

WELL CONTROL COMPETENCE

Mapping of well control competence within the drilling and well industry

The Petroleum Safety Authority

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Table of contents

1	EXECUTIVE SUMMARY	1
1.1	Introduction	1
1.2	Results	1
2	INTRODUCTION.....	5
3	METHODOLOGY	5
3.1	Questionnaire	5
3.2	Sample	6
3.3	Distribution of survey	6
3.4	Analysis	6
4	RESULTS	7
4.1	Respondents	7
4.2	Results	8
4.2.1	Competence level	9
4.2.2	Understanding of roles and responsibilities	11
4.2.3	Training, exercises and teamwork	13
4.2.4	Working conditions, technical-, operational-, and organizational barrier elements	17
4.2.5	Integrated Operations	20
4.2.6	Consequences of advanced drilling methods	23
4.2.7	Development in contract model between, operator, drilling contractor and service companies	24
5	CONCLUSION	26
6	REFERENCES.....	27
7	RELEVANT LITERATURE	27
Appendix A	Questionnaire	
Appendix B	Information to respondents	

1 EXECUTIVE SUMMARY

1.1 Introduction

For personnel involved in Drilling and Well (D&W) operations education, training and drills addressing well control are of great importance for ensuring adequate well control competence. Through audits and when evaluating applications of compliance and applications for consent, the Petroleum Safety Authority (PSA) has a high focus on factors such as competence and capacity amongst personnel involved in D&W operations. It is also important that these items are followed-up in the companies' management systems.

In order to get a better overview of the situation, the PSA has decided to conduct a study. In this context, PSA has requested DNV GL to carry out a mapping of well control competence within rig companies/drilling contractors, operators and service companies. In addition to gathering knowledge, PSA intends to use the results to raise awareness of the quality level that is expected in relation to requirements in regulations and standards. An important focus area is to contribute to further development and continuous improvement of the quality level within well control.

This report summarizes the results of a survey conducted by DNV GL on behalf of the PSA in the second half of 2019. A questionnaire on which the survey is based was developed by Reflekt AS in collaboration with the PSA and covers the following 7 topics, all of which are expected to have a direct or indirect influence on well control:

- Competence level
- Understanding of roles and responsibilities
- Training, exercises and teamwork
- Working conditions, technical, operational, and organizational barrier elements
- Integrated operations (IO)
- Consequences of advanced drilling methods
- Development in contract model between, operator, drilling contractor and service companies


The survey was distributed via email to a total of 257 people, of whom 138 responded which corresponds to a response rate of 54%.

1.2 Results

The purpose of this section is to provide an overall summary of the results per topic. More detailed information is included in Chapter 4. Anonymized results have also been made available to selected persons in the PSA and Reflekt AS through DNV GL's open data platform [Veracity](#).

To increase the understanding of how the results can be interpreted, we wish to begin this chapter by presenting some general observations.

In general, the results shows that personnel in service companies differ from other respondents in terms of the response options they use for certain statements. These personnel more often use the response option "I don't know" when responding to statements that deal with understanding of roles and responsibilities, knowledge of well control procedures, knowledge of competency requirements, etc. The sample size of this group is relatively small (18 persons) compared to the number of respondents in the groups rig owners (65 persons) and operators (55 persons). A minimum group size of 5 people was defined in advance in order to



achieve robust results and to maintain the anonymity of the respondents. As there were fewer than 5 responses for some job categories it was decided to merge some of the job categories with comparable competence requirements into bigger groups in order to meet the criterion of minimum group size. The results, however, indicate that the merged groups were not necessarily homogeneous in terms of i.e. competence requirements and it is also commented by several respondents within some job categories that they do not have any role in the execution of well control.

The fact that the merged groups are not necessarily homogeneous and that several comment that they have no role in well control may be a cause for the large spread in the use of response options within the groups as well as the extensive use of the response option "I don't know".

The following sections summarize the key findings / observations for the 7 topics covered by this study.

Competence level

The results show that personnel within rig- and operator companies have clearly defined competence requirements. Personnel working for service companies report to a lesser extent that there are clearly defined competence requirements with regard to well control for their positions. A possible cause may be that some of the job categories within the service companies do not have a formal role in performing well control and that as such no specific competence requirements have been defined.

On a statement concerning whether new personnel involved in well control have a good training program in the use of well control equipment, a relatively large proportion (41%) report that they do not agree or strongly agree with this statement.

Understanding of roles and responsibilities


Roles and responsibilities in handling a well control situation generally appear to be well known. The results show that personnel working for rig companies report the greatest understanding of roles and responsibilities, followed by personnel working for operator companies. Among offshore personnel directly involved in handling well control events (e.g. driller, toolpusher and drilling section leader), all 30 respondents make use of the "agree" or "strongly agree" response options on the statement "*I understand my role in a well control incident*".

The results further show that personnel in all types of companies are very well acquainted with who has decision-making authority in a well control situation and in addition, respondents report a high degree of agreement on a statement that deals with whether interfaces between the various roles in the well control team are clear. In the latter statement, employees in rig- and operator companies report somewhat greater agreement than employees in service companies.

Training, exercises and teamwork

Training and exercises are an important measure to increase competence related to well control, and this is supported by the results of this study. An interesting observation is that respondents highlight the usefulness of simulator training¹, but there is at the same time a significant gap between perceived value and actual completed training.

¹ The respondents may have different interpretations of what is meant by a simulator since the span is large and can include everything from the use of a few functions on a BOP control panel to modern simulators with a fully equipped driller's cabin with overview of rig floor.



The survey also contains several statements that address whether the exercises are adequate, realistic and whether the quality is perceived as good. In a statement that addresses whether the exercises cover all possible well control events, only half of the respondents use response options "agree" or "strongly agree". It is further commented that the primary focus in exercises is handling well kicks while drilling with drilling fluid as primary barrier and with BOP as a functioning secondary barrier.

Stress and fatigue are relevant factors when dealing with a real well control event, but are rarely reflected in exercises. In this context, it should also be mentioned that the respondents largely believe that the exercises that are performed are relevant.

Implementation of new contract models (alliance contracts) between operator, rig owner and service company may entail the relocation of some positions that have a role in well control from offshore to onshore operation centers. In this context, it has been commented that it is challenging to involve onshore personnel in exercises due to different shift patterns/working hours.

Working conditions, technical, operational, and organizational barrier elements

Understanding your own role in preventing a well control situation seems to be well known across all types of companies, with 98% of respondents using the response options "agree" or "strongly agree" on the statement *"I understand my role in the prevention of a well control situation"*.

The results show a relatively large difference between company types on a statement that addresses whether one's current working conditions facilitate the execution of tasks to prevent well control situations. Here, employees of operating companies agree most, with 97% using the "agree" and "strongly agree" response options. Among the service companies, only 56% of the respondents use the same alternatives. One cannot draw any strong conclusions regarding the cause for this relatively big difference, but some respondents employed by service companies have made comments about higher cost focus and increased workload which may explain the choice of response options.

Employees in rig and operator companies report to be very familiar with the operation of and limitations of well control equipment. Employees in service companies report somewhat less familiarity. One possible explanation of the difference is that personnel in certain job categories among the service companies are not involved in operating well control equipment.


On a statement that addresses whether other well control events are reviewed to ensure learning, a relatively large proportion of respondents (24%) report that they do not agree with this.

Integrated operations (IO).

The results of this survey indicate that there is some uncertainty about the concept of IO. This is supported by the wide use of the response option "I don't know" and several comments also expressing lack of experience with IO. Some also comment that they do not know what IO is.

One of the most salient observations under this subject is that only 17% of all respondents disagree or strongly disagree that offshore personnel reduction has not had a negative effect on handling well control situations. In this context, it can also be mentioned that a large proportion make use of the "I don't know" response option, which may also reflect limited experience with IO.

Another interesting observation is that the roles and responsibilities between onshore and offshore appear to be relatively little known. Under the subject "roles and responsibilities", 86% reports to agree or strongly



agree to a statement concerning whether roles and responsibilities between personnel who are part of the well control team are clear and understood. In a similar statement regarding clarity in roles and responsibilities between onshore and offshore, only 47% make use of the same alternatives.

Commonly stated objectives of implementing drilling automation is to carry out more consistent and efficient drilling operations in addition to increasing safety. On a statement regarding whether drilling automation increases safety margins related to well control, a relatively large proportion of respondents (43%) select the "disagree" or "strongly disagree" response options.

Consequences of advanced drilling methods.

Most comments on this topic deal with a lack of experience in using advanced drilling methods such as "managed pressure drilling" (MPD), "dual gradient drilling" (DGD) and "underbalanced drilling" (UBD). The fact that respondents have little experience is supported by the extensive use of the answer option "I don't know" on several statements. It is mainly job categories within operator- and service companies that use this alternative, where it is used on average in 24% of cases across all statements. Regarding whether one has received specialized training in handling well control situations using advanced drilling methods, 62% of respondents choose the response options "agree" and "fully agree". The percentage is relatively low, but as mentioned above, there seems to be a large proportion of respondents who do not have experience with advanced drilling methods, and it is therefore likely that many have not had such training.

Development of new contract model between, operator, drilling contractor and service companies.

New contract model refers to so-called "alliance contracts" which entails reducing the number of suppliers of drilling and well services. These contract models may also lead to reorganization of offshore crew, relocating some positions from offshore to onshore and also changing economic incentives so that drilling contractors and service companies are rewarded for good performance, but may share the cost of non-productive time.

On a general basis, the comments show that there are many positive and negative opinions related to this topic. On the positive side, one respondent comment that this contract model may lead to increased robustness. On the negative side, several comment that changes in incentive schemes related to sharing the cost of "downtime" have negative effects. It must however be emphasized that there may not be any cause and effect relationship between cost sharing and effect on well control.

An interesting observation is that only 41% of the respondents reports to "agree" or "strongly agree" on a statement that addresses whether individual workload related to well control have not increased in recent years. It must also be mentioned that there is also a relatively small proportion of 12% who report that they either "disagree" or "strongly disagree" with this statement. It has also been commented that workload has increased over the recent years, but not necessarily related to well control. It is further commented that a general increase in the workload can lead to reduced focus on well control.

2 INTRODUCTION

For personnel involved in Drilling and Well (D&W) operations education, training and drills addressing well control are of great importance for ensuring adequate well control competence. Through audits and when evaluating applications of compliance and applications for consent, the Petroleum Safety Authority (PSA) has a high focus on factors such as competence and capacity amongst personnel involved in D&W operations. It is also important that these items are followed-up in the companies' management systems.

In order to get a better overview of training, knowledge and competence as well as roles and responsibilities related to well control within D&W activities, PSA has decided to conduct a study. In this context, PSA has requested DNV GL to carry out a mapping of well control expertise within different types of companies. In addition to gathering knowledge, PSA intends to use the results to raise awareness of the quality level that is expected in relation to requirements in regulations and standards. An important focus area is to contribute to further development and continuous improvement of the quality level within well control in D&W activities. This report describes the results of a survey conducted by DNV GL on behalf of the PSA in the second half of 2019.

