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Training

Advanced Training for DP Operators

Is it time? What should it look like? How could it be used?

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Abstract

This Paper will address the concept of "Advanced DP Operator Training" and provide answers to the questions: Is it time for the offshore industry to seriously consider an advanced training program? What subjects, exercises, and scope of simulator work should be included? And finally, how could companies use this program to enhance operational safety?

The author represents one of the Dynamic Positioning training facilities in the U.S. who have developed, implemented, and conducted Advanced DP Operator courses. The presentation and paper will include the Subject Matter Outline of the course, as well as information regarding the written and simulator exercises conducted, including corresponding results.

The Nautical Institute DP Training scheme of shore based Induction (basic) and Simulator (advanced) courses have, the most part, served industry well in the past. However, in the time since many DP Operators have taken theses courses, a number of things have changed regarding DP operations, and the current scope of DP training may not be keeping pace.

Today, more DP vessels than ever before have electric propulsion plants. DP vessels are used for a wider variety and complexity of operations, and many vessels are configured for multiple operations. DP control systems have undergone significant changes in software and hardware with many additional functions to provide enhanced control.

There are those who would argue that today, some entry level DP Operator trainees may not have enough of the basic skills or experience necessary to fully benefit from the initial DP certification training courses. Advanced DP Operator Training could be used to fill some of this void for those persons.

Advanced DP Operator Training can increase operational safety and reduce serious incidents through additional knowledge of Power Management Systems, safe power plant set up and operation, common power and thruster system faults and failures, review of possible solutions to positioning system problems, as well as realistic, challenging, and operationally advanced simulator exercises.

Advanced Training For DP Operators - Is it time?

Experienced DP Instructors at well established training facilities are in a unique position from a DPO qualification and competency standpoint, as they get to see a very diverse group of personnel representing many different segments of the DP community. Much of the information in this section is based upon observations resulting from that experience.

When we use words such as qualified, competent, or experienced in describing DP operators it may be worth actually defining these terms as our perception of, and the reality regarding this issue, may be very different. "Qualified" as defined in the dictionary is: *to make fit for an office or occupation – to make legally capable – to be or become qualified as by meeting requirements.* The term "Competent" is defined as: *well qualified, capable – sufficient, adequate – legally qualified, authorized, or fit.* And finally, the definition of "Experienced" is: *having had much experience, as in a particular occupation or activity – having learned from experience, made wise, competent, etc. by experience.*

Present formal shore side training program effect on qualification and competence.

The Nautical Institute formal training portion of the training scheme is very "front loaded" by necessity, in that DP Induction (basic) and the DP Simulator (advanced) courses may be, and often are, taken within the first three or four months of starting the program. Since there is no mandate, or time available, for testing with regard to general knowledge, any misconceptions or misunderstanding may not be corrected and may be carried forward into the DP operator's career.

While all "validated" DP training facilities operate with essentially the same approved curriculum, the amount of emphasis on any portion may vary dramatically between centers, and in some cases, may be almost non existent when it comes to subjects like electric power propulsion.

This should in no way be construed as a mandate for a formal testing program, as that route would probably generate more problems than it would solve. Advanced DP Operator training may provide the best and most cost effective solution to "tie up loose ends" in the current training scheme. Consider this: the training scheme for DP operators consists of a grand total of 218 days, with only 8 or 9 of those days formal classroom training. Compare this with 17 days of formal training for ROV Operators!

Inadequate on board training.

The "on board" training phase of the certification process is very inconsistent throughout the DP community. In some areas the trainee may hold a position as a third member of a watch team under a certified DPO and a senior DPO (vary rare) or as the second member of the watch team under a certified DPO with varying degrees of experience or skills. In some cases the trainee may actually be the only person on watch or with another trainee! Therefore the quality of on board training is determined by the competency and experience of the certified personnel. This training phase is, in some cases, reduced to a "trial and error" program.

Unfortunately, there is very little consistency as to the manner in which this training is conducted. Most of the emphasis appears to be on basic DP system control functions, as opposed to functionality from a "whole system" approach, which includes internal (non sensor) control system components, as well as power plant and thrusters. Case in point, very few DPO trainees attending the DP Simulator (advanced) course, have ever seen or read their vessel's FMEA or reviewed the capability plots.

