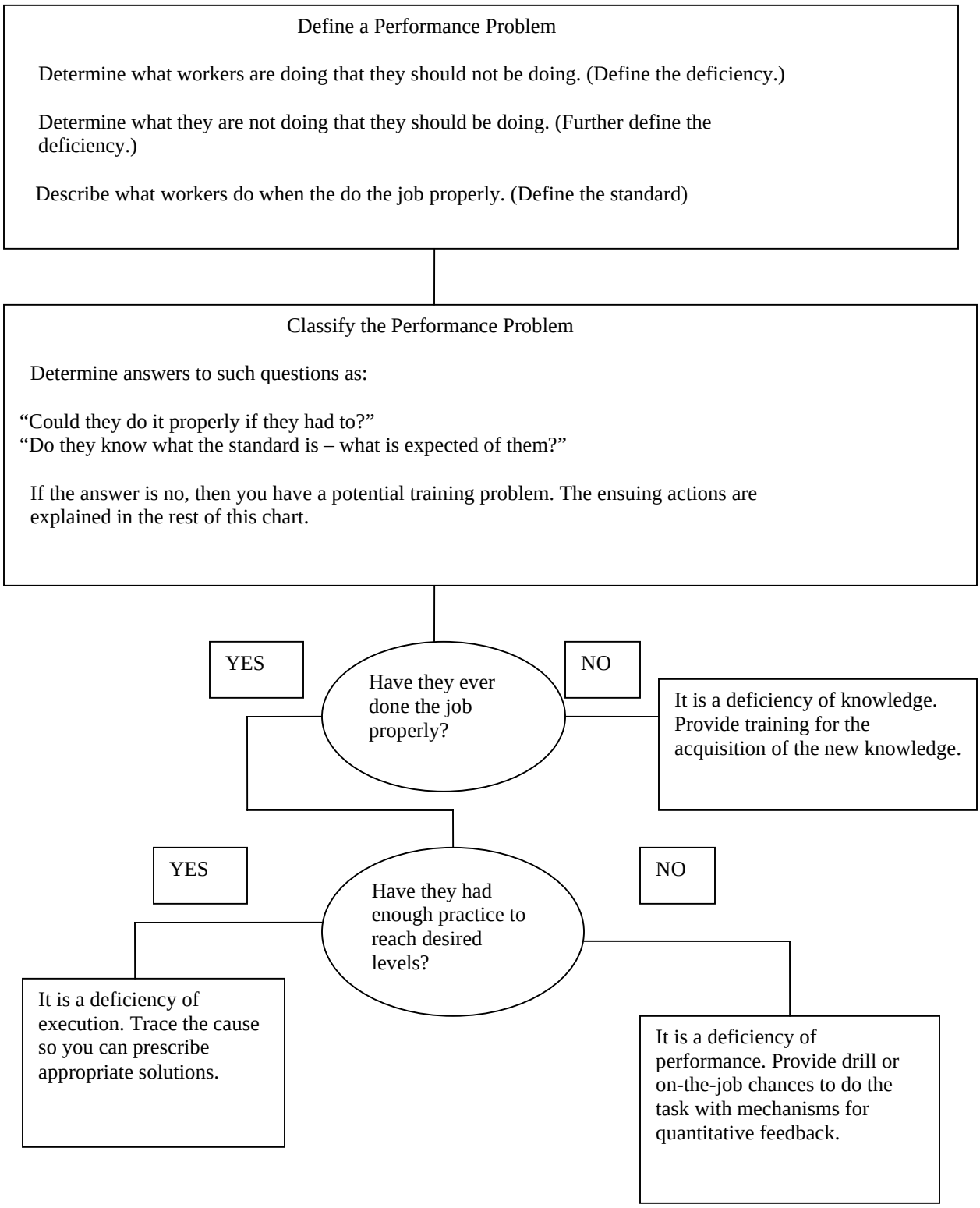
Recruitment
There are significant questions to be answered. Who is best suited to be a DPO in the drilling industry? Who is best suited to recruit the DPOs? Some companies still send "drilling types" to hire the DPOs. Others hire DPO candidates directly from maritime academies without properly explaining the life in offshore drilling to the candidates. Using "drilling types" that have little knowledge of a vessel's power management system or DP processes to hire candidates that have little experience with vessel management systems and little or no experience or formal training with dynamic positioning appears dubious. The idea is that these personnel will be hired solely as entry-level DPO trainees. This is a viable option if a company has time and adequate resources (bed space and personnel to mentor trainees).
Yet, this poses the following questions: Would it not be better to send DPOs, masters, and engineers to hire the DPO candidates? Is it more practical to hire experienced personnel with actual DP experience and who appreciate the shorter and more civil schedule offered by the drilling industry? It is important that those recruited fully understand their responsibilities, schedules, and the environment in which they will work. Otherwise, companies will continue to misuse time and resources hiring personnel that do not remain in the industry and that are not competent to undertake DP and vessel management