3 METHODOLOGY

3.1 Questionnaire

The survey is based on a questionnaire developed by Reflekt AS in collaboration with the PSA /1/. The questionnaire consists of 83 statements in English within the following categories:

- Competence level.
- Understanding of roles and responsibilities.
- Training, exercises and teamwork.
- Working conditions, technical, operational, and organizational barrier elements.
- Integrated operations (IO).
- Consequences of advanced drilling methods.
- Development in contract model between, operator, drilling contractor and service companies.

For each of the 83 statements, respondents were required to report their level of agreement with the statement on a 5-point likert-scale. The following options were available:

- Strongly agree
- Agree
- Somewhat agree
- Disagree
- Strongly disagree

In addition to these categories, the respondents also had the opportunity to select "I don't know". It was also decided to include fields for free text so that the respondents had the opportunity to submit supplementary comments for each subject.

In relation to the original questionnaire developed by Reflekt AS, it was decided to move some of the statements to other categories to ensure good agreement between statements and categories. The final version of the questionnaire is attached in Appendix A.

3.2 Sample

The sample in the survey consists of specific personnel groups within the following company categories:

- Operators
- Rig Owners/ Drilling Contractors
- Service Companies

The PSA decided which companies the survey should be distributed to and informed about the survey at the Drilling Manager's Forum. Chapter 4.1 shows an overview of the various job categories that participated in the survey as well as the response rate.

3.3 Distribution of survey

Prior to the release of the survey, DNV GL contacted the authorities' contacts in the respective companies to inform about the survey and to request a list of possible respondents associated with the various job categories of interest. After DNV GL received a list of respondents, the survey was distributed via email. The survey was sent out on October 4, 2019 with a reply deadline of October 27. The response deadline was later extended to 5 November to increase the number of responses from personnel in job categories with few respondents.

3.4 Analysis

When distributing the survey, it was chosen to cover more job categories than what is included in the analysis. In terms of anonymity and robustness of the results, a minimum group size of 5 people was defined in advance. Since fewer than 5 responses were received for several job categories, it was decided to merge some groups with comparable competence requirements. Compared to the original plan, the following job categories (left column) were merged into new groups (right column):

Job category	Merged group
<ul style="list-style-type: none">- Cementer- Mudlogger- Directional driller	Cementer, mudlogger and directional driller
<ul style="list-style-type: none">- Service pusher- Onshore operation drilling supervisor	Service pusher and onshore operation drilling supervisor
<ul style="list-style-type: none">- Drilling supervisor day	Drilling supervisor

- Drilling supervisor night	
- Completion engineer	Completion engineer and drilling engineer
- Drilling engineer	

Table 3-1: Initial job categories and merged groups

4 RESULTS

The purpose of this chapter is to present the results. The focus is primarily on giving a brief summary of the results per topic and further noting where the answers are either surprising and / or greater differences have been observed between the three different types of company. Some comparisons were also made between job categories within the three different types of company when this was considered relevant.

Some comments from the respondents are included in the report. This is primarily done when comments support descriptive statistics and / or provide additional information on why respondents respond as they do

The complete survey, as mentioned in chapter 3.1, consists of 83 different statements, but only a sample of the statistics are presented in this report. The complete aggregated and anonymized data set has been made available for selected personnel in Reflekt AS and PSA on DNV GL's data portal [Veracity](#).

4.1 Respondents

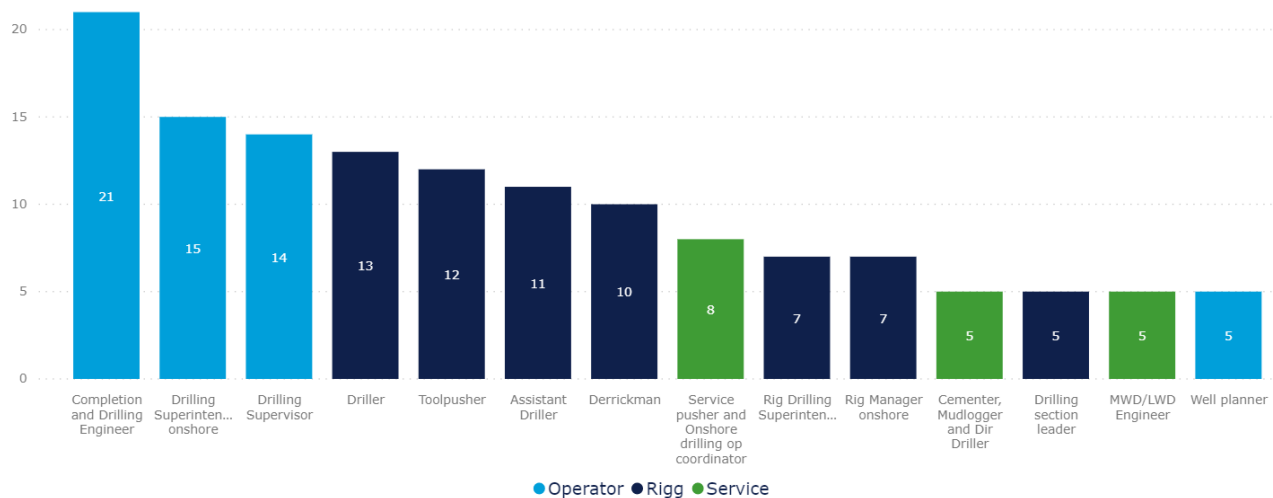


Figure 4-1: Number of respondents for the different company types and respective job categories

Company type	Invited	Responded	Response rate
Operator	85	55	65%
Rig Owner	146	65	45%
Service Company	26	18	69%
Total	257	138	54%

Table 4-1: Response rates

4.2 Results

As mentioned, the purpose of this chapter is to present selected results by topic. To increase the understanding of how the results can be interpreted, we wish to begin this chapter by presenting some general observations.

In general, the survey shows that personnel in Service Companies differ from other respondents in relation to the choice of response options for some statements. The sample size of this group is relatively small (18 persons) compared to the number of respondents in the groups Rig Owners (65 persons) and Operators (55 persons).

In addition to the small sample size for the group as a whole, the group is divided into subgroups ranging in size from 5 to 8 people (see Figure 4-1). In order to achieve the criterion of a minimum group size of 5 people, as described in chapter 3.4, some job categories were merged. For example, the job categories "cementer", "mud logger" and "directional driller" which were initially planned to be treated as three distinct groups in the analysis, were merged into one group in order to meet this criterion.

When reviewing the comments, it emerged that the merged groups were not necessarily homogeneous in terms of the role and competence requirements they perceived to have in relation to well control. For example, personnel in the group that includes the job categories "cementer", "mud logger" and "directional driller" left several comments implying that they were not aware of any formally defined roles with regards to well control. It has e.g. been commented on by one directional driller that he/she did not perceive to be involved in well control, while on the other hand, it is expected that a "mudlogger" do have a formally defined role and is aware of it.

The same applies to the group "Service Pusher" and "Onshore Drilling Operation Coordinator" where a "Service pusher" comments that he/she is also not familiar with having a formal role in well control despite this job category is assumed to have a central role in operational management, communication and coordination on behalf of the Service Company.

It is also important to point out that several Service Companies are included in the survey and that competence requirements may differ from company to company in terms of how they are specified. This means that some of the Service Companies may have formally defined competence requirements for all positions while others may not.

4.2.1 Competence level

The results show that personnel working for rig- and operator companies generally agree more with positively phrased statements concerning level of competence related to well control than personnel working for service companies. As mentioned in chapter 4.2, this may be attributed to the fact that competence requirements within well control are not clearly defined for all the job categories among the service companies. It has been for instance commented by both a "Service Pusher" and a "Directional Driller" that they are not involved in well control.

Defined competence requirements²: Figure 4-2 shows the breakdown between company types on the statement "*My company has defined competency requirements for well control for my position*". For personnel working for rig- and operator companies, 93% use the "agree" and "strongly agree" response options, while only 50% of the respondents from the Service Companies selects the same alternatives.

Without drawing entirely certain conclusions, one can expect, based on respondents' comments, that this difference may be attributed to the fact that personnel within some personnel categories of Service Companies did not perceive to have any formally defined role with regard to well control and it may also be a reason to believe that competence requirements may not be clearly described for some positions (see chapter 4.2 for more information).

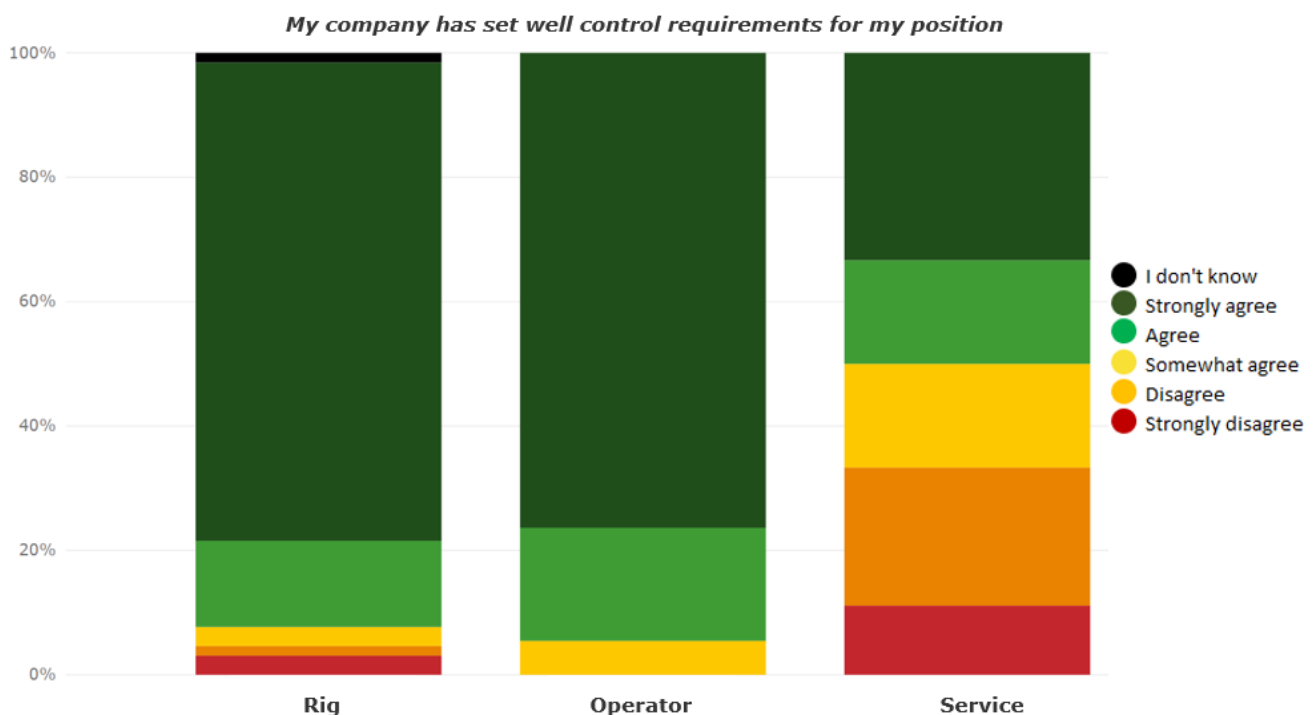


Figure 4-2: Responses to the statement "*My company has defined competency requirements for well control for my position*"

² Norwegian Oil and Gas Association has established a recommended guideline for competence requirements for drilling and well personnel operating at the Norwegian Continental Shelf. See chapter 7, point 2, for the reference.

