DYNAMIC POSITIONING CONFERENCE
October 10-11, 2017

TRAINING/COMPETENCY SESSION

Real DP Time – Really?

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Abstract

Dynamic Positioning Operators (DPOs) are in control of equipment worth millions. While most are highly skilled, it's almost impossible to know just how good, or experienced, individual operators are. This is because the only information the industry currently has to go on – from Accreditation bodies to owners, Charterers and the DPOs themselves – are paper logbooks containing generalizations that are, at best, less than precise and, at worst (given the honesty basis they work on), actually wrong.

This paper will cover the current issues of 'DP time', the potential for digital technology to be used and the potential benefits such technology could bring to the DP industry.

The initial stage will provide a review of error prone entries using quantitative analysis of current paper logbook entries versus actual ship operations with a comparison against industry current norms.

We will then consider the technological barriers any digital based system would have to overcome along with options a solution could take into account.

Potential benefits will be discussed including qualitative measurements of 'DP time' covering the skills, knowledge and experience of a DPO. These will aim to show how data could enhance benchmarking against industry standards, and potentially, industry peers using 'big data' – and how it could be complementary to, and potentially enhancing, other training methods.

Finally the paper will consider combining proactive management of 'DP time' with operational support utilizing technology to enhance and positively manage observance with Activity Specific Operating Guidelines including both the onboard DPO's and the shore side personnel responsible for DP operations.

An analogy

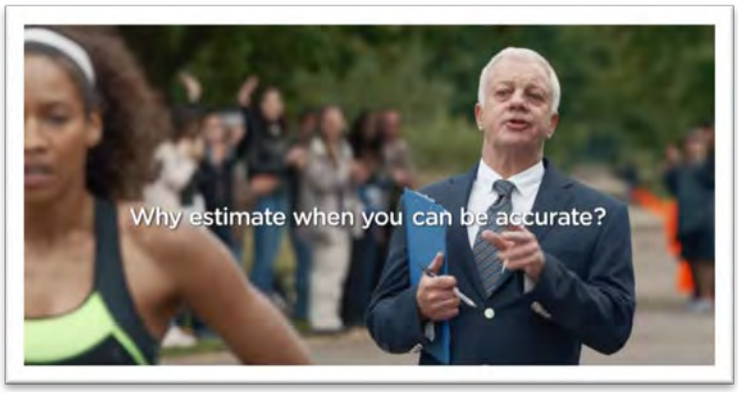


Figure 1 - Smart Energy GB - Why Estimate advert

Figure 1 is a screen shot from Smart Energy GB advertising campaign back in 2015. It shows a runner completing a marathon and asks for her time to which the adjudicator explains that he can't give an accurate time just an estimate of around four hours.

The idea of giving someone something that is valuable to them as a generalization doesn't really go down well or provide any reasonably reliable figures on which to base a decision.

Risk areas in Dynamic Positioning

We can define Dynamic Positioning Risk into four main areas;

1) Vessel Equipment – the vessel has to be fitted with redundant and reliable equipment

2) Vessel Setup – the equipment has to be setup in the correct configuration in order to ensure the redundancy concept is not compromised

3) Vessel Performance – the equipment has to be able to perform correctly under Worst Case failure conditions

4) DP Operators – The operators have to be sufficiently experienced in order to be able to setup, operate and manage failures.

Figure 2 - DP 'swiss cheese' model

The industry has come a long way in identifying and managing the first three with the use of MTS Techop guidance on equipment, configuration, performance and MDAT for operators knowledge management. However, the DP Operators experience has always been left to generalizations. As an industry, should we accept these generalizations?

Even when time is recorded with scrupulous accuracy, there is scope for a huge difference in 'DP Days' and hence the actual levels of experience.

With DP days being logged on an honesty basis it is open to ambiguity, interpretation and potential abuse, both in a reduction of hours, penalizing a DPO, or an exaggeration of hours, effectively penalizing the industry with a miss representation of experience and therefore competence and skill presenting a danger for the vessel owner/operators/charterers.

Part of the problem is the use of a 'unit' (the DP Day) that it is ambiguous! A DP Day for a DP operator could be 2 hours, it could be 12 hours or anywhere in between. It can also be an estimate of a vessel's

total hours on DP over a period divided by 2. So long as that number of calculated 'DP Days' from DP hours is not more than the actual days the DP operator served on board it will be accepted.

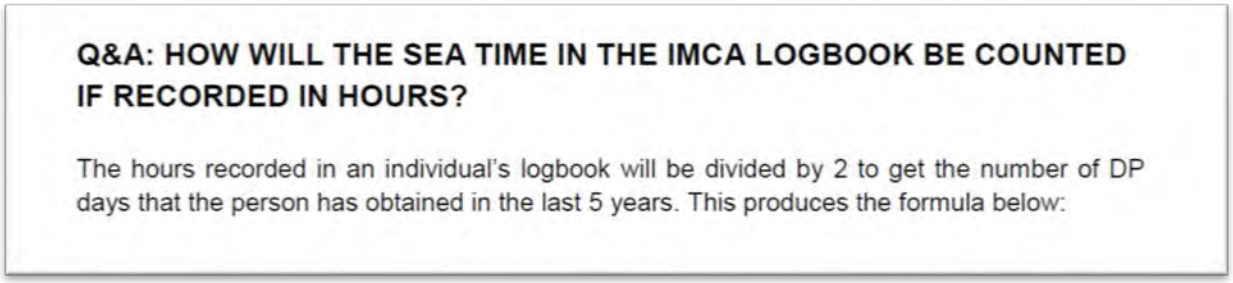
It's a bit like saying a distance is 200. 200 what? 200 Nautical miles, 200 miles, 200 kilometres. Would we be happy to buy petrol (gas) by the same measure, US gallon, UK gallon, Litre, pint – surely, they are pretty much the same.