responsibilities. There is a clear need for a better understanding of recruitment and the required aptitude for the position of DPO within the drilling industry. Some argue that those people that understand automation systems are possibly the best candidates for a DPO position. It is argued that DPOs basically "operate" the DP in other industries such as diving and pipe lay, while in the drilling industry they basically "supervise" the automation systems, with DP being the least troublesome of the automation systems that they supervise.

Training Requirement Diagnosis

It is important to identify, design, and implement training solutions. It is equally important to be proactive by working with personnel, clients, and DP manufacturers to circumvent potential problems by enhancing training augmented by succession planning, individual development plans and power management issues that impact DP positioning on drill ships and DP mobile offshore units (MOUs). To be successful in this endeavor, statistics must be compiled which identify the causes of each incident. A convenient framework similar to the Swanson Diagnosis Matrix (Swanson, 1996) can be used to diagnose performance problems. Built on the Rummler and Brach model (1995), this diagnostic tool examines mission/goal, system design, capacity, motivation, and expertise within the organizational, process, and individual contexts. It is important to define whether the performance problems were caused by deficiency of knowledge, execution, practice, motivation or a combination of the deficiencies (see Figure 1).

Figure 1. Example of performance problem causes.[1]



[1] From "Approaches to Training and Development," by Dugan Laird, 2003, p. 94. Copyright 2003 by Perseus Books Group, LLC.

DPO performance data indicate deficiencies in:

- execution
- practice
- knowledge
- motivation

Inadequate performance combined with adequate training indicates a deficiency of execution. Inadequate performance combined with inadequate training indicates a deficiency of practice.
Both are common among DPOs in the drilling industry. Some suggest that a DPO's job is "99 percent boredom and 1 percent sheer panic". A DPO may sit and monitor the DP system and vessel management system for weeks or months at a time without having to make a significant decision on what to do in order to prevent a blackout or drive off. It is for this critical reason that policies and procedures are in place for drills and testing to be done when the vessel is not connected to a wellhead. It is the responsibility of offshore and onshore management to ensure that the clients are fully aware and agree to allocate adequate time for these training purposes. This training should be properly documented so that those concerned may properly track the training processes. This on-the-job practice or simulation is able to give quantitative feedback and improve the skills of the DPOs and others that support the DP operations. In order to motivate, it is necessary to receive "buy in" from all levels of management and operations. Leadership must agree on guidelines for a standard of competence and all involved must be fully committed to attain 100 percent compliance. Establishing and maintaining this leadership is not an easy task and often leads to the demise of the best-laid plans. Therefore, assessing what is required to improve the deficiencies and sustaining leadership is critical.

Guidelines for Accessing and Certifying Dynamic Positioning Personnel (see Note 1 for list of competencies)

The guidelines for assessing and certifying competence consider the following levels of Dynamic Position Operator:

- Master
- Chief Mate
- Senior DPO
- DPO
- Assistant DPO

Presently the Nautical Institute DP Certificate is required of all DP personnel. This certification consists of:

1. Basic DP Induction Course
2. 30 days working on a rig as DP Operator
3. DP Simulator Course
4. Approval letter by master
5. 6 months working on a rig as DP operator

Companies should provide the following:

1. A structured corporate DP on-the-job training program
2. Vessel and equipment specific DP on-the-job training programs
3. A structured mentor program
4. DP Lessons Learned classes
5. Major Emergency Management class for masters

6. Lessons Learned Simulator classes

Competence of Key DP Personnel Pertaining to DP Operations

There are no "plug and play" DPO personnel from outside the industry. Note 1 illustrates that the DPO has many responsibilities and those identified do not address the normal marine and drilling related responsibilities. Knowledge and expertise of bilge and ballast systems; bulk and fuel systems; crane, drilling and subsea operations are all critical to ensuring a professional and safe operation. This establishes a critical reason for DPOs entering the field from outside of the industry to enter as a trainee in order to learn all essential operations. Many DPOs assume previous experience provides adequate knowledge to competently manage the DP / Vessel Management System (VMS). This represents a naivety of the complexities involved in the automation systems. Truly mastering their systems requires mentoring, on-going training, succession planning, and individual development plans.