Equipment familiarization: 36% of the respondents working for Operators reports to “strongly disagree”, “disagree” or “somewhat agree” to a statement related to whether new people involved in well control have a satisfactory equipment familiarization program. In addition, 15% respond that they don’t know. Among the comments, one person working for an Operator states that sufficient time is not set aside for training new personnel in use of equipment which is critical in order to maintain well control.

Completion/drilling engineer: *«New people are not given sufficient time to understand equipment behavior, which is critical to know and be familiar with in case of an actual well control situation»*

Personnel working for the rig owners are more in agreement with this statement where 73% selects the response options "agree" or "strongly agree" and only 5% reports that they do not know. Figure 4-3 shows the distribution between company types on the statement "new people involved in well control have a satisfactory equipment familiarization program".

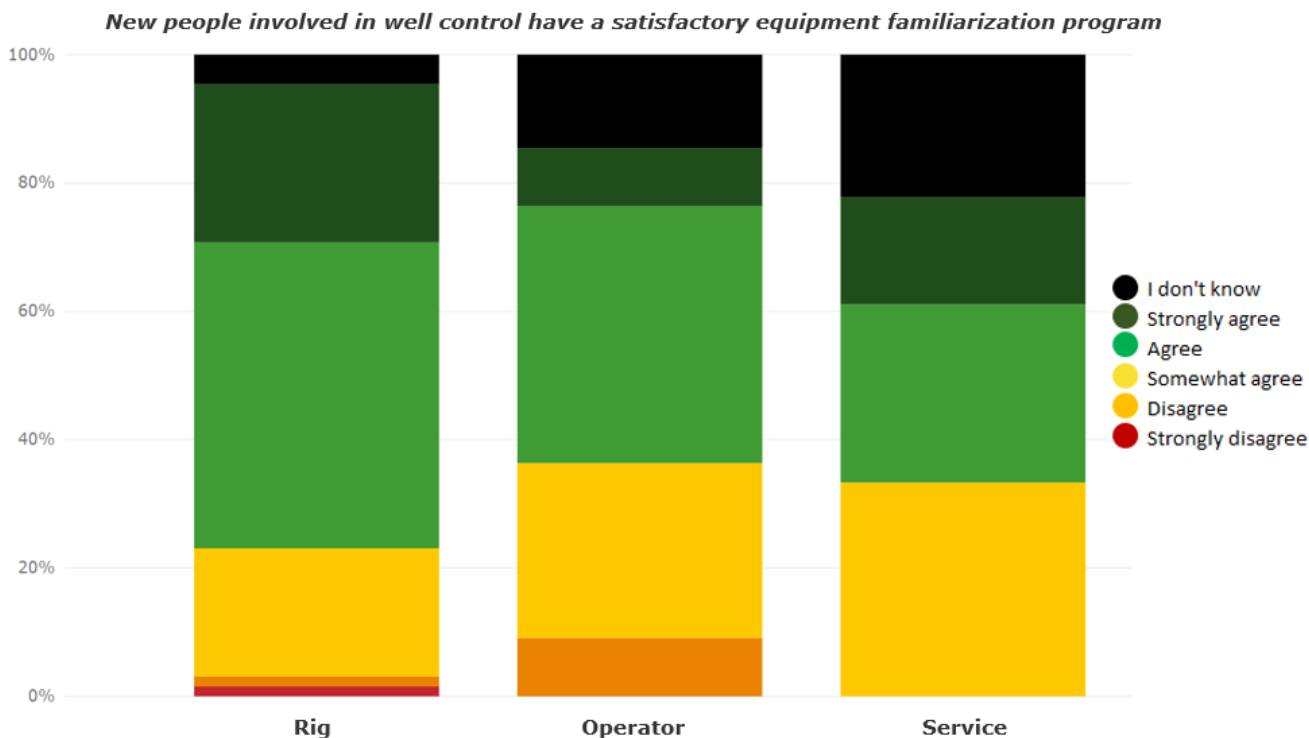


Figure 4-3: Responses to the statement "New people involved in well control have a satisfactory program for familiarisation with equipment"

Formal competence vs. practical experience: Regarding a statement whether there is a strong relationship between education ("level of education") and the ability to understand a well control situation, 85% of the respondents selects the "agree" and "fully agree" response options. It can also be mentioned that several comments that they do not understand what is meant by "level of education" and thereby selects the "I don't know" option.

Several people also comment on the importance of both formal education and practical experience. Many point out that practical experience is at least as important as formal education.

Preparedness in dealing with a well control situation: In general, 93% of rig contractor and operators employees state that they "agree" or "strongly agree" with the statement that they are always prepared for a well control situation, while 84% of service companies use the same response options.

4.2.2 Understanding of roles and responsibilities

Roles and responsibilities when handling a well control situation appear to be well known. The results show that personnel working for rig owners report the greatest understanding of roles and responsibilities, followed by personnel working for operator companies. Among offshore personnel directly involved in handling well control situations, e.g. "Driller", "Toolpusher" and "Drilling Section Leader", all 30 respondents use the "agree" and "strongly agree" response options on the statement "*I understand my role in a well control situation*". Among personnel working for service companies, 83% use the same alternatives.

As mentioned in chapter 4.2, a possible explanation for using the "disagree" and "I don't know" alternatives may be that some job categories within service companies have no defined role with regard to well control and thus will not have as good oversight. Figure 4-4 shows which response options respondents from the different types of companies have used in the statement "I understand my role in a well control incident".

Drilling section leader: *«The roles and responsibility must always be clear to everyone involved in well control! »*

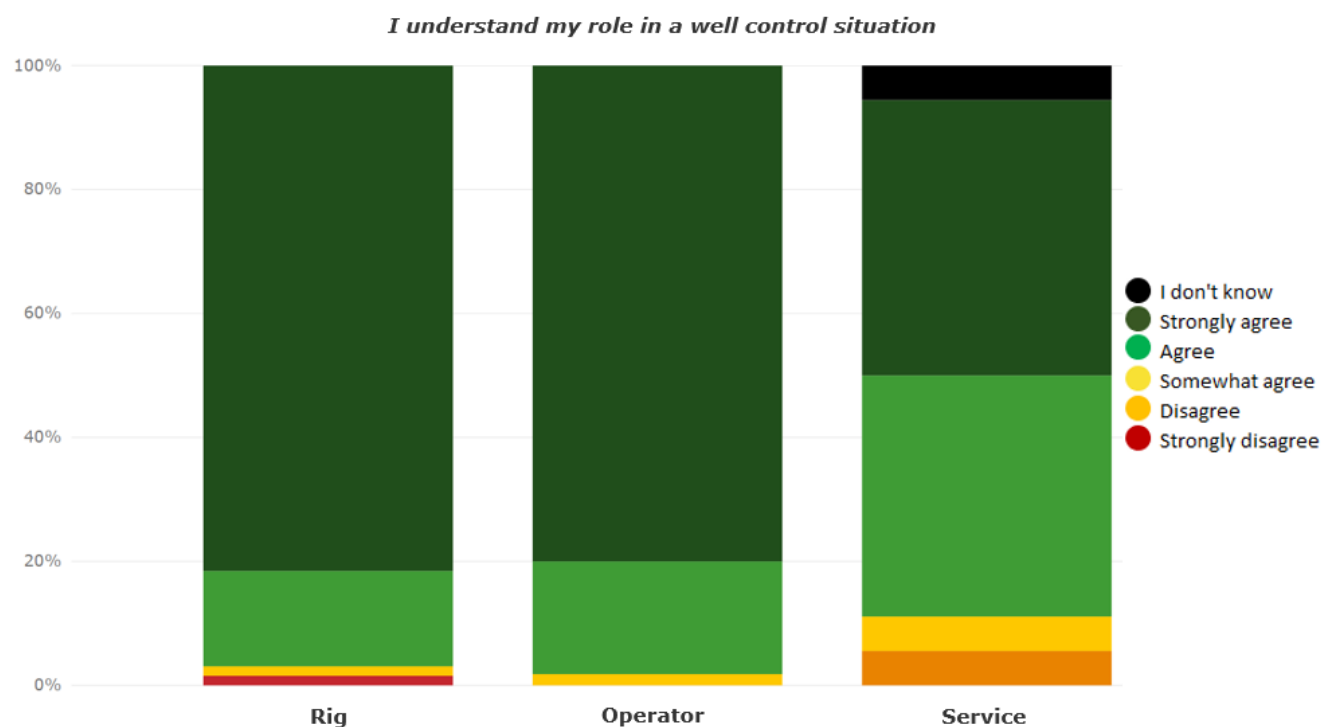


Figure 4-4: Responses to the statement "*I understand my own role in a well control event*"

Interfaces between roles: Respondents employed in rig- and operator companies seem to be most familiar with the interface between roles. 88% of the respondents within these types of companies use the "agree" or "strongly agree" response options on a statement that addresses whether interfaces between the various roles involved in handling well control situations are clear. Among the job categories "Driller" and "Toolpusher", all 25 respondents select these alternatives.

Certain job categories among service companies appear to be somewhat less familiar with interfaces where 72% of the respondents use the same response options. As mentioned in chapter 4.2, some of the explanation to a lesser degree of agreement in the statement may be that some of the job categories are not involved in well control and thus have less overview of interfaces.

Authority and decision making: Across all types of companies, 95% of the respondents selects the response options "strongly agree" or "agree" to a statement concerning whether it is clear who makes the decisions in a well control situation. Of the personnel working in the rig companies, everyone in the job categories "Driller", "Toolpusher" and "Drilling Section Leader" makes use of these response options.

Simulator training³: The results of the survey show that personnel from all types of companies see great value in simulator training. On average, 89% say they "agree" or "strongly agree" that simulator training has a positive effect on handling well control situations.

An interesting observation is that there is an experienced gap between reported value of simulator training and how much simulator training the respondents have actually completed. In a statement about whether respondents have completed adequate simulator training related to well control, "only" 58% use the "agree" or "strongly agree" options.

Figure 4-5 shows which response options personnel employed in the different types of companies have used for statements that deal with perceived value of simulator training and whether they themselves have completed adequate training on handling well control events in simulator. From the figure you can see that there is a gap between perceived value and actual completed training.

³ The respondents in the survey may have different interpretations of what is meant by the simulator since the expression can include everything from the use of a few functions on a BOP control panel to modern simulators with full driller offices with an overview of rig floors and the possibility of a training.