A definition of competence can be defined as 'skills and experience gained through training and operation'. If the Dynamic Positioning Industry is to align with a robust view of competence then not just the training undertaken in simulators or onshore courses for revalidation but the actual and real operational experience should be taken into account when assessing competence.

An industry Example

Looking back at the video for Smart Energy GB we can relate this to our own specific domain of Dynamic Positioning Operators by looking at an example of some log book entries.
In the following example, we can see that the DPO is logging his time in hours in an IMCA log book. The DPO will then have to convert these to 'DP Day's' in order to apply for revalidation.

The current calculation is hours divided by two which has to be less than the number of days onboard.



Q&A: HOW WILL THE SEA TIME IN THE IMCA LOGBOOK BE COUNTED IF RECORDED IN HOURS?

The hours recorded in an individual's logbook will be divided by 2 to get the number of DP days that the person has obtained in the last 5 years. This produces the formula below:

Figure 3 - Nautical Institute - hours to 'DP Days' Calculation

A 'DP Day' is defined as anything above 2 hours within a 24 hour period, this could then potentially be 2 hours to 12 hours (if a DPO's time is taken as the full watch or should it be only the time on the Desk?) the current guidance is it is all the time on the bridge, is this a correct assumption?

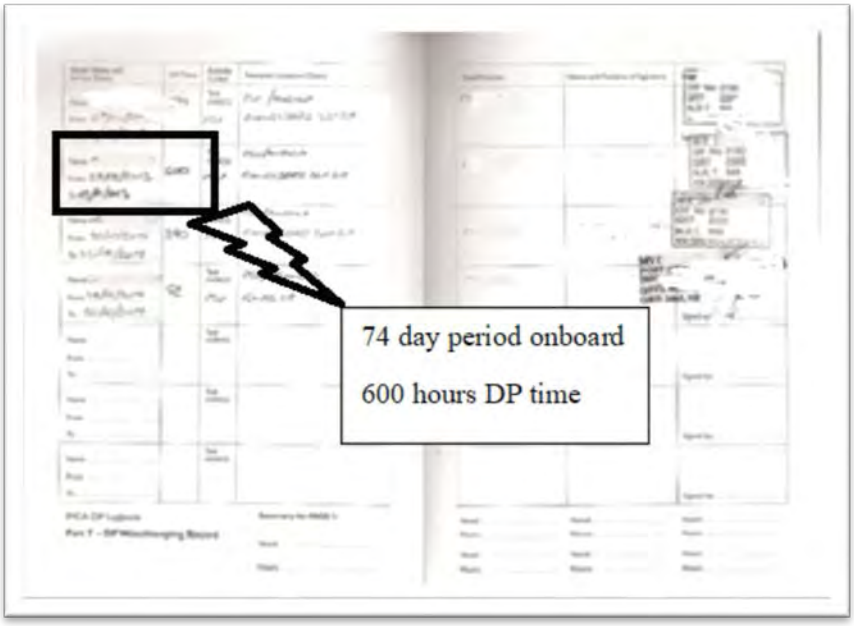


Figure 4 - Declared IMCA log book entry

In this example we can see the DPO has been onboard the vessel for seventy four days. Converting this to hours allows us to see what proportion of time onboard the DPO is claiming. Total hours onboard would be 1,776.

Total working time based on watch keeping routine of working twelve hour shifts would give 888 hours. The DPO is therefore claiming that 67% of his working time was spent on DP, dividing this over the number of days (seventy four) onboard gives an average of eight hours per day for the total period which may appear reasonable to a brief look.

Validating the entry

The example log entry is for a Platform Supply Vessel providing logistics functions to several fields within the area. It is therefore reasonable to infer that there typically would be some port calls and transit time for the vessel.

In order to validate this assumption relevant AIS data for the vessel was extracted independently and analyzed. This is not fool proof way of showing if a vessel is in DP but does produce some insightful data, i.e. vessel in port or out at sea. If the vessel is in transit, both by the speed given from the AIS and the delta of the distances from each AIS 'ping' provide details of the vessels history.

By analyzing the AIS data it is then possible to take into account Port days (mapping) and transit times (speed and location delta's) in analyzing the claimed hours.

MMSI
STATUS
SPEED (KNOTSx10)
LON
LAT
COURSE
HEADING
TIMESTAMP UTC

Figure 5 - AIS Data

Accuracy of the data could be improved by the inclusion of metocean data model to highlight any potential vessel drift which would have quantified any time the vessel was drifting with the environment and not in DP.

The example vessel data showed that the vessel was possibly in DP for a period of 777 hours over the seventy four days the DPO was onboard. This equates to thirty two days of Total DP Time for the vessel.

The watchkeeping pattern was known for the DPO being 06:00 to 12:00 and then 18:00 to 24:00. Based on the watchkeeping pattern the log book entry should have been closer to 380 hours of DP time, giving the DPO all watch keeping periods as credit. In all likelihood actual DP desktime would be far shorter if the DPO's were operating on the typical industry standard of hour about on the desk with their watch keeping partner.

Figure 6 – Vessel position data – in Port not in DP

We acknowledge there has been some progress, following the date of this log book extract, with additional checks via the Nautical Institutes Alexis platform along with the additional requirement for 'sea time verification letters'.

This does add an additional check but also an additional bureaucratic burden to offshore vessel operators as highlighted by the questions raised at the European DP conference 2015.

To add further frustration for the DPO different interpretations of time have been encountered, one Captain religiously signing off only hours on the Desk whilst another Captain signed off all the time onboard, this was for the same vessel.

The Nautical Institutes calculation would give the DPO a total of 74 'DP Days', far short from what was claimed.

Figure 7 - European DP conference - 2015

Referring back to our definition of competence 'skills and <u>experience</u> gained through training and operation' it could be stated that the industry is in an ambiguous state. The DPO over claiming his experience but the industry certification scheme under recognizing their experience.