Succession Planning and Development Plans

During these current times with the possibility of a pandemic shortage of personnel, it is essential to have a deliberate process in place that ensures that personnel are well equipped to replace their immediate supervisors. The industry is experiencing a higher than normal rate of attrition, due both to retirement and the influx of new vessels and rigs coming on to the market. It is clear that internal development programs and effective recruiting efforts are inextricably linked; companies providing accelerated opportunities for competency will have the upper hand. This reinforces the importance of identifying high potential personnel through appraisals and supervisory consultations. A succession plan should:

- forecast activity forecast activity
- develop strategy to anticipate workforce needs
- collect and analyze employee census data
- analyze current staffing levels
- analyze turnover
- determine development needs
- develop business plans
- develop strategy to source/recruit candidates internally and externally
- develop performance standards, measurements, and evaluation methods
- undergo periodic review
- interface with individual development plan programs (to be discussed)

In order to have a successful succession plan, critical competencies must be identified and tracked. This is done through an Online Performance and Learning System. The Online Learning System contains the competencies (see Figure 2) and the individual development plans with both soft-skill (management) and hard-skill (technical) sets; and a detailed development plan to be used by employees and their mentors. In addition to the mentor, a virtual online advisor is able to provide just–in-time advice and learning tools for the work problems that personnel deal with every day.

Figure 2. Example of management and technical competencies. For technical competencies, please see Note 1.

BEHAVIORAL COMPETENCIES	
Interpersonal Skills	**Leadership Skills**
Communication	Facilitating Change
Client Relationships	Coaching
Building Strategic Working Relationships	Aligning Performance for Success
Gaining Commitment	Developing Others
	Building a Successful Team
	Delegating Responsibility
Business/Management Skills	**Personal Attributes**
Planning and Organizing	Accountability
Technical Knowledge	Cultural Adaptability
Decision Making	
Safety	

TECHNICAL COMPETENCIES *What a person knows regarding facts, technologies, a profession, processes, or procedures – What you know.*	**MOTIVATIONAL COMPETENICES** *How a person feels about a job, organization, or geographic location – What you are willing to do.*
See Note 1	**Not included**

The succession plan data record should include “ready now” personnel complete with ranking of all personnel for each position; and “ready in the future”. These “ready in the future” personnel can be subdivided into proper succession implementation, e.g. “ready in 6 months”, “ready in 6 – 12 months” and “ready in 12 – 24 months”. It is at this point that the individual development plans are most critical. A mentor, alignment of goals, and a central repository for the ranking of all personnel is vital. Still in question is determining whether the succession planning should be transparent for all to access or if it should be used solely as a management tool to address personnel development work force planning. Governance policies must be in place to assure proper use of the information. It must always be considered that appraisals used in succession planning are subjective and subject to bias. Therefore, it is critical to have core competency benchmarking and break down competencies into constituent sub processes, activities, and skills to more accurately rank personnel.

Assessments Required

What is considered the requisite amount of knowledge and experience? It can be seen from the aforementioned competencies that there are no “plug and play” dynamic position operators entering from outside of the industry. Newly hired DPOs with experience in other industries may sit idle on a well for up to a year and not experience key operations such as location arrivals, location departures, and black out drills. New hires directly out of academies may lack automation system knowledge, control system and power plant understanding, and critical

experience or confidence required for transits from one location to the other among heavy vessel traffic. This must be recognized and managed by the company. Due to a shift in position responsibilities, many DPOs in the industry find themselves responsible for more than they originally "signed on" to do. This appears to be a direct result of hiring personnel with significant differences in operational expertise, exposure and training. Current areas of inadequacies may include:

- proficiency in the bilge and ballast systems
- fixed fire fighting systems
- bulk product systems
- crane operations
- operate/optimize vessel management system operation
- power plant management
- operate/optimize power management system
- crude oil storage and transfer

Modern $600 million dollar vessels have sophisticated vessel management systems that require specific and substantial knowledge to understand and operate. For those personnel with marine licenses, additional automation training is required. For other DPOs there may be gaps in knowledge due to lack of exposure to the various operations. In addition, there are many DPOs with little or no training to run the power plants and automations systems on today's sophisticated vessels.