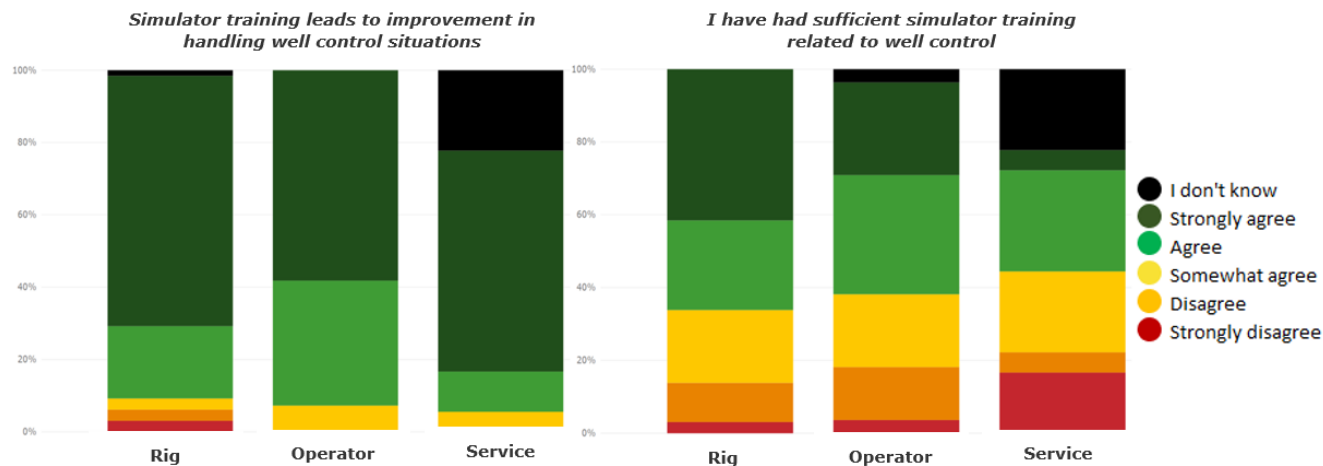


Figure 4-5: Responses to statements about simulator training. Left: "Simulator training leads to better handling of well control situations". Right: "I've had adequate simulator training related to well control"

4.2.3 Training, exercises and teamwork

Knowledge of well control procedures: Personnel in all types of company seem to have good knowledge of well control procedures. Across company types and job categories, 92% say they "agree" or "strongly agree" that they are familiar with such procedures. Personnel working for the rig companies most agree with the statement, of which 96% make use of these response options.

Respondents from the service companies show a somewhat lesser degree of agreement in the statement. Here, 77% use the options "agree" or "strongly agree" while 23% answer "disagree", "somewhat agree" or "I don't know". A possible explanation to a lesser degree of agreement may be attributed to the fact that some of the job categories do not perceive being involved in well control and thus do not need to be familiar with such procedures (see section 4.2). Figure 4-6 shows the breakdown between company types on the statement "I am familiar with well control procedures".

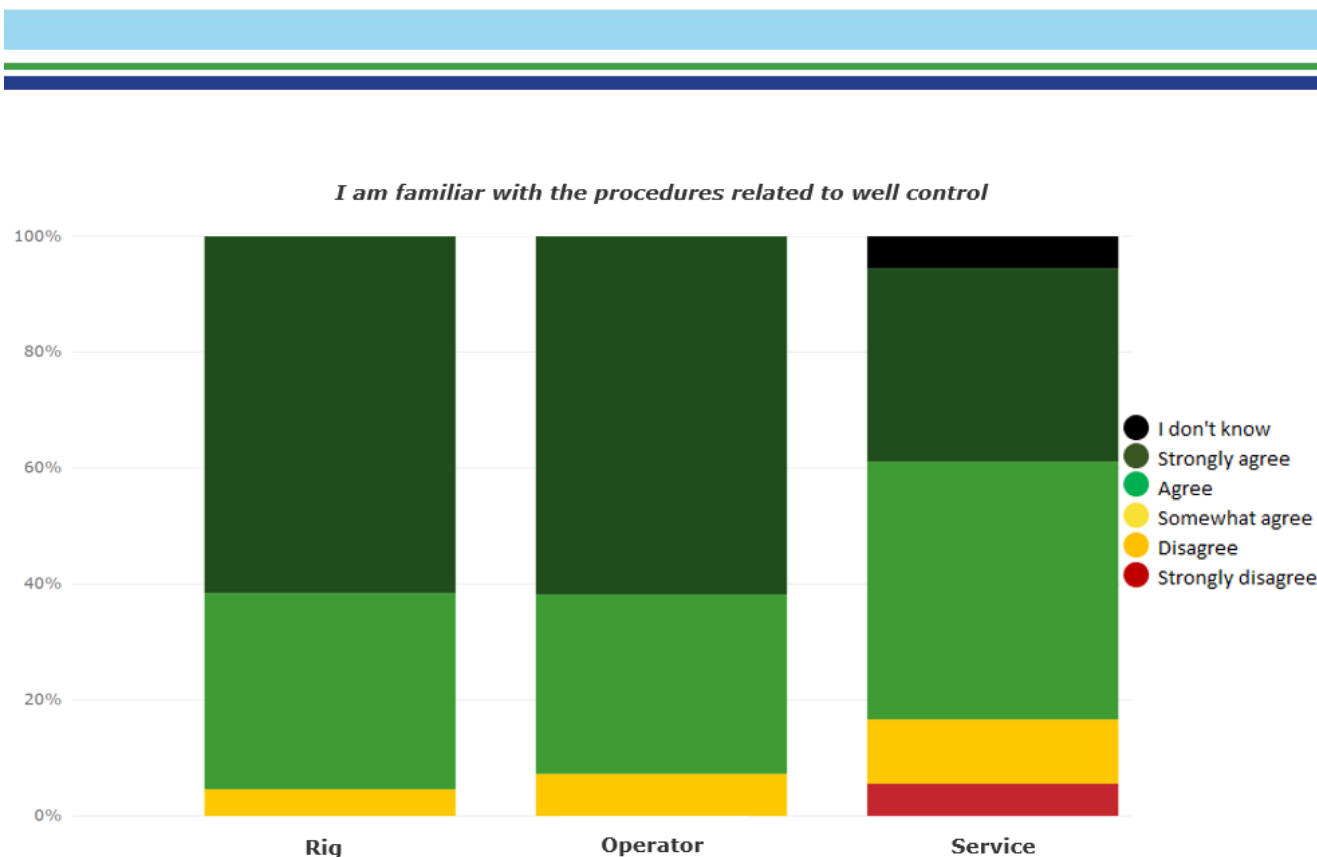


Figure 4-6: Responses to the statement "I am familiar with well control procedures"

Ability to train with other personnel in the well control team⁴: In a statement that deals with whether one has the opportunity to train with other personnel in the well control team, there is wide variation in the use of response options across company types. On average, 62% say they "agree" or "strongly agree" with the statement. Not unexpectedly, the largest consensus in this statement is among personnel working for rig companies, of which 72% make use of these response options. Among respondents working for service companies, "only" 28% report to "agree" or "strongly agree" to this statement.

Some of the reason for a lesser degree of agreement may be attributed to the fact that some job categories within service companies do not have clearly defined roles in terms of well control and that they will therefore not be included in training (see chapter 4.2).

An interesting observation is that a "service pusher" (offshore position) working in a service company comments that it is challenging to involve onshore personnel in training and drills due to different shift patterns/working hours onshore and offshore.

Service Pusher: *«We see now that we struggle to involve onshore service personnel in well control exercises. This is because table-tops normally happens after shift is finished»*

⁴ Collaboration is described as improvement suggestions in several review reports. In the U.S. The Chemical Safety and Hazard Investigation Board investigation report (volume 3, 2016) of the Macondo accident recommends that training (Crew Resource Management, CRM) should be used to a greater extent as part of the training of personnel involved in drilling and well operations. The International Association for Oil & Gas Producers (IOGP) has established guidelines for how CRM can be developed and implemented in practice. The International Association of Drilling Contractors (IADC) has established the WellCAP Plus training program, which includes team-based scenario training and uses CRM principles. See Chapter 8 for references to literature mentioned above. The chapter also contains references to other standards and guidelines regarding competency requirements, skills development, training and exercises.

Mustering in emergency situations: 96% of respondents working for operator- and rig companies reports to "agree" or "strongly agree" to a statement concerning what to do and where to muster in an emergency situation. For service companies, this figure is somewhat lower, of which 77% selects the same response options. Figure 4-7 shows which response options the respondents from the different types of companies have used.

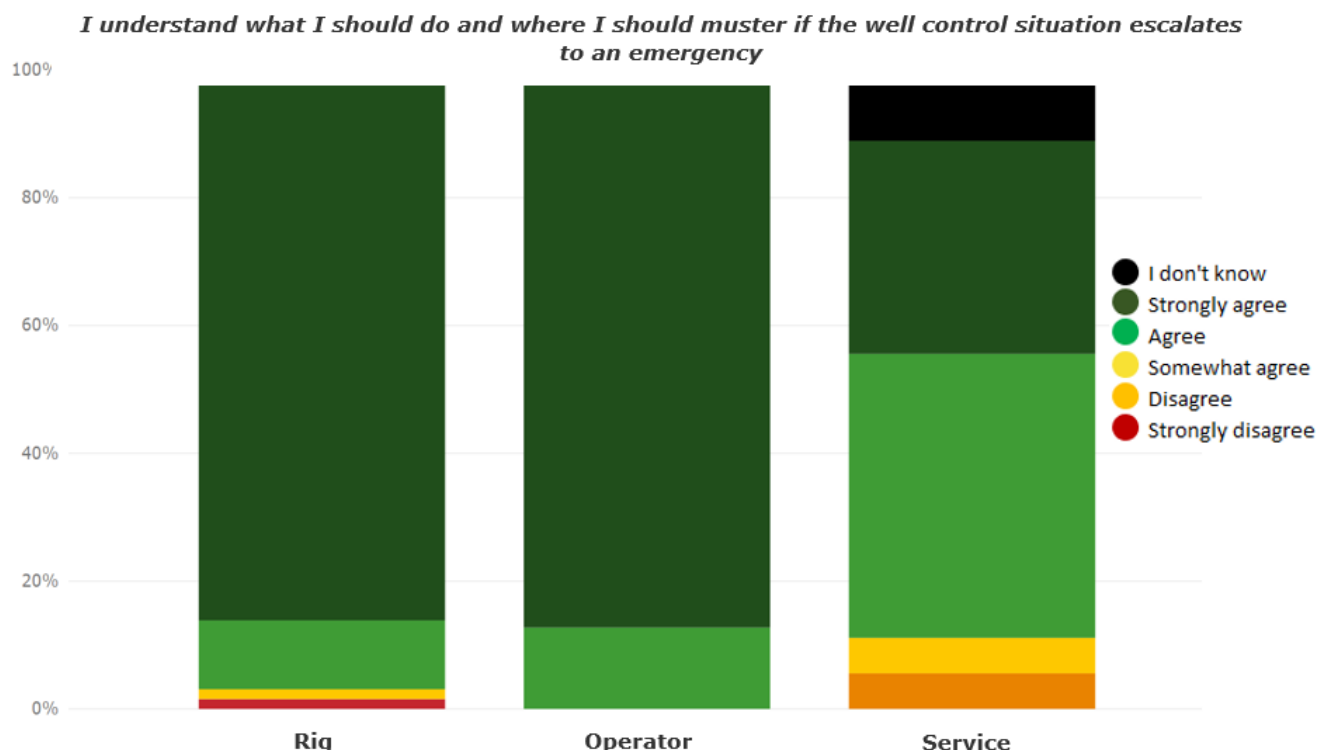


Figure 4-7: Responses to the statement "I understand what I need to do and where to muster if the well control situation escalates to an emergency"

Onshore vs. offshore well control exercise and drills: In general, personnel across the different types of companies consider that conducting training and drilling offshore is more valuable than training and drills performed onshore. 60% of the respondents reports to "agree" or "strongly agree" that offshore training and exercise provide the most value, while 27% use the same alternatives on a statement that addresses whether onshore training and drills provide the most value.