Does this give a real rigorous backbone for the definition of <u>experience?</u>

	Claim	AIS	Notes
Time onboard	74 days	74 days	
DP Time	600 hours	380 hours	DPO over claim of true hours
DP Time (real days)		35 days	Actual number of DP Days @ any above 2 hours per day
NI Limit	74 days		
NI Calculation @ min 2 hours per day	148 hours		
DP Days	74 days	35 days	Variance
Hours	148 hours	380 hours	

Figure 8 - Comparison of NI DP Time and AIS Data

For the DPO going for revalidation they are unable to claim a significant portion of experience and would need additional sea going days to gain it back.

It could be said that with the estimation techniques the industry is currently using, is the whole industry carrying an unrequired / unmanaged risk by not truly recognizing a DPO's experience.

Figure 9 - Operator Experience - limit barrier

Building Accuracy

Digital technology is pervading its way into all facets of life, take the analogy we used at the start. The British energy companies are being steered towards implementing accurate energy measurement for households by using smart meters.

For our industry what would we have to do to embrace a technological solution whilst not hindering the safety of the DP system.

What not to do

1) Don't digitize a S**T system.

If a step into the digital is going to be undertaken then there is little point in digitizing a shit system.

Digitizing what we have now would not really provide any new data or metrics for DP operator experience.

A digital version would still have the same ambiguities that the current paper based system currently has, no accurate management of a DPO's experience that could be combined with their training records to provide a total picture of their competence.

Some minimal additional benefit could be some increase in speed of data access, but the residual ambiguities of accuracy of records would still remain.

Figure 10 - Linkin Article on Digitizing processes

Any opportunity to digitize should take the opportunity to improve the situation for all stakeholders and enhance any system or process.

2) Distract the Operator

Both the UK's Marine and Coast Guard Agency (MCA) and the USCG have recognized that use of mobile phones whilst officers are undertaking navigation activities should not be allowed.

Interference in the MCA's context relates to 'the distraction caused by making or receiving mobile phone calls at inappropriate times during the conduct of the vessel's navigation and conning'. This was first published in 2005, since then the whole world has seen massive uptake of smart phones with a multitude of APP's available.


MARINE GUIDANCE NOTE

MGN 299 (M + F)

INTERFERENCE WITH SAFE NAVIGATION THROUGH INAPPROPRIATE USE OF MOBILE PHONES

Figure 11 - MCA Notice on moible phone use

Potentially adding an APP version to a DPO's mobile phone would this give them the opportunity to use other APP's, say Games or chatting to Friends, which would interfere with their actual job or holding a DP watch.

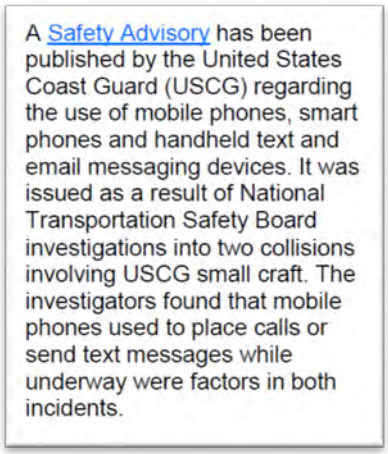

A Safety Advisory has been published by the United States Coast Guard (USCG) regarding the use of mobile phones, smart phones and handheld text and email messaging devices. It was issued as a result of National Transportation Safety Board investigations into two collisions involving USCG small craft. The investigators found that mobile phones used to place calls or send text messages while underway were factors in both incidents.

Figure 12 - USCG notice on mobile use

What to consider

Technology can be applied to give us an objective SMART system. The challenges that need to be overcome;

Knowing when the vessel is in DP

In order to gain more accurate data compared to utilization of a paper based system or AIS records any system needs to know when the ship is operating in a DP mode.

A switch, digital input, would not suffice as this could be easily circumvented by unscrupulous operators. Additional data could be taken into account in order to determine if the vessel was operating in DP mode.

Data can include details of thrusters in use, position, Position reference sensors in use, generators and thrust magnitude and direction as checks and balances to confirm that the system is truly in operation and not just switched on.

The use of encryption has a part to play here. This can be used to determine the 'sender' of the data to the digital system by using a keyed Hash message authentication code (HMAC). The would involve the DP system and the digital system knowing secret keys to translate the outgoing and incoming data. This

would ensure only registered/real systems could send data to a digital system and not just some computer sitting in a static office.

Network integrity

Getting the data from the DP has to be in a secure manner. The days of 'wannacry' and other malware are not over. It is therefore NOT needed or even warranted to put the DP critical networks onto anything that has the potential to interrupt the position control of the vessel.

Shipping is a very traditional industry, the article shown highlights how the industry is often considered between 5 and 10 years behind cutting-edge business practice.

Algorithms and big data set the stage for culture clash

Digitalisation offers great opportunity but also the risk that valuable industry expertise and initiative may be thoughtlessly jettisoned

Intrusion of digital technology into all aspects of business life is a reality that is rapidly catching up with shipping. As an industry often considered between five and 10 years behind cutting-edge business practice, shipping faces upheavals on many fronts as the impact of newly enabled digital technologies threatens to drive change in every nook and cranny.

Yet while some challenges are already being digested, others are far from understood or accepted.

The impact of the digital revolution on

Figure 13 - Tradewinds - Shipping 5 to 10 years behind

In order to keep the DP system network integrity it is possible to use commonly understood communications systems already used onboard the vessel and DP systems.

The National Marine Electronics Marine (NMEA) has successfully utilized serial message formats for a variety of systems onboard vessels. Typically, in the case of Dynamic Positioning Systems it is for the input of Position Reference Sensor (PRS) and Environmental Sensor data, DGPS, Acoustics, Lasers, Gyro compasses, wind sensors to name a few devices.

In the case of a digital logging system the data is not going into the dynamic positioning system but is only being transmitted out of the DP.

