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DPS Notations: Clarifying the Role of Classification
through Frequently Asked Questions and Answers

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Abstract

Each year ABS is asked many questions regarding dynamic positioning. Most questions are asked because it is not clear to many what the scope of class and its notations are. At the highest level there is a widespread assumption that compliance with class DP Rules indicates a vessel which meets all of a client's position keeping needs will be delivered. At the lowest level, the Rules do not appear to address all of the interconnecting details that are relevant in achieving redundancy. This paper poses questions regarding environmental capability, open vs. closed bus-bars, ESD vs. single point failure, status of class while equipment is out of service, combined operations, survey requirements and other common topics. The answers will allow a better understanding of the limits of classification, the intent behind the class DP Rules, and the reasoning behind the application of those Rules.

Introduction

The original ABS Guide for Dynamic Positioning was issued in 1994.

The IMO concept of *consequence classes* and the use of the Failure Modes and Effects Analysis (FMEA) as a risk tool, are now widely understood and accepted. Yet, back in 1994 when the world was a simpler place, each was considered quite a departure from the traditional ABS classification approach.

Designing and reviewing to the prescriptive class Rules was the norm, so it took some time to adjust to the fact that the DPS notation would be dependent upon concepts such as:

- Redundancy targets
- The need to consider a single point failure during design
- The need to produce and submit an FMEA
- The class society verifying the thoroughness of the FMEA and its contents against the approved class drawings leading to the FMEA trials document being reviewed and forming the basis of the trials on board.

The physical layout of the equipment, rather than just the functional interconnectedness, became a consideration, consequently:

- Cable routes and power supplies took on greater significance
- The effect of seemingly unconnected systems and equipment – such as ventilation and fire extinguishing arrangements had an impact and needed to be considered

Clients who were accustomed to receiving 'Yes' or 'No' answers when asking if certain arrangements were acceptable were given increasingly complex answers and found that greater emphasis was being placed on the impact that different elements and systems had upon each other.

The 1994 Guide, and the IMO Guidance that the ABS requirements were built, on stood the test of time very well with only comparatively small changes being made, until its incorporation into the main Steel Vessel Rules in 2000.

While the basic Guidance was consistent over the years, the number of vessels that were classed with DPS, and the functions for which they were designed, increased significantly over the 10-year period from 1994 to 2004. The basic principles that were introduced in the original guide held good for most of the new and complex applications without significant modification.

Over this time, most discussion regarding potential changes to the requirements centered on the more complicated arrangements that designers were developing, and the need to establish precedents to cover these. Sometimes such questions, and the need for specific decisions, may have given the impression that the existing requirements were not serving the community adequately.

However, views or concerns expressed were inconsistent with no discernable trend or direction. For example:

- Sometimes, potential owners wanted more onerous design requirements but opposed more stringent survey requirements
- Shipyards did not want extended trials
- Charterers were asking for more meaningful performance criteria so that they could compare different vessels' station keeping capability or reliability.

At one time or another, comments along these lines have been offered up as criticisms of class, yet there has been no general consensus on what changes should be made nor on how the requirements could or should be improved.

For a class society, the issue is not always what the industry wants, as our focus *must always be* on safety. Rules are developed in consultation with industry, but not being able to clearly discern what it was that industry wanted, or what would be really meaningful, has made it difficult to move decisively and make substantive changes to the established approach to DP Rule requirements. All that was clear was that any change would not have been supported by one sector or another. In the last few years there has been an additional factor coming into play.

Over the first 10 years of the Guide's life, ABS had grown used to considering technically challenging questions regarding novel concepts and equipment, or the application of the Rules to complex designs. However, more recently the emphasis has changed; the majority of DP related issues raised with ABS have become more basic and generic in scope.