Comprehensive well control exercises: On a statement concerning whether the well control exercise plans cover all possible well control events, 51% reported to "agree" or "strongly agree". A fairly large proportion (26-31%) of the respondents also selected the "I don't know" response option.

The statement below comes from a "completion/drilling engineer". He/she express that there is little variation in well control training scenarios. In this context, it should also be mentioned that the results from the survey shows that the exercises that are actually performed are perceived as both realistic and relevant (see Figure 4-8).

Completion/drilling engineer: «Well control training is more or less only related to taking a kick when drilling with mud in hole and BOP as secondary well control element»

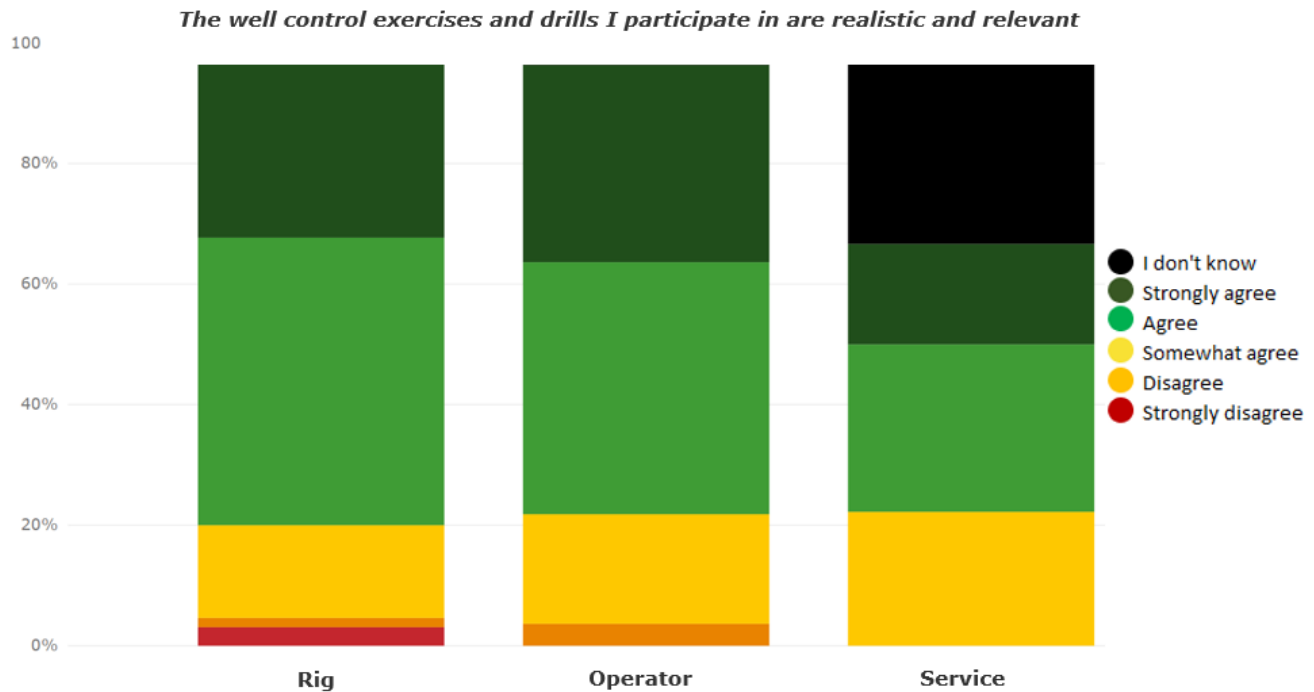


Figure 4-8: Responses to the statement "Well control training and the exercises I participate in are realistic and relevant"

Adequate well control competence: 90% of the respondents across the companies selects the response options "agree" and "strongly agree" on a statement that addresses whether there is sufficient well control expertise in the team to handle a well control situation. 17% of respondents who work in the service companies use the "I don't know" option.

The somewhat lower degree of agreement can possibly be attributed to the fact that some personnel in some job categories of service companies are uncertain about their role in well control situations and that they are also not well acquainted with how the team is organized and what competence the team possesses (ref. chapter 4.2).

Inclusion of stress and fatigue in training and exercises: 31% of the respondents reported to "agree" or "strongly agree" on a statement concerning whether stress and fatigue are included as factors in training and exercises. A quite high proportion of personnel working for service companies (28%) also selects the "I don't know" alternative. This is probably related to the fact that they participate less in training and exercises than the other personnel.

Experience transfer after exercises: 68% of personnel across company types reports to "agree" or "strongly agree" that there is adequate review and transfer of experience after exercises have been completed. Here, personnel working for the rig companies shows the highest degree of agreement, of which 77% use these response options.

It has also been commented that there is not sufficient learning from actual incidents and accidents. According to one of the comments from a person working in a service company, experience is not shared with personnel who work onshore since experience transfer normally takes place after the end of the shift, when onshore personnel may not be available.

4.2.4 Working conditions, technical-, operational-, and organizational barrier elements

Understanding of one's role in preventing well control situations: Understanding of one's own role in preventing a well control event seems to be well known as 98% of respondents selects the response options "agree" or "strongly agree" on the statement "*I understand my role in preventing a well control*". Figure 4-9 shows which response options respondents within the different types of companies use. Here we see that the results correspond well with a similar statement concerning understanding of one's own role in a well control event (ref. Figure 4-4).

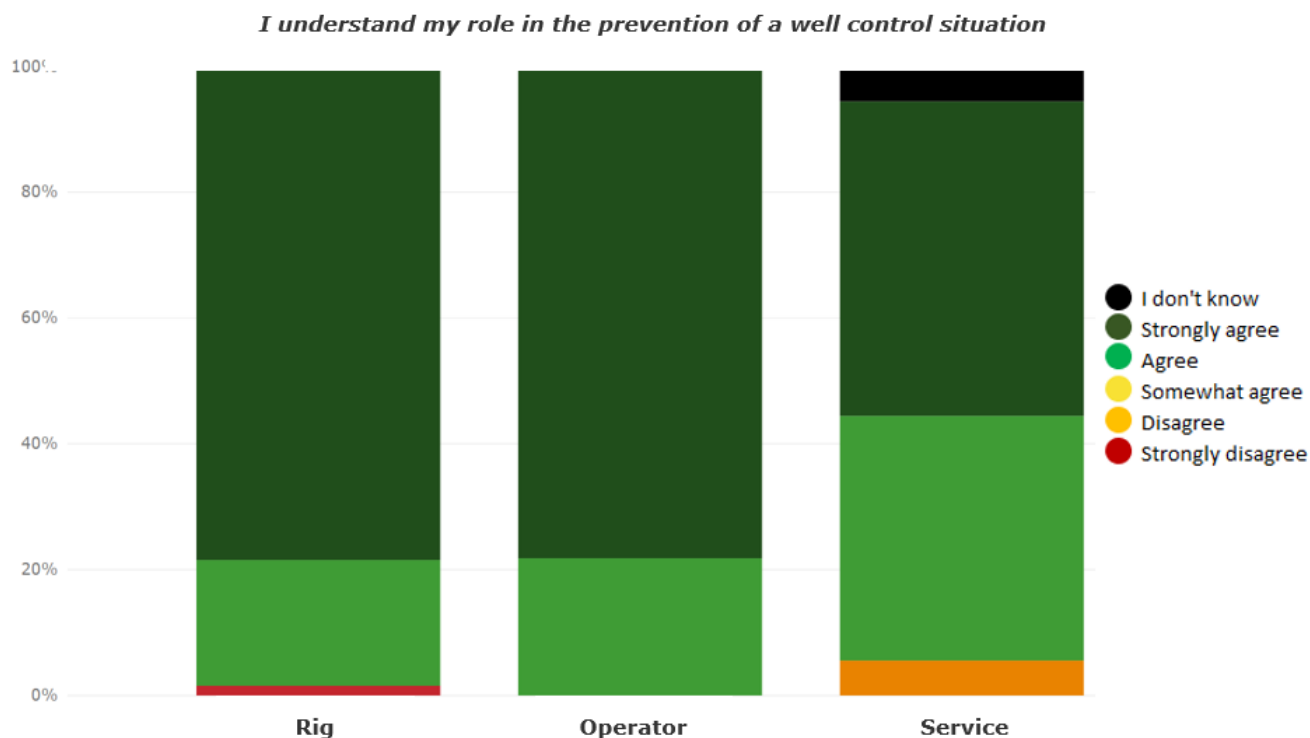


Figure 4-9: Responses to the statement "*I understand my role in preventing a well control incident*"

Organisation of working conditions to prevent well control situations: The results show that 90% of all respondents use the "agree" or "strongly agree" response options on a statement that addresses whether

their current working conditions facilitate the execution of tasks to prevent well control situations. Respondents working for operator companies most agree with this statement where 97% make use of these alternatives, while “only” 56% of personnel working for service companies do the same.

The reason for this relatively large difference is difficult to identify, but one respondent working for a service company comments that cost savings and reorganization have contributed to increase the workload of service company employees. At the same time, there is some uncertainty as to the extent to which work pressure affects quality in the work of preventing well control situations.

Cementer/mudlogger/directional driller: «...pressure is more and more present for teams working onshore and offshore to do more with less resources...»

Figure 4-10 shows which response options the respondents from the different types of companies have used for the statement “my working conditions allow me to carry out my duties in prevention of well control situations”. Here you can see that personnel working for service companies have to a large extent used other response options than employees in operator- and rig companies.