With NMEA serial messages it is possible to have bidirectional communication but to ensure complete integrity of the DP system a unidirectional communication pathway can be utilized without any issues of network integrity.

Operator identification

In order to align the vessels DP operational record with an operator the identification of each operator needs to be taken into account.

Think about how you use your bank card and how banking standards maintain user identification and alignment with current/savings account information.

Banks typically use two factor authentication. For example, you have a physical asset, namely the card, and also your PIN number. The banking industry defined this in around 2000 as EMV.

For onshore static systems banks typically use common forms of two factor authentication with data being transmitted back to the main server for confirmation. With a ship, however, that may have intermittent communications by VSAT or FBB, if fitted, or if none at all, it would slow due

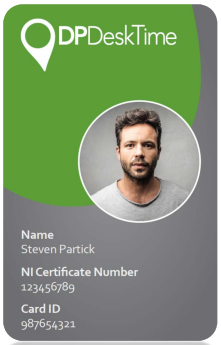


Figure 14 - sample Digital logbook

to latency, low bandwidth to utilize an effective system that confirmed the operator identification with the master server.

It is possible to again use banking standards to overcome the isolated nature of vessels working out at sea. By utilizing the EMV standards it is possible to effectively use a system similar to 'chip and pin' in an offline environment. This therefore provides solution for identification in when communication to a master server is down or extremely slow.

An additional consideration with operator identification comes down to how time is allocated. Currently the Nautical Institute accept 'when 2 DPOs are on watch together, each is eligible to claim the watchkeeping time'. The statement was only clarified in November 2016 and as highlighted above experience shows that Captains' have previously used different interpretations of DP Day's.

There is still a bloc of the industry, rightly or wrongly, that would actually define DP time as the operational experience the DPO is getting, not being the second man on the bridge.

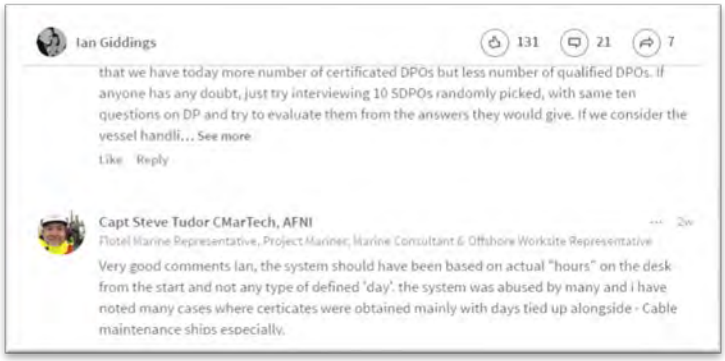


Figure 15 - Linkedin discussion on what is real DP time

It is quite possible that the second operator is carrying out Heli ops or other sundry tasks in their hour away from the desk.

In order to be able to manage specific operational time and 'second operator' time any system should have the ability to allow two DPO's to be logged in and determine which hour they are operating on the DP desk.

The Captain and any trainee DPO's need to be taken into account as well. A Captain on a larger vessel may not typically hold a DP watch. They would still require validation of the DP time, whether in a supervisory role as Captain or any actual operation time to be validated in a digital system.

Trainees should be accounted for in carrying out operations supervised by an experienced DPO. A digital system would allow the records of the operation to be logged along with the identification of the supervising DPO.

Data Storage

With a paper log book data storage is fairly ease, with a pen. In order to match this, any system would need to be able to allow an operator to safely store their own data independently of any transmission back to a main server.

This can be achieved by the use of smart cards. Smart cards have been around since 1968 and are used for banking, building/office access and in some European countries for medical records and person identification.

By utilizing this technology with increased memory storage on the card it is possible to then provide a comprehensive digital log of an operator's experience which is independent of any transmission back to a main server.

Nautical Institute revalidation is now setup for DPO's to complete every five years. In such cases a new smart card could be issued with the old card being terminated internally. Alternatively, the original card could be allowed be revalidated and continue to be used by the operator providing sufficient storage for a working life time was provided.

Data transmission

Data from the system does need to be available and processed by other stakeholders including the DPO's for their records. Other stakeholders with interest in the operational experience of DPO's include ship owners, ship charterers, insurers and certification bodies.

In order to effectively transmit data back to a main server a digital system would need to use VSAT, FBB if provided on a vessel. For larger vessels communication from the digital system back to a main server is fairly easy. For smaller ships that do not have a VSAT or FBB system data could be stored locally on the vessel and then when a vessel enters port, which would be more frequently for smaller platform supply vessels, the system could utilize the existing 3G/4G networks to dial up and transmit the data back to the main server.

The system as it is not going to affect the DP critical networks can be connected to the VSAT and a secure transmission line and encrypted data transmitted back.

Data from the main host server can then be sent out to the relevant stakeholders via controlled and secure API's which again will only allow data out and not manipulated data back in.

Is there a place for 'blockchain' in all this? Well there could be, some areas that need to be resolved here are the number of nodes/peers in the network providing the validation. The lowest number is approximately seven which is above the three certification systems we have in the industry at present.

Data integrity

The number of data breaches that are hitting the headlines each year are increasing. Typically, these are large / high value companies that have been compromised by focused hackers.

This does not absolve a small system from not being prepared for this type of eventuality.

Any system should go through Penetration Testing via an independent experience company to ensure the integrity of their databases and web applications.

The main objective of penetration testing is to determine security weaknesses in the IT code and hosted environment. Any identified weaknesses can then be prioritized for fixes ensuring the integrity of data.

Figure 16 - BBC article on data breach at Equifax

Digital System Data

Based on our own beta system we have been able to look at the output of a digital system and confirm the challenges highlighted earlier can be overcome.
The beta system is installed on a platform supply vessel operating in Asian market. Data for initial analysis is over a 365 day period which has been collected and analyzed.