The courses offered by DP manufacturers are primarily focused on the DP equipment and do not prepare personnel to handle problems outside the DP room, which is where most problems arise that result in DP incidents. Maritime academies prepare personnel for handling bilge, ballast, navigation, fire, and safety responsibilities; but do not address DP, control theory, or automation system issues. Nautical Institute certification by major DP vendors is only designed to prepare the dynamic position operator to begin learning the job of a dynamic position operator. While a Nautical Institute certified program trains the DPOs well in the subjects covered, it must be recognized that this is the bare minimum level of competence, rather than the requisite knowledge necessary to become a DPO. Some companies view this certification as providing all the qualification necessary to obtain a DPO position; others recognize it as just a small portion of the qualification process for DPO.

Simulator Class

Currently under development is an advanced simulator course that is specifically designed to fill some of the gaps identified in DPO skill and training, and provide the means to identify additional training required for individual DPOs. A minimum of an intermediate level of DP skill may be assumed for anyone attending this advanced training course. It is not aimed at entry-level personnel, although it might be a useful tool to assess the skill level of new hires from other companies or industries. It is intended that it will:

- Measure the level of advanced knowledge among dynamic position operators
- Teach advanced skills and techniques
- Measure how well the skills were learned
- Identify opportunities for further improvement

At completion of the course the DPO will be:

- certified as having mastered all the concepts
- provided with a recommendation of areas for further improvement
- or both.

The advanced simulator course will train in the proper techniques to control both the main power plant and the DP automation systems. This may be accomplished by a simulator, screen captures, animation, or other methods. The goal is not to teach the details of how to operate every power plant and DP plant in existence, but rather to teach DPOs to understand how power plants and DP automation systems operate in principle, how they fail, and how to mitigate or prevent failures. Rig audits and DP incident data show that the weakest area of operation relates to handling problems external to DP. Thus, exactly simulating all the screens of all automation systems is not required. Generic screens will provide adequate understanding with the goal of theory and conceptual comprehension, rather than the memorization of response to failures.

The goal is to present a range of failures and monitor DPO response to see if they correctly interpret the type of failure and respond properly. It is less important to know exactly which button to push than to know what type of response to take. The goal is to make scenarios challenging enough that an incorrect response from the DPO will result in disconnect, blackout, drive off, drift off, or push off. Again, the idea is less to see them push the right button than to properly analyze the problem.

Dynamic position operators should regularly demonstrate mastery of DP skills similar to well control for drillers. This may be accomplished by a formal classroom session coupled with simulator training. Training methods are constantly evolving. It makes good business sense to adopt technical innovation, where such innovations make functional and economic sense, including any and all methods that can:

- Reduce the training burden (time) on our people our greatest assets
- Improve training effectiveness
- Reduce cost, both of managing and training

Corporate DP training programs should, as much as possible, parallel DPO requirements as specified in IMCA 117 (Training and Qualifications of DP Operators). Companies should also plan to remain involved permanently, using “Lessons Learned” for regular “fine tuning” of specialized simulator training.

Scenarios

Prior to each scenario there will be a theoretical walkthrough presented with Power Point slides. This discussion will include:

- Symptoms of a potential incident
- Possible reasons for the situation
- Data/Figures on their vessels, whether they are calculated or measured
- How to avoid a black out
- Failure modes of generators and thrusters
- How to identify type of failure and best response
- How to operate DP to reduce risk during event
- Options to prevent failure
- Options to correct or limit effects of failure
- What actions will make the situation worse
- What is important to know about an individual’s vessel

Figures 3 and 4 depict how scenarios will be facilitated. The purpose is to illustrate how two similar scenarios can have similar symptoms, yet require different actions in order to rectify the problem.

Figure 3. Example of scenario, its symptoms, possible reasons for the situation, possible actions to take and actions not to take.