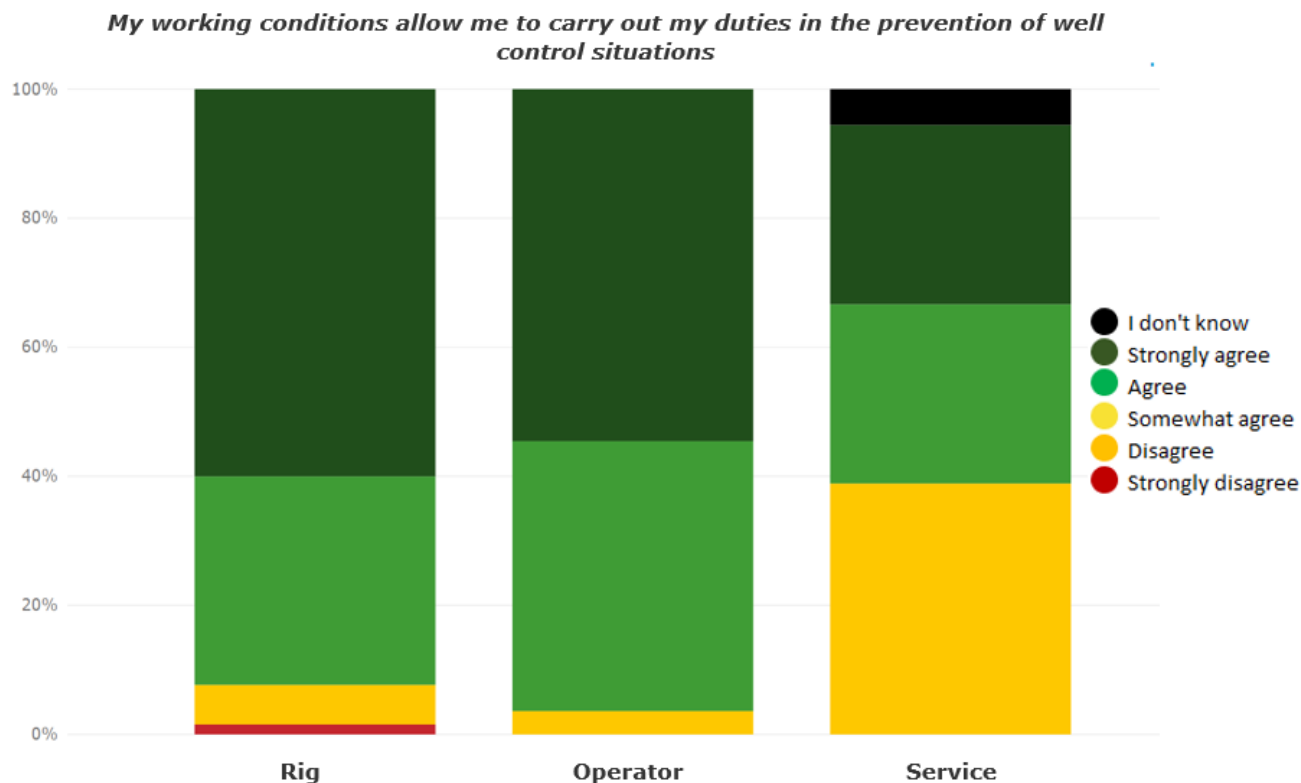


Figure 4-10: Responses to the statement “My working conditions allow me to perform my tasks in preventing well control situations”

Knowledge of the use of well control equipment: Across all company types, 91% of the respondents selects the “agree” or “strongly agree” response options on a statement that addresses whether they are familiar with the operation and limitations of well control equipment. Here, personnel working for the

operator- and rig companies most agree with the statement, of which 95% make use of these response options while "only" 66% of the personnel working for service companies selects the same alternatives.

One possible explanation for the lower level of agreement among personnel working for service companies could be that there are some job categories at service companies that do not operate well control related equipment. In this context, it may also be added that there could be different perceptions of what is considered as well control equipment.

Changes in units of measurements: The results indicate that different uses of units of measurement (i.e. bar vs. PSI, etc.) from operation to operation can lead to misunderstandings. "Only" 54% of all respondents reports to "agree" or "strongly agree" to the statement "*changes in units of measurement from operation to operation does not cause confusion*". Personnel working for service companies most disagree with this statement, of which 44% selects these response options.

Figure 4-11 shows the distribution between company types on the statement "changes in units of measurement from operation to operation does not cause confusion". The figure shows that a relatively large proportion of the respondents reports that the use of different units of measurement may lead to confusion.

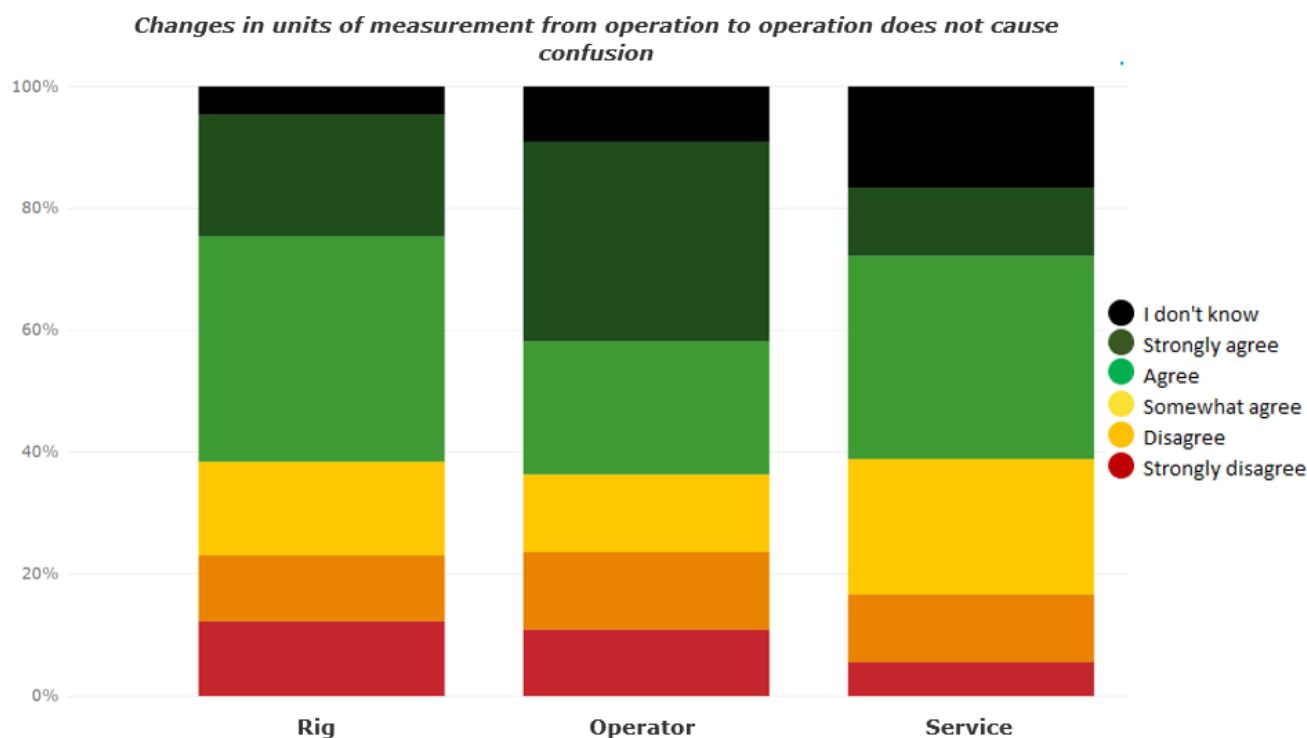



Figure 4-11: Responses to the statement "*Changes in units of measurement from operation to operation do not cause confusion*"

Learning from past events: 24% of the respondents selects the "strongly disagree," "disagree," "somewhat agree," or "I don't know" response options to the statement that other well control events are



reviewed to capture learning. The statement below comes from a well planner who comments that there is an improvement potential in learning from mistakes made by others.

Well planner: *«Learning from other's mistakes could be better!»*

Reporting of well control incidents: Across all company types, there is a great deal of agreement on a statement that addresses whether well kicks and serious events related to BOP functions and well control systems are always reported. On average, 94% of the respondents selects response options "agree" or "strongly agree" for this statement. Among the employees working for the operator companies, all respondents make use of these alternatives, while personnel employed by service companies make more use of other response options whereas 17% report that they don't know.

4.2.5 Integrated Operations

The results of the survey indicate that there is some uncertainty about the concept of integrated operations (IO). For example, the respondents make use of the response option "I don't know" to a relatively large extent for statements addressing IO. Several comments have also been made regarding the lack of knowledge of the operating concept or that the respondents have limited experience. Among the comments, many are positive about using IO and see the benefit of having a strong support organization onshore. Other comments are less positive and fear that implementation of IO will lead to fewer jobs offshore, and that drilling automation and IO are mainly used as a means to reduce costs and not necessarily to improve safety.

Cementer/mudlogger/directional driller: *«This evolution is mainly focused on cost control rather than safety improvement»*

Drilling automation helps to increase safety margins: There is a relatively large level of disagreement on a statement that deals with whether drilling automation helps to increase safety margins related to well control. For example, "only" 43% of the respondents selects the "agree" or "strongly agree" response options to this statement and only 17% of the respondents working for service companies make use of these alternatives. Figure 4-12 shows which response options the respondents within the different types of companies have used.

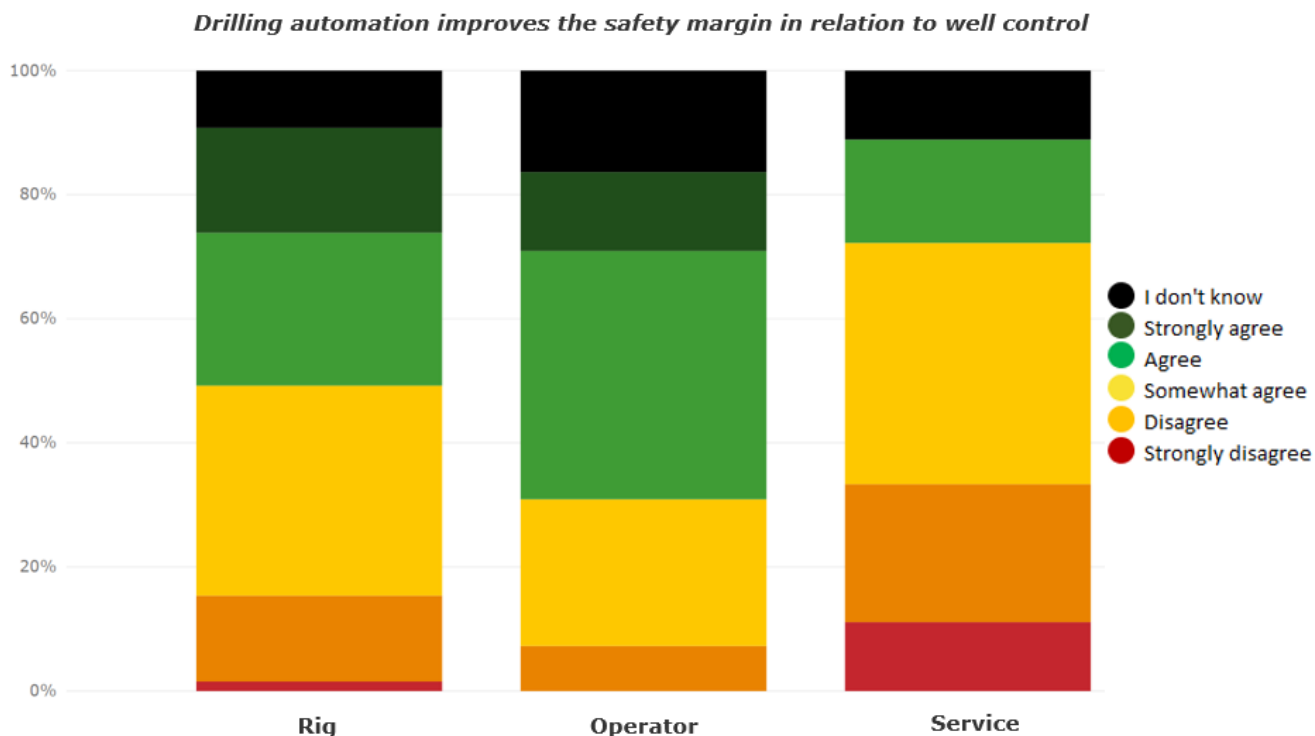


Figure 4-12: Responses to the statement *"Drilling automation helps to increase safety margins within well control"*

Handling well control situations with reduced staffing offshore: Only 17% of all respondents selects the response options "agree" or "strongly agree" on the statement *"reduction of personnel offshore through Integrated Operations has not had negative effect on handling well control situations"*. A relatively large proportion of 27% also selects the "I don't know" alternative. This may indicate that the respondents have limited experience with IO and reduced staffing offshore. Figure 4-13 shows which response options the respondents within the different types of companies have used.