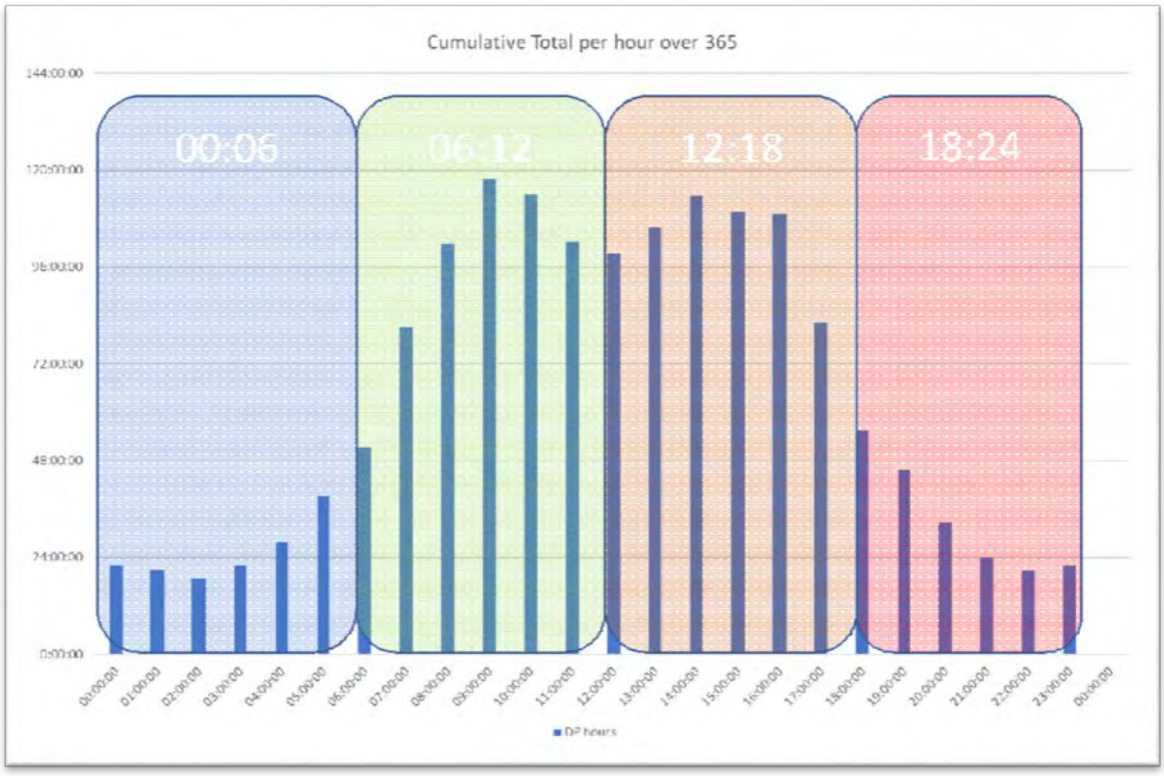


Figure 17 - frequency of DP time during 24 hour periods for 365 days of DP operation

The chart above shows the cumulative totals for each hour of operating over the year. For this vessel specifically, it can be seen that the DPO's who are holding the early morning (24:00 to 06:00) and the late evening (18:00 to 24:00) watches will gain reduced DP time compared to the DPO's operating on day shift watches. This is due to the nature of the vessels operations typically only being carried out in morning or afternoon day light.

The actual true DP Desk hours have also been compared with normal records for the operators. For example, if they were claiming under the Nautical Institutes 'DP Day' or utilizing an IMCA log book record for recording DP hours.