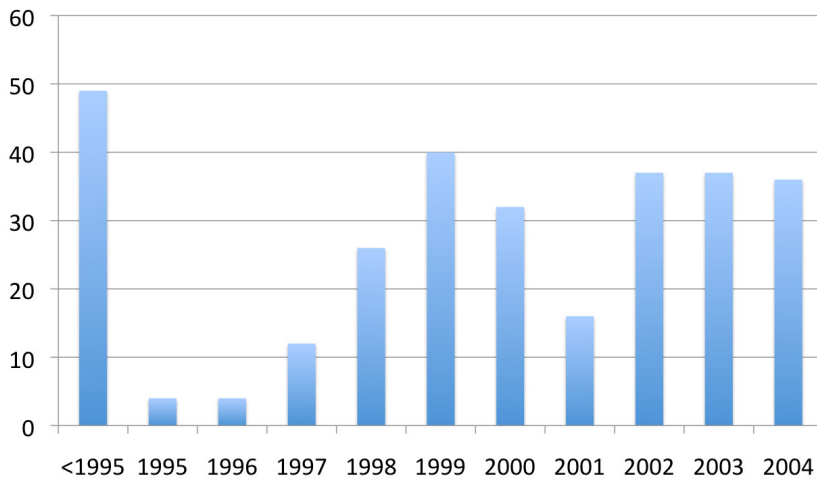
The traditional clients are still testing ABS with complex questions, but the more widespread use of DP systems has resulted in a significant number of comparative newcomers to the subject. The questions from those newcomers reflect their lack of experience with dynamic positioning. This trend has also reflected in ABS receiving more requests to give presentations along the lines of '*An Introduction to DP*' rather than on '*The Complexities of DP*'.

These relative newcomers are also quite different from those that ABS was dealing with back in 1994. They are from a much broader audience – no longer dominated by traditional operators. They also have the benefit of a mature market of systems and equipment and have access to an industry that has a great deal of accumulated experience.

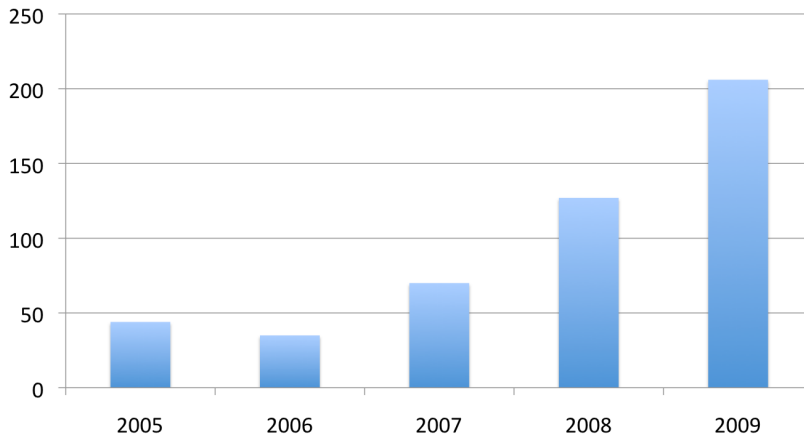
Graph 1 shows the steady increase in number of vessels coming into ABS class with DPS notation over the periods 1994-2004.

Graph 2 shows the substantial increase in the number of vessels with DP notation from 2005-2009.

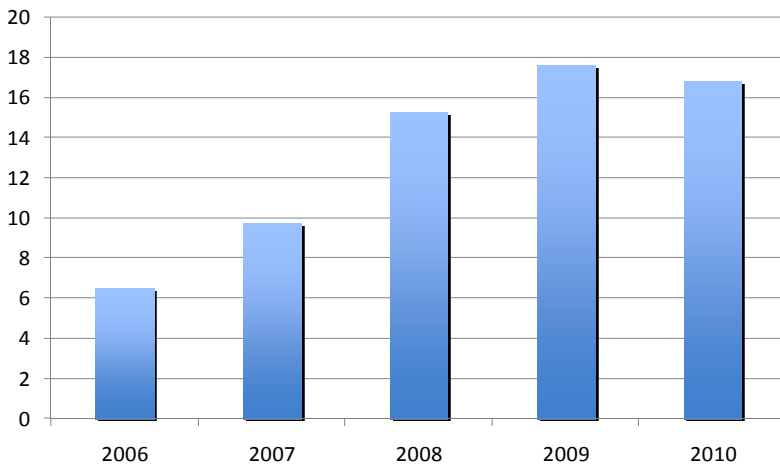
Graph 3 illustrates how widespread DP has become by showing newly classed vessels as a percentage of the total vessels for each year from 2005-2009