Cementer/mudlogger/directional driller: *«...pressure has been to move personnel onshore and perform more multitasking instead of focusing on one well. This jeopardizes the wells safety»*

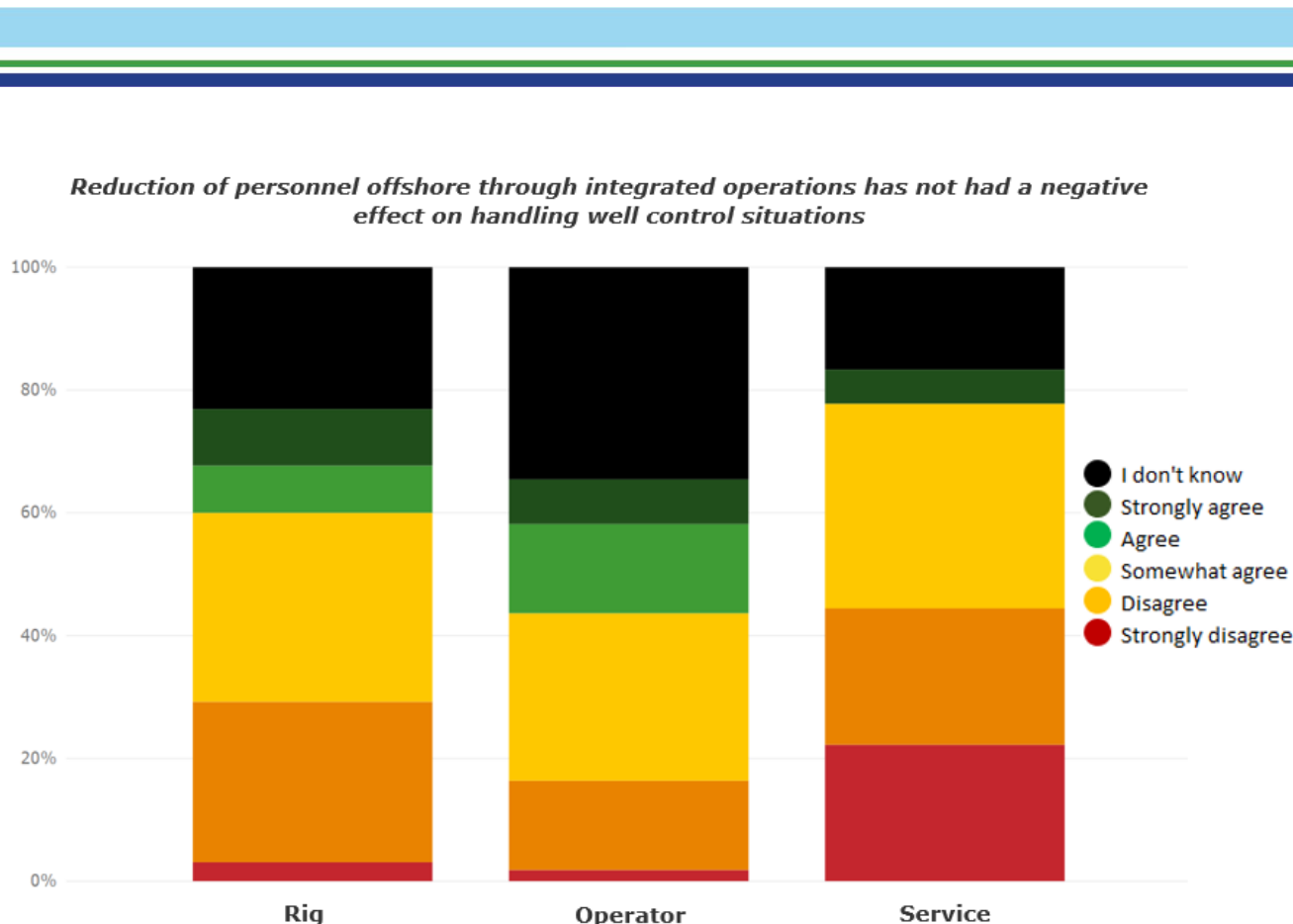


Figure 4-13: Responses to the statement *"Reduction of personnel offshore through integrated operations has not had a negative effect on handling well control situations"*

Clarity of roles and responsibilities with integrated operations: Under the subject "roles and responsibilities" (ref. chapter 4.2.2), there is generally a large degree of agreement on statements that deal with clarity of interfaces, role expectations, and decision-making authority. As an example, 86% of the respondents reported to "agree" or "strongly agree" on a statement about whether interfaces between personnel involved in well control are clear.

When the context changes to IO, the picture is slightly different. Overall, "only" 47% of the respondents make use of the same response options for a similar statement that addresses whether there are clear interfaces between onshore and offshore personnel involved in handling well control situations. As mentioned earlier, part of the explanation for this "gap" may be that the respondents have relatively limited experience with this mode of operation.

Figure 4-14 illustrates how respondents respond to statements related to roles and responsibilities. As can be seen from the figure, respondents show a high degree of agreement that interface between personnel in the well control team is clear. In a similar statement that deals with the interface between onshore and offshore, the same respondents show a lesser degree of agreement.

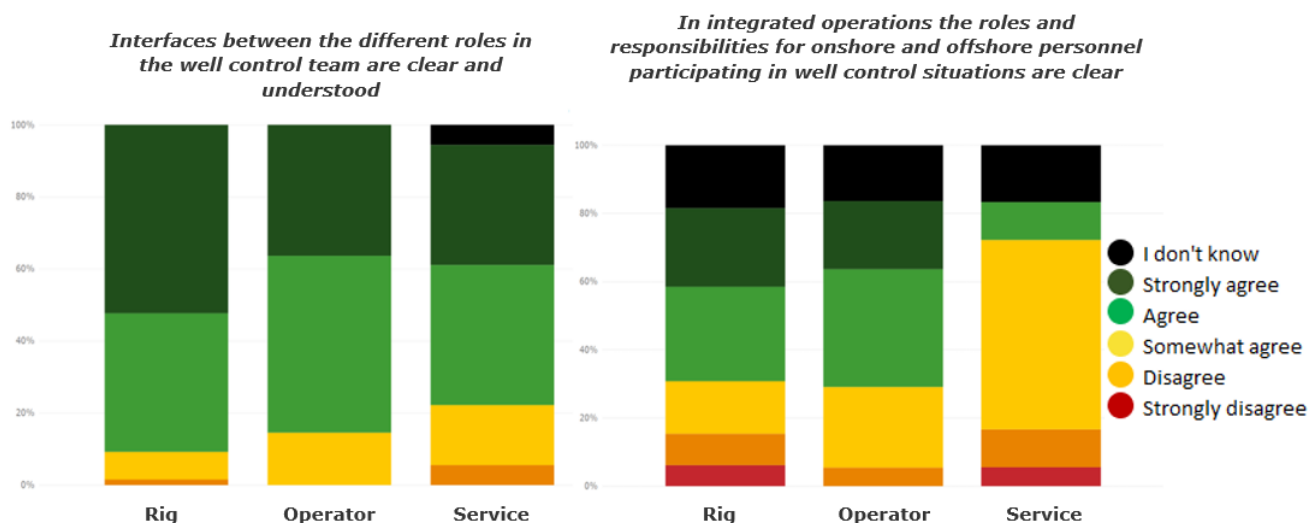


Figure 4-14: Responses to statements concerning roles and responsibilities. Left: "The interface between the various roles of a well control team is clear and understood". Right: "In integrated operations, roles and responsibilities for onshore and offshore personnel participating in well control situations are clear"

4.2.6 Consequences of advanced drilling methods

Most comments on this topic deal with a lack of experience in using advanced drilling methods such as "managed pressure drilling" (MPD), "dual gradient drilling" (DGD) and "underbalanced drilling" (UBD). The fact that respondents have little experience is supported by the widespread use of the answer option "I don't know". It is mainly job categories within operator and service companies that use this response option, where it is used on average in 24% of cases across all statements. In comparison, this alternative is used in only 9% of the cases among respondents working for rig companies. There are also 6 respondents in job categories within operating companies who comment that they have not used such methods, while only 2 people working for rig companies have made similar comments.

One possible explanation for personnel working for rig companies have more experience in using advanced drilling methods than personnel employed by operator- or service companies may be that rig company personnel are involved in more drilling operations in general and thus are also more likely to have been involved in advanced drilling methods.

Training: On average, 62% of the respondents from the rig contractors and operators respond "agree" or "strongly agree" to a statement concerning whether they have received specialized training to deal with well control situations using advanced drilling methods. In comparison, these alternatives are only used in 39% of the cases among employees working for service companies. The distribution of use of response options is shown in Figure 4-15.