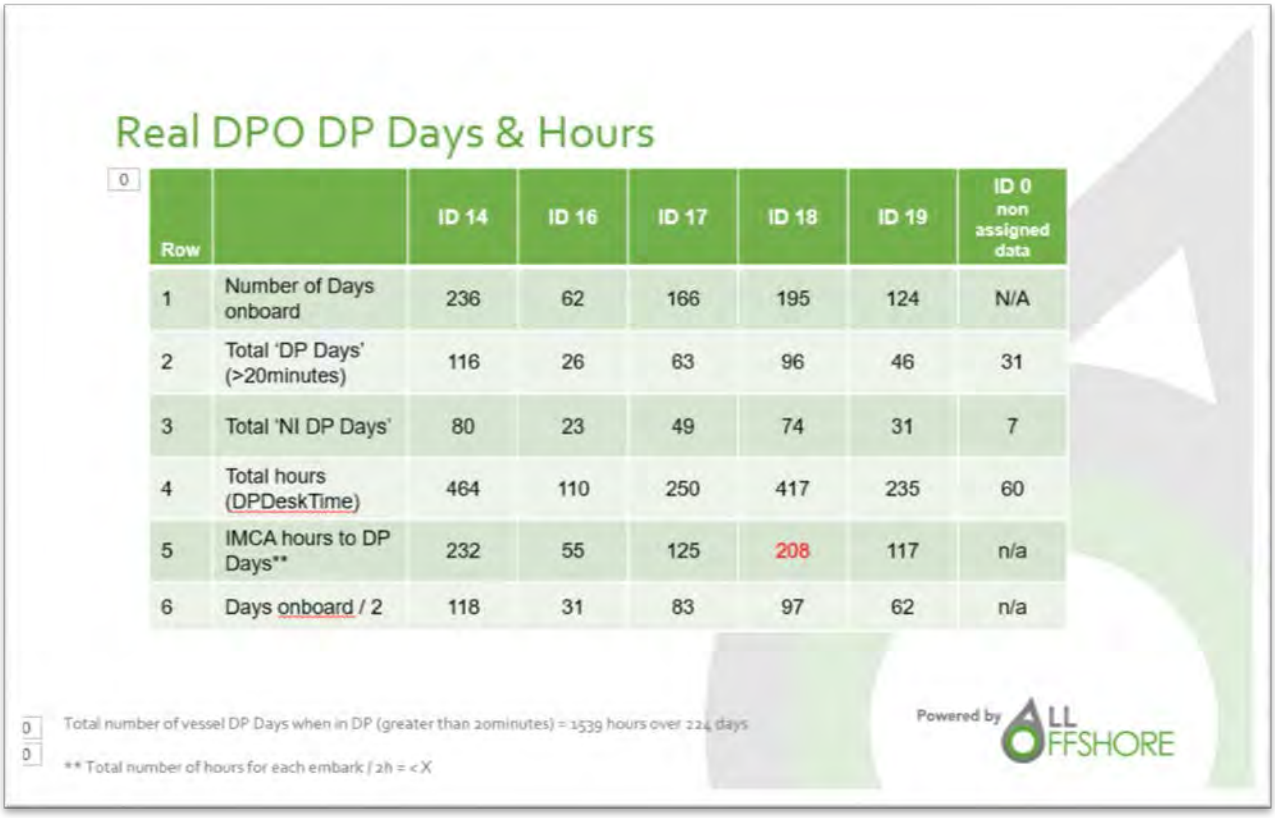


Figure 18 - comparison of NI 'DP Day', IMCA records in Hours and Real DP time using DPDeskTime

Row 1 is the total number of days onboard the vessel, including leave rotation	Row 2 is the total DP Days where any DP period was greater than 20minutes in duration.	Row 3 is a strict NI DP Day definition where a DP Day is anything above 2hours.
Row 4 is the total number of DPDeskTime hours from the DPDeskTime system	Row 5 is the calculation based on logging DP hours in an IMCA logbook and using the NI formula for calculating back to DP days	Row 6 is the total number of days onboard divided by 2.

Figure 19 - row descriptions

The table shows the figures for four DPO's working on the vessel over a 365 period.

Row 1 shows the total number of days the DPO was onboard during this period covering time onboard and leave time.

Row 2 shows the number of 'DP Days' where an operator completed DP time that was above a 20minute period. A 20-minute period was taken to be the normal settling time for the DP system as such one operation may have been 1:15minutes and would not have been counted as a NI DP Day.

Row 2 provides a comparison to Row 3 which shows the true NI DP Days. In these cases this is a strict interpretation being based on actual time on the Desk and not being the second DP operator on the bridge.

Row 4 shows the total number of real DP hours a DP has completed over the 365-day period. Row 4 can then be utilized to calculate the number of DP Days that would be credited, for example if a DPO was recording DP hours in an IMCA log book.

Based on the Nautical Institute calculation of Total number of hours for each embark / 2h = < X where X is the total number of days onboard.

Finally Row 6 is the total number of days onboard divided by two. This provides a rough estimate of how many DP Days a DPO may claim by just using their signed on / signed off dates as DP hours to get DP days.

Comparing the two traditional methods of calculating DP time shows the large variance. The figures are based on the real DP hours and the NI DP Day as being any period of operation above 2 hours.

The DP Days (IMCA) is the calculation as laid down by the Nautical Institute.

Under the current guidance both figures would be valid for claiming DP time for gaining certification and for revalidation.

Row		ID 14	ID 16	ID 17	ID 18	ID 19	ID 0 non assigned data
3	Total 'NI DP Days'	80	23	49	74	31	7
5	DP Days (IMCA)**	232	55	125	208	117	n/a
	Variance (R5-R3)	152	32	76	134	86	

Figure 20 - Current industry accepted variance from real Data using DPDeskTime

The variance, calculated by taking Row 5 – Row 3 figures for each column, shows how many days difference there is between the two valid methods. This shows the large variance that the industry is currently working with and accepting inclusion into competence records.

The figure marked in red in Row 5 in figure 18 show that the total number of DP calculated hours to DP Days is greater than the number of days onboard. The additional DP Days would have been rejected by the NI. Therefore, the DPO ID18 would apparently lose out on actual DP time, their real experience is not being credited correctly using the DP Day formula.

The data highlights that DPO ID 16 would have a marginal chance of achieving 5-year revalidation if they used the NI DP Day but would achieve it if using the hours to DP Day calculation.

Do hours matter?

The data analysis for the vessel clearly shows that accurate hours data is indeed achievable for DP operators when the vessel is operating in a DP. The data can include all forms of DP system control from Joystick Manual Heading through to specific DP modes like ROV follow and Track follow.

A step into Qualitative data

So do hours really give us what we need for competence measurement? If we can apply this to a credit based system, would real experience of operations be a better measure rather than generalized hours.

The beta data from the vessel showed that it is possible to take a qualitative approach to experience.

The chart to the right shows a three-day period where the vessel was operating in DP mode at different positions within a field. It is clearly possible to see the different periods of DP time.

Each DP period can then be reviewed for which can then be aligned with the correct DP operator who was standing watch at the time.

Figure 21 - vessel operating profile for 3 days

Drilling down further into the data it is possible to provide a qualitative measure of an operator's experience. Figure 22 shows a 500metre zone entry and exit for the vessel carrying out logistics operations to an FPSO.

The total period of operation from setup through to termination was four hours three minutes and thirty six seconds, with the total periods of DP time, shown in red, three hours eight minutes and thirteen seconds. Time alongside the FPSO was one hour fifty six minutes.

In this case the complete entry and exit was carried out by a single DPO.