Operational procedures, policy, and safety, is another area of concern from a DPO trainee standpoint. There are still some companies who are struggling in this area. In the absence of guidance and policy on a company wide scale, each vessel Master or Senior DPO will eventually develop some rudimentary policy, which can vary widely with differing degrees of safety between vessels in a fleet. This can be very confusing and detrimental to the on board training process. This problem is evidenced repeatedly in the conduct of DP Simulator courses. In many cases operational safety has been relegated to simply completing the DP checklist.

Advanced DP Operator training can serve as a tool to reinforce a particular company policy, or assist DP Operators in formulating their own proper operational safety procedures.

Changes in DP System equipment & Functions

There have been many changes in the past five to ten years with regard to the DP control system, as well as the entire DP system itself. These include new system control modes, enhanced control functions, changes in system hardware and software, different thruster configurations and modes, not to mention diesel electric propulsion vs. engine driven thruster propulsion.

DP operators having years of experience only on the older systems could surely benefit from the subject matter and simulator time contained in the Advanced DP Operator course, not to mention the advantage of the familiarization time for those operators who may be transferring from operating one manufactured system to another.

DP work experience.

The actual experience "level" of DP operators may vary greatly between operators with the same "amount" of experience, depending upon the type of vessel and operations conducted. In some segments of the industry, a twelve hour watch may consist of three hours of DP operating time and remaining time in transit, while in other areas the operator's twelve hour DP watch standing time includes six hours of monitoring system displays and trends with absolutely no maneuvering interaction with the system. In contrast, there are operations conducted where the DPO may spent six to twelve hours per watch continuously monitoring, maneuvering, and interacting with the DP System.

Another concern that should be considered is the result of a DP operator moving from one area of the industry to another, such as offshore supply to pipe laying, heavy lift to drilling, or survey to dive support operations, where different DP system functions and position measurement equipment are used, and operational skills and knowledge are needed. Should there be little or no familiarization time available, the operation would surely be placed at a higher level of risk. The answer here again may be Advanced DP Operator training where the simulator exercises are tailored to meet these needs.

The purpose of the preceding portion of this paper has not been to criticize, cast doubt, or create undue fear, but rather to point out that there are many factors and variables to be considered in determining the level of qualification, competency, and experience of DP system operating personnel.

Advanced Training For DP Operators - What should It Look Like?

The "Advanced DP Operator Course" was designed specifically for certified and experienced DP operators as a supplement to The Nautical Institute training scheme. The resulting subject matter came about as a collaborative effort between industry (mainly drilling) and training centers.

The course design focus was on reducing the risk of DP incidents by providing additional knowledge of Power Management, power and thruster system faults and failures, safe power plant operation, as well as review and discussion of past DP incidents, review of position measurement system processing, and possible solutions to positioning system problems. The secondary focus was to enhance operational skills through the use of thought provoking written exercises involving DP operational situations, followed by realistic, challenging, and operationally advanced simulator exercises.

Advanced DP Operator Course
"Subject Matter Outline"

Day ONE

DP Operational Situations Written Exercise (DPOS-1)

The course starts out with this written exercise to assess basic knowledge and fundamentals of system operation, control, and safe operating practices. The ten questions in the exercise are representative of power, position measurement, environmental, thruster, and control function related issues.

Power Management System

This section consists of power terms and definitions, generator, bus bar, and bus tie control functions, active power load share and frequency control, reactive power load share and voltage control, load shed and load reduction, and blackout recovery. Speed governing, emergency shutdown, load sharing methods, governor and AVR configuration, split vs.; tied bus considerations, and power management system displays are also covered.

Power System Faults / Failures & Safe Operation

Fuel rack actuator malfunction, engine speed control instability and failure, voltage control failure, and engine over temperature / low oil pressure are discussed, and a number of different power redundancy and load share scenarios are reviewed.

AC Drives & Thrusters

Power control, drive phase back, thruster alarms, and faults.

DP Incidents Review – Loss of position cases

Review and discussion of IMCA Station Keeping Incidents: power related (5), position measurement system related (5), thruster related (2), operator error related (2), and environment related (3).