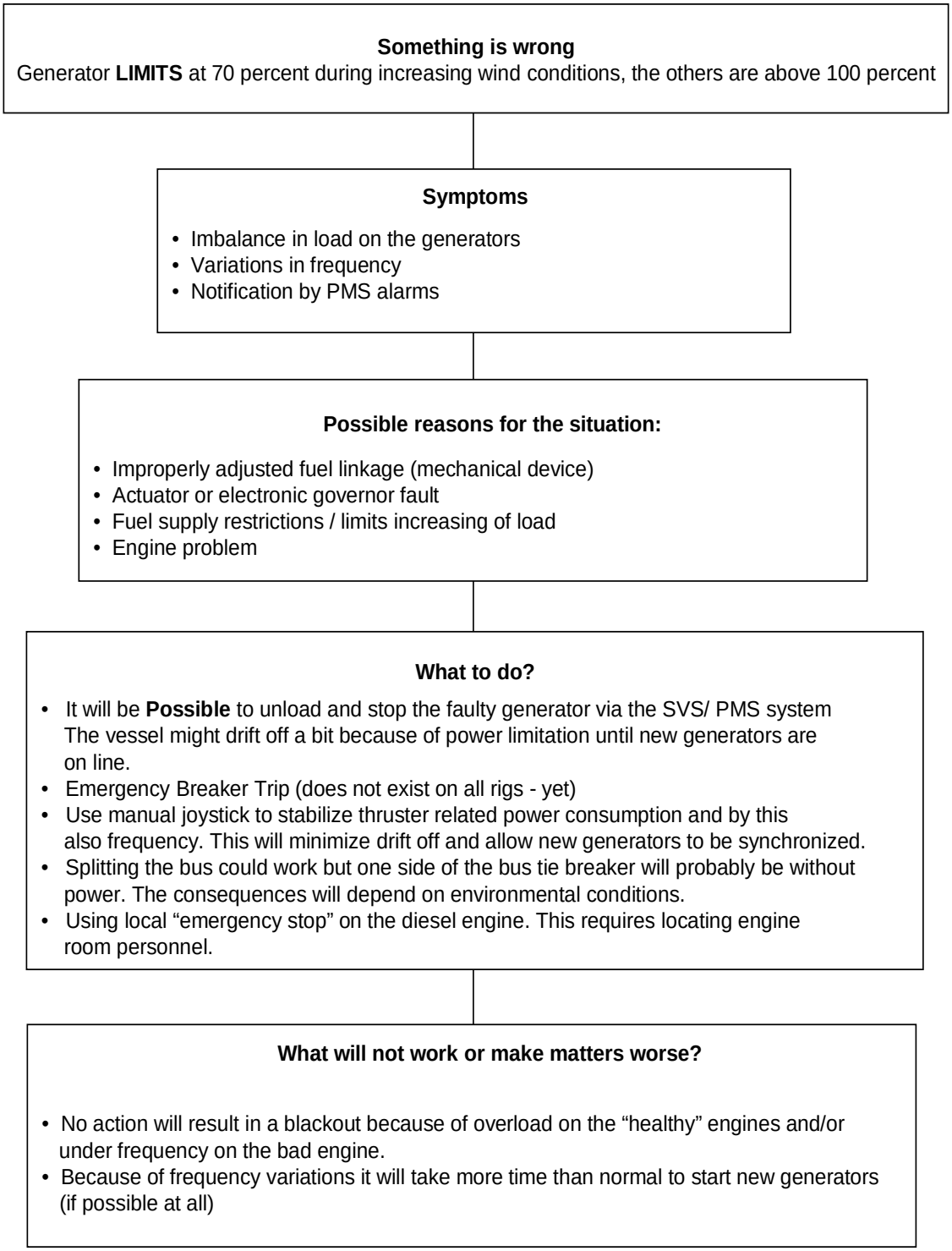
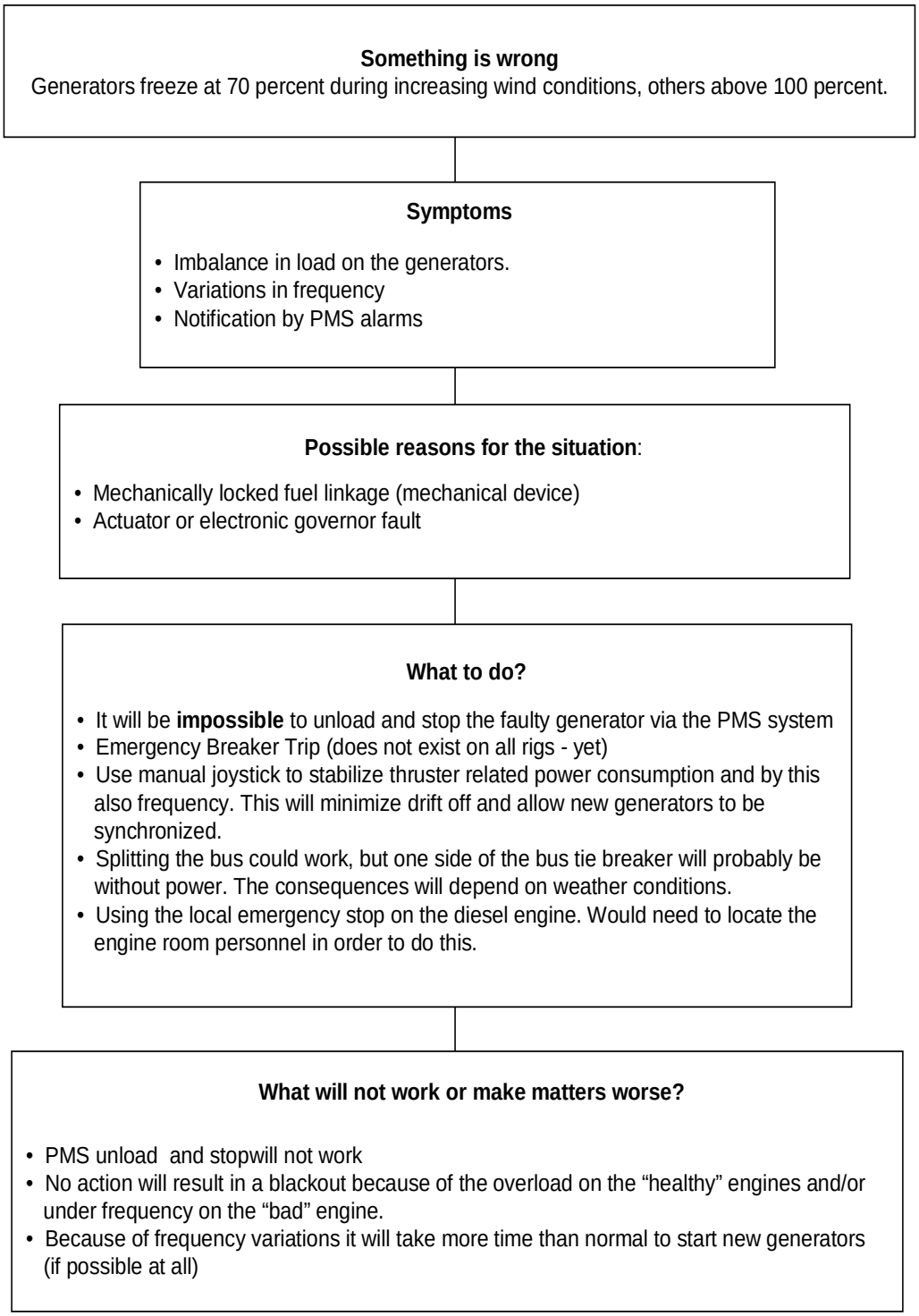