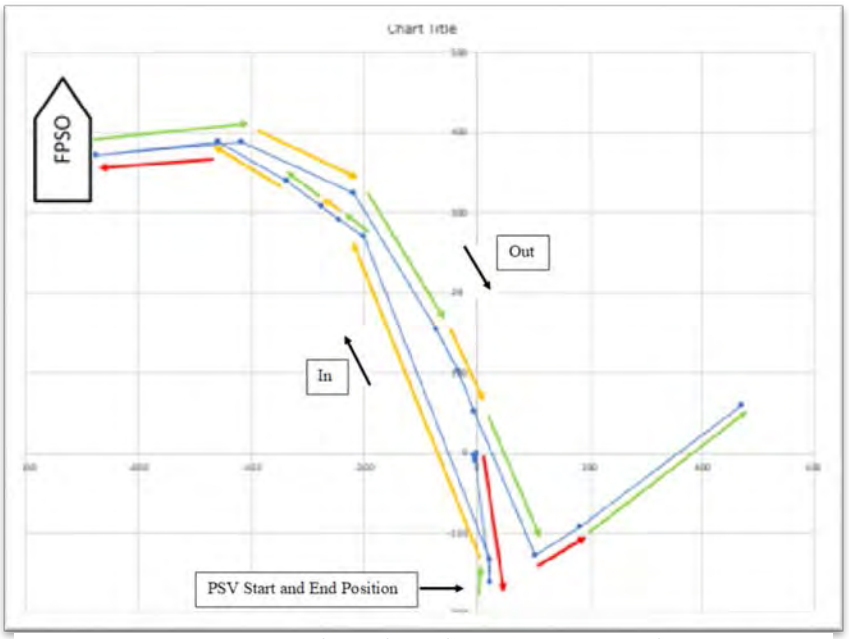


Figure 22 - DPDeskTime logged 500m zone Entry and Exit

Onboard Training

With the ability to capture the DP operator identification and monitor the setup and position/heading from the DP system, as shown in the above example of a 500metre zone entry/exit. A digital system has the ability to enhance the training of DPO's whilst onboard a DP vessel and can then provide accurate documented evidence for continual professional development automatically.

When setting up on DP, or if there's spare time available, it is possible for an operator to run a wide range of scenarios, from worst-case situations to operating in different modes and carrying out specific maneuverers using the DP system.

Firstly, it means operators can carry out training on-board that is documented accurately, so there's less need for them to train in their spare time.

Secondly, it can highlight areas where they need more support, which means their onshore classroom and simulator training can be more focused.

Finally, and most importantly of all, it means the operators can get real on-board training – not just experience, but precise and actionable feedback – in the different operating modes and the sorts of situations they may only see a few times in their careers.

The learning pyramid can be attributed to the national training laboratory. The aim of the pyramid was to show how people retain knowledge.

Although the percentage figures have been debated and other variables have been shown to affect retention rates, it does provide a broad outline that 'practice by doing' is far better for learning than lectures, audio visual or demonstrations.

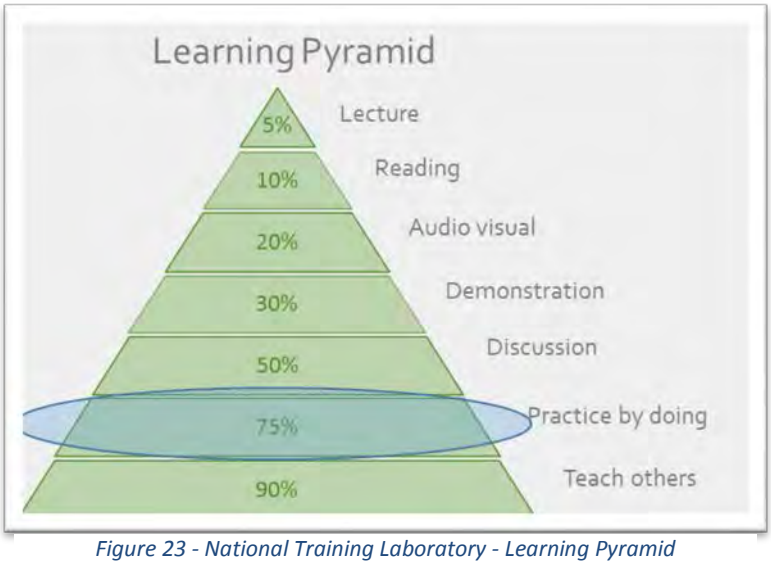


Figure 23 - National Training Laboratory - Learning Pyramid

An example training scenario

As an example of a task that could be covered is an operator's use of the manual joystick to control the vessel. Figure 24 shows the actual ship position and heading in relation to the selected set point and the calculated deviations.

The data can be benchmarked against other DPOs within a fleet – so, as some training experts suggests, it will be possible to use "the observations of outstanding performers" for the benefit of all.

Figure 24 - Digital Training Record

By benchmarking and comparing all DPOs to the best, it will enable a determination of a true level and ultimately setting what is an acceptable level of skill for certain tasks. Completing, documenting and benchmarking this type of task can also give you the reassurance that DPOs are also developing their knowledge of vessel dynamics.

Additionally, DP operators can practice the worst-case failure setup for the vessel. Operators can be requested to set the DP system up to match the worst-case failure design intent, not by tripping equipment, but just by selecting what is defined to be operating after the worst-case failure. The DPO can then visualize the setup and gauge the dynamics of the vessel in a real-life situation.

This is not just for practice, this will encourage the operator to go find more about a vessel's worst-case failure design intent from the operations manuals and failure modes and effects analysis, thus reinforcing their understanding of the vessel.

This moves onboard training more into the sphere of Outcomes Based training and education ideals.

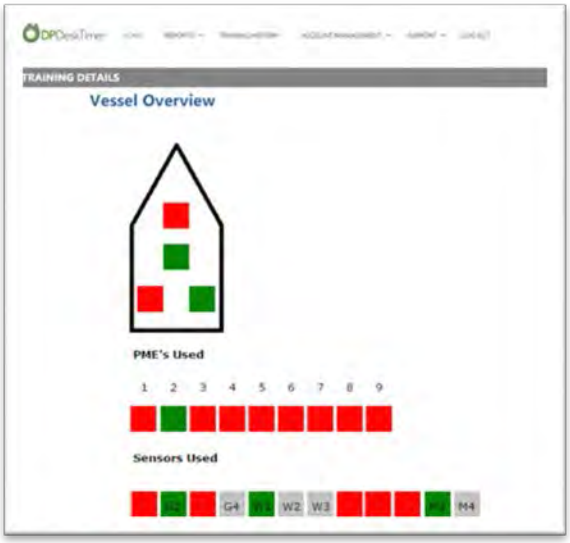


Figure 25 - Worst case failure report extract

The above examples are more than achievable for Platform Supply Vessels and the types of operational profiles, port calls, transit, standby time, that they follow. However, these may not be possible for larger vessels where the vessels are operating on DP for months at a time.