Graph 1. Number Vessels Receiving ABS DPS Class notation 1994 - 2004



Graph 2. Number of Vessels Receiving ABS DPS Class notation 2005 - 2009



Graph 3 Percentage of Vessels Receiving ABS DPS Class notation 2005 - 2009

The percentage of vessels entering ABS with the DPS notation in 2007 reached nearly 10 percent. For the last three years the number has exceeded 15 percent. This means that DP vessels and the issuance of DP notations is now commonplace. This has also meant that there are more clients of DP services out there, and more people affected by, and interested in, receiving the class notations.

ABS realizes that DP isn't a goal in itself. It is a tool that is used, when appropriate, by an industry seeking greater efficiencies and increased safety in their operations. However, it appears that many of the increasing numbers of newcomers to the DP sector of the industry do not have a clear understanding of the role of class with regard to these systems and within the broader envelope of maritime safety.

Comments have been made regarding the perceived shortcomings of class at some industry venues – yet ABS has not done as much as it perhaps could or should have to clarify the misunderstandings on which many of those perceived shortcomings are based.

Drilling and offshore support are the most established, or envisioned, uses of DP, but cable/pipe laying vessels, floatels, cranes, barges, wind turbine installation and repair vessels and other vessel types have turned to DP for assistance in their operations, providing departures from traditional applications that have tested the industry and been the subject of many discussions between ABS and its clients.

While ABS is aware of the developments and changes in industry and the challenges they raise, the ABS DP Rules have not needed to change to address each of these novel situations as the Rules are structured in a way that will allow their application in different circumstances. Yet it seems that, on occasions, the deliberate decision to retain the status quo has been interpreted within the industry as inaction on the part of class or as a deficiency in the Rules.

Clients who have worked closely with ABS generally appreciate the approach that we have. However, perhaps we have not been sufficiently sensitive to the growing group of clients that do not have such a long or deep association with us. This may be part of the reason behind the confusing and contradictory views and the critical comments relative to classification and DP that have been expressed in recent years.

The purpose of this paper is to provide, with Q and A's some background on the position ABS takes on various issues and through this allow the comparative newcomers the opportunity to raise their awareness of the world of DP regulation, thereby catching up on some of the dialogue that took place before they too became clients of ABS.

ABS expects that, from now on, increased and more open communication between class and industry will be the key to the convergence and mutual understanding of each other's needs and capabilities.

The following addresses some of the more frequently asked questions received by ABS from industry with respect to ABS Rules for DP systems.

Frequently Asked Questions

Q1. ABS DPS class notation numbers mirror the IMO consequence classes, as neither demands any particular environmental capability. Is this an omission?

A1. The concept of the consequence classes was to match the increased danger of a vessel losing position with the redundancy provided to guard against that loss of position. The class Rules simply reflect the prescriptive requirements that flow from this. The capability of the vessel for the purpose was assumed.

Vessels operating in benign environments would require a less complex system if the less demanding environment was taken into account.

Vessels requiring a high degree of availability in more demanding environments would need more ability to deliver thrust through a wider set of operational capabilities.

Some vessels may operate in areas where the environment can be tough, but their operation on DP will only be during calmer window periods – for example diving support vessels.

Another example would be the different capabilities, with regard to the capability plot, required for a shuttle tanker loading from behind a weather vaning FPSO.

There is no question that a measure of capability seems like a good idea and it is tempting to address this. Some other classification societies have tried to satisfy this perceived demand, but ABS has found this approach does not have much industry support, and, to date, there has been no real demand for ABS to fill this missing space with equivalents. If ABS is wrong in this assessment, industry representatives are urged to bring this to the attention of ABS for appropriate action.

To understand ABS' approach to date, consider a more common analogy: road vehicles.

If a client is buying a road vehicle, he will base that decision on his needs.