Figure 4. Example of a similar scenario and the different actions to take to illustrate the importance of understanding vessel automation verses memorization of actions to take.



The results of the actions of the DPO will determine which development plans will be given to the participants.

Below are examples of scenarios that will test the response of the DPOs:

- *Fuel rack actuator malfunction.* Three-generator operation. A "rip current" strikes the beam, requiring full power. One generator stops delivering power at 70% forcing the other generators to reach 115%. An overload alarm is sounded and after 5 seconds the overloaded generators trip on overload, the remaining generator trips 3 seconds later on under-frequency, and the rig blacks out. The DP Operator must turn off the faulty generator or deselect thrusters so that power limiting works properly.
- *Diesel speed control runaway*. One generator tries to ramp up to maximum RPM, causing it to pick up kW and forcing the remaining generators to release kW to maintain frequency. There must be more than one generator capacity of total load initially so that none of the generators go to reverse power. As long as the DPO doesn't decrease load, the faulty generator will time out and trip on overload (maybe we make this as long as one minute at 130%) and the other generators will pick up the load. If the DPO reduces thruster load, the good generators will time out and trip off on reverse power after 5 seconds, then the faulty generator will trip off on over speed immediately and the rig blacks out.
- *Diesel speed control instability*. Two generators, #1 and #6, one on each buss, 40% load on each generator. Suddenly, #1 takes 50% of the load, forcing #6 to drop to 30%. 10 seconds later #6 ramps to 60%, forcing #1 to drop to 20%. 10 seconds later #1 ramps to 70%, forcing #6 to drop to 10%. 10 seconds later #6 ramps to 80%, forcing #1 to drop to 0%. 10 seconds later #1 ramps to 90%, forcing #6 to drop to -10%, trip offline in 5 seconds on reverse power, followed by #1 immediately tripping on over speed and blacking out the rig. If the DPO decreases the load, the same thing happens, only faster. If the DPO increases the load to over 50% on each generator, they oscillate back and forth but both stay above zero and don't fail. If the DPO splits the busses, both generators settle down and perhaps one becomes unstable and trips off.
- *Voltage Control Failure*. During the simulation we want one generator to lose control of voltage, with the voltage regulator going to maximum and forcing the remaining generators to high voltage. A high voltage alarm will be generated on all busses. The SVC should display generator kVAR and/or generator excitation amps so the DPO has the information to identify the fault. If the DPO does not identify and remove the faulty generator within 1 or 2 minutes, all generators will time out and trip on over voltage.
- *Diesel over temperature #1*. Individual diesels begin to overheat and issue high temperature alarms when they exceed 70% load for more than 1 minute. This simulates blocked heat exchangers or reduced flow. See if the DPO thinks to start more diesels, cycle diesels on/off or reduce thruster load. If not, after 3 minutes the diesels trip on high-high temperature. The idea is either take action or ask for assistance. At this point, someone can simulate being the motorman and instruct the DPO to cycle between engines or run more diesels via the telephone, but only if asked.
- *Diesel over temperature #2*. All diesels are online at 60% load. The driller is drilling at a high rate, using a lot of power. There are no spare diesels in standby. There is no DP bias, just station-keeping load. The rig has variable speed thrusters, of which only half are online and running at high RPM where the kW/thrust efficiency is not most efficient. Wind and current start to increase and as the generators reach 70% load, the diesels begin to overheat and issue high temperature alarms. They cool off after 2 minutes if the load is reduced. There is no way to reduce environment, but the driller can cut back on drill floor power usage or the DPO can improve thruster efficiency. Monitor if the DPO thinks to reduce the DP kW load by putting the remaining thrusters online. If not, after 3 minutes the diesels trip on high-high temperature. A secondary response might be to shut of the driller which avoids a disconnect.