Accurate experience management does not just have to apply to specific training tasks. A digital system could also document the actions an operator carries out during their work.

For example, a heading change on a drillship or position moves on a pipe layer, or take a configuration change where thrusters or generators are down for maintenance. It is vitally important to recognize when operators have had experience of items like this whilst working at sea, so if they haven't done it, shore-side training can be focused to cover the knowledge and if they have done it the details can be used for debriefing and knowledge development.

These are a few examples of what can be achieved and this will no doubt develop in terms of scope and breath in the future as a technology based system is implemented.

Simulators

We do not believe that the onboard training would take the place of onshore simulator training. A simulator setting has controlled conditions can be replicated for complex scenarios and operators tested without the concern for damage to equipment.

However, if a digital system can show benefits for offshore operations and qualitative experience onboard, then would it be sensible to explore adding a digital system to simulator training in a shore side environment.?

It would then be possible to gain a full picture of an operators training and experience. This would provide a comprehensive professional development log for operators, ship owners and the industry as a whole.

Supporting operational guidance

Data from the DP system is used by the digital system to determine if the DP system is in control the data can also be used for other activities. For an example, it could be used to compare the current configuration to the optimum setup as a digital checklist or decision support tool. When an operator is not using the optimum setup they are removing one of the barriers in preventing a loss of position.

The aviation industry

The aviation industry started developing digital checklists in the 1980's and have been through an evolution of types over four levels of digitization.

Level 0 is a paper system, basic with lots of information on one sheet.

Level 1 is the initial digitization, some benefits of quick distribution and system checking for missing boxes but no integration with aircraft systems.

Level 2 can be defined as semi automation where some sensor information is integrated into the checklist, this can highlight issues/changes to sensors and alert the operator as needed so proactive action can be taken.

The final level is level 3 where full sensor integration has been completed and the system can alert the operator to a number of issues/changes where the operator will have to take action.

Figure 26 - Boeing Digital Checklist for 777

Level	Type	Description
0	Paper	Basic – lots of information on one sheet
1	Digital	No integration, some benefits of quick distribution & checking of missing boxes
2	Semi Automation	Some sensor information, can highlight high level issues/changes
3	Full Automation	Full sensor/system integration full identification of issues/changes

Figure 27 - Digitisation Levels

The benefits of such digitization can be summarized as;

- Bring a reduction in errors for missing items
- As an aide memoir for operators forgetting items or leaving outstanding items forgotten.

As highlighted in figure 13 the marine industry is often considered to be 5 to 10 years behind other industries in cutting edge practices.

For operational support, we can see that in this example of a poster provided by an insurer. It does provide some guidance but in the day and age of digitization it is sorely lacking.

The Marine Technology Society should be acknowledged for their proactive work in on instituting Activity Specific Operating Guidelines (ASOG's) within the industry.

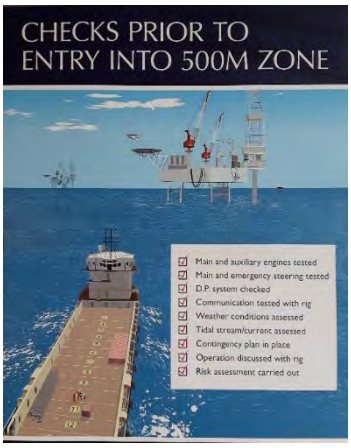


Figure 28 - Insurers poster for prevention of incidents in the 500m zone

What is an ASOG

An ASOG will typically have two sections, one for configuration and one for operational criteria.

The configuration section proving detail for the correct setup of the vessel for the specific activity to be undertaken. This will cover engine, switchboard auxiliary systems and define the Position Reference Sensors (PRS's) that should be selected for use for the operation.

The operational criteria section will define the operational limits for the vessel for each system covered and provide guidance to the operator on what to do if a limit is reached. Operational criteria is normally set with four levels, Green for normal operation, Blue for assessment if something is escalating, Yellow for terminating operations where the philosophy is the next failure will cause a loss of position and Red where the failure has caused a loss of position.

Typically, this are held in paper format so can be classified as Level 0 in the above table.

By utilizing the data that is already in use for DP operator experience it is possible to move from Level 0 up to Level 2 and if not Level 3 with the right set of data being monitored.

The digital system is then able to monitor the configuration for setup and for operational criteria and advise the operator if the system is out of limits. This information can be sent to all relevant stakeholders so proactive action can be taken if the configuration is incorrect or an operational limit has been exceeded.

Figure 29 - Example digital ASOG operational criteria section

Following from the Aviation example it would then be possible to encompass full emergency checklists as an aide memoir for the operators allowing consistency in operations.

Conclusion

A digital system can provide unambiguous records for a DP operators operational experience. The beta test data provided in the paper highlighted the large variation in accepted data that is currently used within the industry.

The paper confirmed that with accurate records the variation can be reduced if not eliminated. This will provide the industry with a definite understanding of an operators experience and when combined with simulator training a complete digital continuing professional development record.

Additional benefits can be derived from using the system for onboard training guidance and as a digital checklist following the Aviation industries lead with integration of sensors and systems at Level 2 and Level 3 of digitization.

Both the use for onboard experience management and operational support through digitization of Activity Specific Operating Guidelines provide ‘awareness prevention’ for the Dynamic Positioning Community.

‘When we know better we should do better’.

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