Day TWO

DP Operational Situations Written Exercise (DPOS-3)

This exercise is designed to be more thought provoking than the first written exercise with regard to safe power plant operation, dealing with environmental force changes and effect on safe operations, position measurement equipment, and thruster related problems.

Position Measurement System Processing

Review of position measurement system displays and processing of data, as well as common positioning problems, redundancy issues, and combined use of geographic and relative position measurement equipment. Review of the DGPS data serial stream information and procedure for configuring system to use GPS only data.

DP Control Loops & Functions

Heading and position control loop review, model control mode, kalman gains, environmental force fast learn, and acceleration / deceleration multipliers.

DP Operations

Conditions resulting in loss of position, safe operations console display set up, wind and current compensation review, and DP alert conditions.

ADP 21 DP System Familiarization

Console operation, Windows DP operating system functionality, system control functions, and display mimics.

Conduct of Simulator Exercises

Vessel characteristics (semi submersible & ship vessel), communications, and exercise operational planning.

Day THREE

DP System Simulator Exercise (ADPOex1) (6 hours)

Exercise vessel and operation consistent with work experience.

- Operation planning
- Conduct exercise
- Exercise critique / review

Day FOUR

DP System Simulator Exercise (ADPOex2) (6 hours)

Exercise vessel and operation consistent with work experience.

- Operation planning
- Conduct exercise
- Exercise critique / review

The simulator exercise scenarios are designed to reinforce concepts discussed in the DP Operational Written Exercises and elsewhere in the course subject matter with respect to problems, faults, failures, and the operational decision making process.

Advanced Training For DP Operators - How could it be used?

The Advanced DP Operator Course can be used in several ways by vessel and rig operating companies, as the course is not attached to The Nautical Institute formal training scheme. The course structure lends itself to being somewhat modular in that training facilities should be able to remove and replace sections as necessary, consistent with client needs.

The simulation exercises may also be highly configurable. Some training centers have multiple vessel external simulation programs such as Multipurpose Semi Submersible, Offshore Supply, Dive / ROV Support, Pipe / Cable Lay, Drill Ship, and Drilling Semi Submersible vessels. Within this mix, almost any kind of operation can be conducted. A large range of faults, failures, and environmental conditions can be simulated including, in some cases, generator load share scenarios.

GENERAL REFRESHER TRAINING

Considering the above capabilities, companies could use this program as a refresher course for Senior DP Operators, or for vessel Captains and Mates who may provide temporary watch relief for DP operators.

STANDARD OPERATIONS TRAINING

Companies may also use this program to promulgate or reinforce their specific DP operations policy or international guidelines specific to their operations. This training would be particularly advantageous when hiring experienced DP operators from a different segment of the industry.

OPERATION SPECIFIC TRAINING

Situations may arise where a specific DP operation may contain a higher than normal risk element, such as those encountered during the conduct of simultaneous operations (SIMOPS), and close operations (CLOSEOPS). The Advanced DP Operator course content could be modified to include survey data, field / well specific operating guidelines, operational safety and planning, FMEA audit review, if applicable, and review of expected environmental conditions. Simulator exercises could then be structured specific to the operation. Depending upon DP training center simulation equipment redundancy and set up, simultaneous / close operations exercises may also be conducted.

OPERATOR KNOWEDGE & SKILLS ASSESMENT

The knowledge and skill level of prospective or newly hired DP operator personnel may be evaluated by utilizing portions of the course. Within a much shortened, possibly one day, format, written and simulator exercises may be used for assessment with proper input, guidance, and evaluation criteria from participating companies.

Conclusion

When we refer to our DP operator personnel as "qualified," "competent," or "experienced," we must keep in mind that these are very subjective terms, and there is no absolute standard by which any operator is measured. We still have DP Incidents, and most of the time, a qualified, competent, and experienced operator is on watch.

Given the large number of DP vessels currently under construction, and the many more which may be in the planning stage, the obvious question may be who are we going to get to man them, but the more critical question may very well be how competent are the operators who are going to train them!

We need to reduce the possibility of "serious" DP Incidents by increasing operational safety. DP system manufacturers are doing their part by providing more sophisticated and reliable DP control and simulation equipment. Maybe now is the time to elevate the competency of our operator personnel as well.

Advanced DP Operator training programs exist. It is now up to the DP community to take advantage of them.