- *Thruster over temperature*. The same scenario applies, only this time the thrusters start to overheat. The thrusters cool off and the alarm clears if the load is reduced. The idea is to see if the DPO thinks to start more thrusters and reduce the load on each individual thruster. If the DPO fails to start thrusters within 3 minutes, the thrusters fail on high temperature and the rig drifts off.
- *Thruster runaway*. A thruster will begin to run at 100% regardless of command. The DP console will alarm, but nothing short of an emergency shutdown of the thruster will stop it. If uncorrected, the thruster will push the bow around and cause the rig to lose location or blackout. The DPO should be given 1 minute to identify the runaway thruster and remove it from operation. This can be done with kW feedback calculated from RPM, but the RPM feedback has failed. Monitor the DPO to determine that the manual thruster control panel kW and RPM readings have been checked – which we told the DPO were fed from a different sensor than that of the DP console.
- *Sensor problems:* Scintillation, median check, and gyro problems will be used.

Conclusions: Companies that anticipate and act rather than react are more likely to be successful in this new business climate. It is not practical or financially prudent to linger. An effective recruiting program targeting those with the correct aptitude; an effective succession plan coupled with competency programs and individual development plans; focus on competitive compensation, benefit programs, and retention programs; improved processes to achieve efficiency in administration of human resource management; and industry leading ideas such as innovative simulations are vital to the interests of a successful company.

Note 1. Example of competencies of Master, Chief Mate, Senior DPO, DPO and Assistant DPO.

Master / Chief Mate

The MASTER or Chief Mate shall have all of the qualifications of the Senior DPO include the following:

- Trained, experienced, appropriately qualified and competent to take charge of a DP watch for any DP operation in which the vessel may become engaged in
- Must hold a DP certificate
- Competent to train new DP personnel and assess the skill level of new and existing DP personnel.
- Competent to conduct a DP incident investigation
- Planning, executing and leading DP trials, and drills including blackout recovery

Senior DP Operator (SDPO)

The SDPO shall have all of the qualifications of the DPO, plus the following:

- Assessed by the master as capable of taking sole charge of a DP watch and complete training of junior staff
- Assessed by the master as capable of providing supervision to dynamic position operators for any DP operation that the particular vessel may become engaged in, [while in the same work space and maintaining continuous oversight of the activities of the ADPO]

- Trainer skill level in the setup and use of all position reference systems, including failure modes and mitigation of problems
- Trainer skill level in the setup and use of all environmental and motion sensors, including failure modes and mitigation of problems
- Use of the Data Logger and MS Excel to analyze DP and Power Plant data for incident analysis and identification of improvement opportunities
- Trainer skill level in the setup and use of the data logger to save data, export data, and print out data charts for analysis
- Trainer skill level on DP Simulator (on rigs that have a simulator)
- Trainer skill level on start up and well set up of all DP Equipment

DP Operator (DPO)

The DPO shall have all of the qualifications of the ADPO, plus the following:

- Assessed by the master as capable of taking sole charge of a DP watch
- Assessed by the master as capable of providing supervision to dynamic position operators for any DP operation that the particular vessel may become engaged in, [while in the same work space and maintaining continuous oversight of the activities of the ADPO]
- Complete knowledge of the setup and use of all position reference systems, including failure modes and mitigation of problems
- Complete knowledge of the setup and use of all environmental and motion sensors, including failure modes and mitigation of problems
- Assist in the use of the Data Logger and MS Excel to analyze DP and Power Plant data for incident analysis and identification of improvement opportunities
- Complete knowledge of the setup and use of the data logger to save data, export data, and print out data charts for analysis
- Comprehensive understanding of all DP and Vessel/Power Management Systems user settings, how they affect operations, and ability to contribute to decisions of how to adjust user settings for changing conditions or operations
- Comprehensive understanding of which displayed data on DP and Vessel/Power Management Systems are real data vs. calculated data, and understanding of how the origin of these data affect operations
- Thorough understanding of every line item on the WSOG (Well Specific Operational Guidelines) and sufficient understanding of all issues which go into the derivation of the WSOG to contribute to decisions on how to modify the WSOG for ongoing operations or conditions
- Understanding of the Electronic Riser and Stack Angle Sensors sufficient to be able to calibrate sensors, verify functional sensors, and detect defective sensors
- Detailed understanding of the DP computer/control system(s), including changing between systems and the various modes of operation
- Comprehensive familiarity with DP Simulator, if applicable
- Detailed knowledge of operational theory, failure modes, testing, and problem mitigation of thruster units and associated systems
- Detailed knowledge of operational theory, failure modes, and problem mitigation of power supplies used for DP – AC, UPS, DC.
- Detailed knowledge of Operational capabilities and footprints and comprehensive knowledge of vessel's operations manuals and communications systems

- Detailed knowledge of emergency procedures and actions due to failures of:
    - Input systems
    - Wind sensors
    - Computers
    - Commands
    - Feedback
    - Generator/power
    - Thrusters.
    - Sensors.
- Any other systems/equipment relevant to the DP

Assistant DP Operator (ADPO)

The ADPO is expected to learn the following before promotion to DPO:

- Controlling the vessel using manual and joystick controls
- Use of the data logger to optimize DP and power plant operations
- Use of the data logger to detect and mitigate DP and power plant problems
- Use of the data logger to backup data
- Export of data logger data to Excel format
- Utilize radar displays for detection and interpretation of local severe weather patterns
- Principles and planning of power plant operations
- Basic understanding of diesel generator controls, operations, and failure modes
- Principles of basic closed loop control system theory
- Familiarity with operation of MS Windows user interface
- Familiarity with Emergency Response Manual
- Familiarity with operation of all corporate software
- Principles of thrusters performance, failure modes, and operation
- Principles of DP operations
- Basic knowledge of the practical operation of the DP control system, including changing between systems and the various modes of operation
- Principles of DP processing of reference systems, wind sensors, VRSs, and other peripheral equipment
- Basic operational theory, calibration methods, and failure modes of electronic riser and stack angle sensor
- Basic understanding of WSOG, drift-off calculations, and riser analysis
- Basic understanding of rig offset test to verify stack heading
- Basic understanding of ROV operations
- Basic understanding of EDS sequences and BOP operations
- Basic understanding of drilling operations and well control
- Basic understanding of boat handling
- Basic understanding of helicopter operations
- Basic operational theory and failure modes of pitch/roll/heave sensors
- Basic operational theory and failure modes of satellite and acoustic position reference systems
- Knowledge of general math, trigonometry, and geometry
- Basic knowledge of architecture of distributed automation systems
- System specific knowledge of DP Control System redundancy, alarms and warnings
- System specific knowledge of Vessel Management System redundancy, alarms and warnings

- Knowledge of operational response to all DP alarms (who to call, what to do)
- Knowledge of operational response to all Vessel Management System alarms (who to call, what to do)
- Knowledge of vessel's operations manuals and communications system
- Knowledge of vessel's FMEA and its implications
- Training on any other systems relevant to the DP for which they are responsible
- Completion of rig-specific OJT program
- Completion of rig-specific DP "driver's license"

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Biography

Captain MacDonald recently came ashore after 22 years at sea. He is presently the Manager for Marine and DP Training for Transocean. He is an unlimited Master, a member of the IADC and Marine Technological Society. His educational degree was earned at Massachusetts Maritime Academy in 1981. He is currently working on his MBA.