The type of vehicle:

- A minibus for moving several people
- An F-150, 250 or 350 truck (with different cab arrangements) for hauling
- A Winnebago (motor home) for mobile accommodation
- An 18 wheeler for serious loads
- A mobile crane for infrequent lifts

The terrain it will operate in:

- Interstate highways
- Off-road
- Desert
- Swamp

At a very specific place and point in time, with knowledge of the environment and the particular task at hand, it is easy to see how a client may wish to have ABS assist with some numerical or comparative measure that would provide him with a means to compare potential vessels.

But, as with the selection of the appropriate road vehicle, so many of the parameters are variable that a useful measure that would suit each client and the changing circumstances the vessel is likely to encounter over its operational life, is elusive.

ABS is aware that there are some means available to categorize environmental capabilities which are based on North Sea operations. But is the North Sea an appropriate generic industry standard? As there is no widely accepted industry standard as yet, and those that have been developed are not regarded with complete satisfaction for all environments, ABS has not taken any action in this regard.

ABS would welcome suggestions on this topic. If there is a need, ABS is more than happy to act as the forum through which practical standards can be identified and described.

Q2. How does ABS verify the capability plot?

A2. ABS does not make a complete analysis of the capability plot. ABS relies on the DP vendor to provide the model, based on hull and thruster power information. ABS then verifies that the plot is consistent with the shape of the hull and the locations of the thrusters. Our purpose is to verify that a *realistic* plot is on file and in the operating manual.

Q3. The IMO Guidance states that “Bus-tie breakers should be open during equipment class 3 operations unless equivalent integrity of power operation can be accepted according to...” ABS does not have an equivalent statement – but is this the intent that is applied?

A3. ABS requirements do not include an equivalent statement. From the outset it has been considered appropriate to rely on the FMEA to address the various possible failures, how they are detected and what the system response is.

The requirement implies that the total separation of the different sections of the electrical system means that they will have no influence on each other. In practice, the different sections are still connected through the environment; that is the healthy sections have to take up the load of a failed section through additional thruster load.

This has a direct and significant impact on the otherwise healthy sections meaning that their reliability is not necessarily the same as it was immediately prior to the failure. Also they can be interconnected in other more subtle ways through the ship's systems.

Having said this, over the years there has been steady pressure to align the Rules with the IMO recommendations. Some of the detailed differences between the IMO Guidance and the ABS requirements that ABS deliberately maintained in the earliest versions of the ABS Guide have been eroded. It is possible that this trend will continue, leading to the adoption of the IMO wording in the ABS Rules in the future.

Q4. ABS MODU Rules require an Emergency Shut Down – but this could introduce a single point of failure which is to be avoided for DPS-2 and 3. How can ABS have such contradictory requirements?

A4. When properly applied these two requirements are not contradictory. It is possible to engineer a solution that addresses both. Examples of different solutions, that have been offered to ABS, and which

have been accepted, have needed at least two actions to activate an ESD, with the two actions separated by space or space and time.

It is up to the designer/operator to devise a way to satisfy both of these requirements, depending upon the vessel, its operation and procedures. It is not appropriate for ABS to direct the means of satisfying both of the requirements.

When ABS has been requested to allow designs to omit or disable the final ESD, ABS has not agreed.

Q5. In real life, equipment is subject to wear and tear and break-downs. What is the ABS position when equipment, which is subject to the ABS DP class requirements, is not available a) day-to-day and b) at the time of survey?

A5. IMO considers consequence class 2 **operations** and consequence class 3 **operations**.

This can easily lead an operator to think in terms of DPS-1 mode of operation or a DPS-2 mode of operation and a DPS-3 mode of operation, with each relating to a particular vessel operation (with the associated consequence) and equipment line-up.

This thought process has led to a common view that vessels with some equipment out of service can operate in a lesser DP mode.

It may be that the operator will want to consider all of the circumstances that could apply in any situation, and that may include labeling different equipment arrangements as different DP modes.

However, ABS does not differentiate between these modes.

The notation of a vessel does not change from DPS-3 to DPS-2 or DPS-1 depending upon the condition or availability of machinery any more than a traditional ship's class is changed or suspended if it suffers some kind of mechanical failure.

The nature of classification is that ABS attests that the design and construction of the DP system complies with the applicable ABS Rules at the time of build. Award of the notation is recommended to the Class Committee at the time the vessel is proposed for acceptance into ABS class.

Throughout the vessels operational life, periodic surveys are undertaken to verify that the vessel continues to comply with the applicable Rules.

If the DP system is found not to be in compliance at the time of survey, it will be up to the operator to restore the system to an appropriate condition within a specified period. Until such time as it is once more in compliance, the operator would be expected to limit his operations accordingly.

If the operator chooses not to bring the system back into compliance, the DP notation will be withdrawn.

The shortcoming in the system would have to be something that, had it not been provided, would have prevented the vessel from receiving the specific DPS notation in the first place.

If it is anticipated that there will be a long period from the survey date to when the vessel's DP system is fully functional again, then the reduced capability plot should be revised and resubmitted to ABS and the vessel's FMEA revisited to provide a systematic check of the new operating conditions. These should

then be resubmitted for review and the revised capability plot included in the operations manual until repairs are made.

It is of course possible that upon the request of the owner, and subject to review and survey, a vessel may change the notation.

Q6. ABS requirements are silent on the subject of combined operations, but combined operations are frequently the norm rather than the exception?

A6. The Rules are framed on the basis of a single vessel. The risks, hull and thruster interactions or sensor interactions of two or more vessels have not been considered.

It is unlikely that any vessel will operate its entire life without getting close to large objects that will exert some kind of influence, whether those objects are fixed, operating on DP or otherwise exert some external interference or force.

In situations where there may be many vessels operating on DP in fairly close proximity, particularly if some of those vessels have limited room for maneuver, the risks associated with the operation of each vessel may increase considerably.

However, it is not possible for the classification Rules to envisage every conceivable operational scenario for each vessel over its life. Class Rules address the design, construction and operational maintenance of each individual vessel accepted into class. Responsibility for the manner in which those vessels are operated rests entirely with the owner/operator. It is expected that the operator will have an established framework for identifying and systematically addressing such risks in his planning and operating procedures.

ABS has not been made aware of any demand for it to become involved in this way. Should operators need assistance in identifying these possible operational risks, the ABS affiliated company, ABS Consulting, is a leader in providing risk management and mitigation services.

Q7. Last year ABS introduced more DP-specific survey requirements. Does ABS have any plan to accept the reports of other independent specialists in lieu of ABS surveyor attendance?

A7. No.

Q8. What of the future?

A8. ABS is actively reviewing capability plot issues:

- to determine if meaningful (to potential charterers trying to make comparisons) values can be assigned
- to determine if criteria for assessing the validity of the capability plot can be given

Currently the ABS DP requirements are contained in the Steel Vessel Rules. ABS is considering having more vessel-type specific versions in the separate Rules for MODUs and offshore support vessels (OSVs) as a higher percentage of these types of vessels have DP than commercial cargo ships do. Alternatively, ABS will consider restoring the DP Rules to the 1994 format of a standalone publication.

Power management systems were fairly crude when the first ABS DP Guide was published. The acronym PMS may have the same meaning as it did all those years ago, but the capabilities, function and importance of the Power Management System have grown beyond what was originally envisaged. This issue would probably benefit from some clarification.

Currently ABS give little guidance with regard to the DP control system software or its tuning. ABS is evaluating if there is something of value it can add here.

Conclusion

The most important point is that classification has always been the means by which industry has established accepted self regulatory standards. ABS does not do this in a vacuum. ABS has an extensive technical and industry specific committee structure that provides a mechanism for industry input into its Rule-making process.

ABS establishes or modifies its Rules based on its own research, input from owners, operators, builders, equipment manufacturers, academia, acknowledged leaders in specific fields and from government regulatory bodies. The final determination of the content of the Rules remains with ABS but they are designed to be authoritative, practical and promote safety. To the extent that industry is united in a view that the ABS Rules relating to DP systems should be amended, ABS is open to meaningful discussion as to how that can best be achieved.