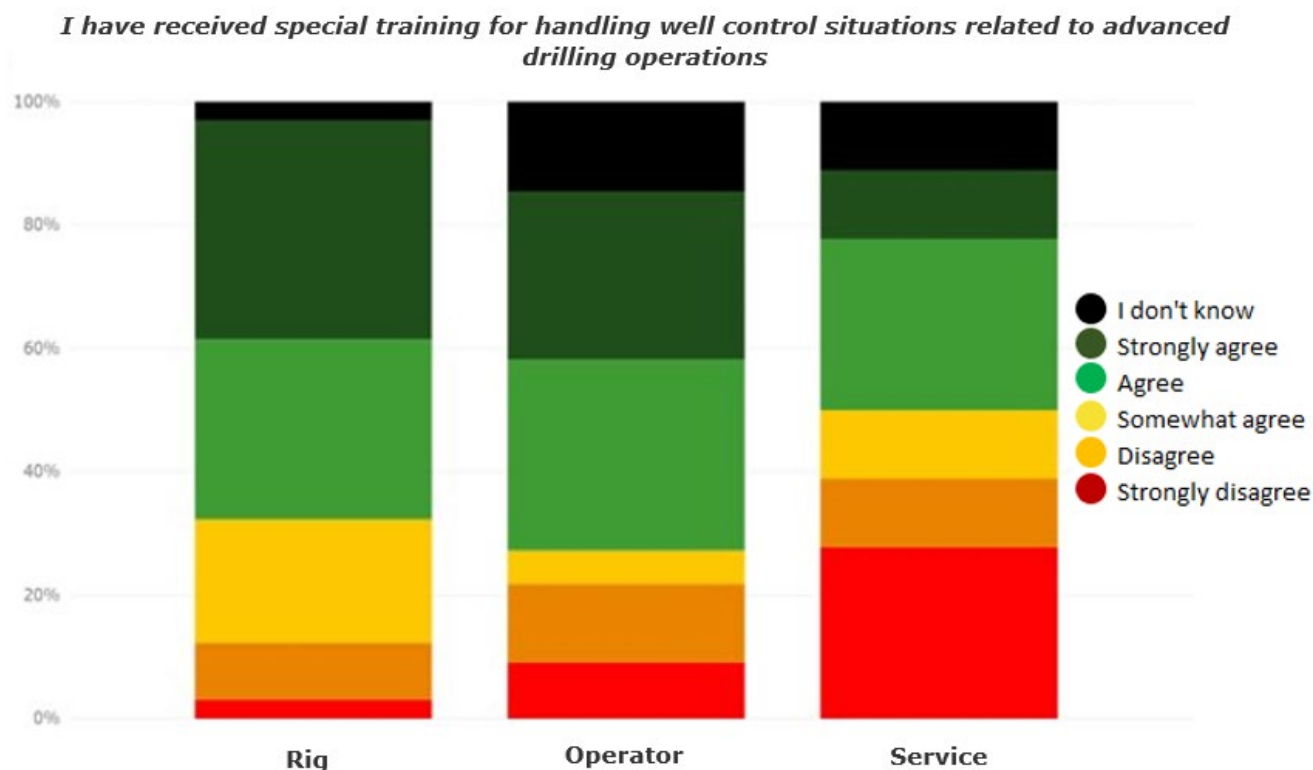


Figure 4-15: Responses to the statement "I have received special training for handling well control situations related to advanced drilling operations"

4.2.7 Development in contract model between, operator, drilling contractor and service companies

"Alliance contracts" are forms of contract aimed at reducing the number of suppliers of drilling and well services for both mobile rigs and for fixed drilling facilities. Typically, one main service provider is selected and will have the overall responsibility. Implementation of such contract models often entails reorganization of offshore personnel, relocating some offshore positions onshore, and increased use of onshore operations centres. These types of contracts also include changes in incentive schemes that have an impact on responsibility and cost distribution related to bonuses and losses.

From the comments to read, there are many strong opinions on topics that deal with contract and framework conditions. There are some who are positive, including a person employed by a service company who comments that alliance contracts can help to make the "team" involved in drilling operations more robust.

Service pusher/drilling operation coordinator: *«I'm very positive towards integrated contracts and sharing responsibilities. This will, if we manage to build a strong team spirit, make our organization stronger related to all operations including well control»*

Line of command with regard to well control situations: The results show that the respondents generally consider the line of command as clear. On the statement "the line of command is clear with respect to roles and responsibilities for handling well control situations", 92% report to agree or strongly agree. None of the respondents make use of the "disagree" or "strongly disagree" alternatives for this statement. This is also consistent with the results of similar statements under the subject that deals with roles and responsibilities (see chapter 4.2.2).

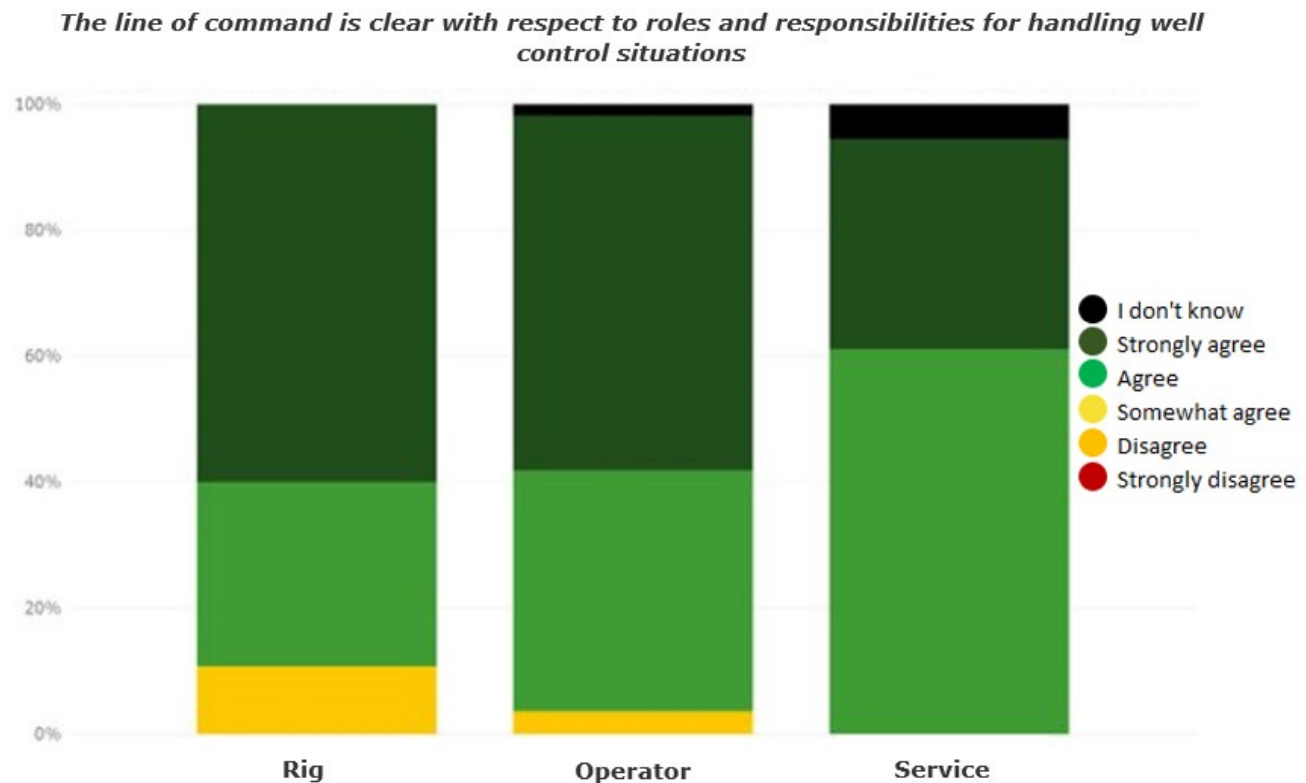


Figure 4-16: Responses to the statement "The line of command is clear with respect to roles and responsibilities for handling well control situations"

Workload: On the statement "the situation of workload on individuals related to well control has not increased in recent years", 41% use the response options "agree" or "strongly agree" while the "somewhat agree" option is most commonly used (38%).

At the same time as a relatively small proportion of respondents agree with the statement, only 12% disagree or strongly disagree. Under the subject of working conditions (see chapter 4.2.4), it has been commented, among other things, that increased cost focus has led to higher workload in general, but the results from the survey cannot be used to conclude whether the introduction of new contract models and working conditions has had a negative effect on well control.

Drilling superintendent onshore: «The workload for individuals has increased over the recent years, but not related to well control. The increased amount of work gives less room for focus on well control»

5 CONCLUSION

The objective of this study has been to carry out a mapping of important technical, operational and organizational factors affecting well control. This report describes observations that the industry can learn from. The Drilling and Well Technology Department in the Petroleum Safety Authority will also use these results as input to their activities.

The results show that the industry still maintains the expected high standard in well control considering factors such as execution of roles, defined areas of responsibilities, level of formal education and content of training programs.

While there are many positive observations, the results show that there is also potential for improvement in several areas including understanding of roles and responsibilities. For the service companies, the results have revealed several weaknesses in terms of job descriptions, competence requirements, and systems for training. The Petroleum Safety Authority will follow up this in future work to harmonize the competence requirements for positions across various companies.

Improvement areas related to training and exercises have also been identified, which include content/variation in training scenarios as well as the involvement of personnel both onshore and offshore. Involvement of personnel onshore is considered to be particularly important in connection with relocation of offshore positions to onshore support centres.

There were many respondents who used the "I don't know" response option on statements that deal with advanced drilling methods. This may indicate that many do not have experience with such methods. However, the results indicate that personnel that have been involved in operations using advanced drilling methods have undergone adequate training in this area.

The results show that many respondents believe that there are challenges associated with well control in integrated operations and after the implementation of new contract models ("alliance contracts"). Identifying the causes of this will also be an important follow-up area for the PSA in the future.

As mentioned, the results of the survey will be used as input to the PSA's future activities in the follow-up of drilling and well activities. In addition to follow-up of findings and observations as described in this report, the PSA will use the results of this survey as input to the development of regulations and standards. The PSA will further adjust its models for conducting audits in such a way that the activities reflect the relevant needs and assist in the continuous improvement of the company's handling of the learning points that emerge from this study.

6 REFERENCES

- /1/ Reflekt AS report, Questions related to education and training in well control, report no. 01-2018-03, Graeme Dick, Mike Pollard. Date revised: 25/01/2019

7 RELEVANT LITERATURE

Recommendations and guidelines for competence requirements, competence development, exercises and drills.

1. American Petroleum Institute (2006). API RP 59. Recommended Practice for Well Control Operations (second edition). Collected from: <https://www.standard.no/nettbutikk/produktkatalogen/produktpresentasjon/?ProductID=537763>
2. Norsk olje og gass (2016). Anbefalte retningslinjer for kompetansekrav til bore- og brønnpersonell (revisjon 6). Hentet fra: <https://norskoljeoggass.no/contentassets/a1a9296ce37742e78d8f54b8c390c667/024---anbefalte-retningslinjer-for-kompetansekrav-til-bore--og-bronnpersonell-.pdf>
3. IOGP. (2019). Report 476. Recommendations for enhancements to well control training, examination and certification. Collected from: <https://www.iogp.org/bookstore/product/recommendations-for-enhancements-to-well-control-training-examination-and-certification/>
4. IOGP. (2014). Report 501. Crew Resource Management for Well Operations teams. Collected from: <https://www.iogp.org/bookstore/product/crew-resource-management-for-well-operations-teams/>
5. IOGP. (2014). Report 502 – Guidelines for implementing Well Operations Crew Resource Management training. Collected from: <https://www.iogp.org/bookstore/product/guidelines-for-implementing-well-operations-crew-resource-management-training/>
6. IOGP. (2019). Report 628 – Recommendations for Enhancements to Well Control Drills in the Oil and Gas Industry. Collected from: <https://www.iogp.org/bookstore/product/iogp-report-628-recommendations-for-enhancements-to-well-control-drills-in-the-oil-and-gas-industry/>
7. International Association of Drilling Contractors (IADC) – WellCAP Plus (www. <https://www.iadc.org/wellcap-plus/>)
8. International Well Control Forum: (www.iwcf.org)

Recommended readings based on the investigation of the Macondo accident

9. Norwegian Oil Industry Association (OLF) (2012). Summary report. Deepwater Horizon. Lessons learned and follow-up. Collected from: <https://norskoljeoggass.no/globalassets/dokumenter/drift/deepwater-horizonmacondo/dwh-summary-june-2012.pdf>
10. U.S. Chemical Safety and Hazard Investigation Board (2016). Investigation report. Drilling Rig Explosion and Fire at the Macondo Well. Report No. 2010-10-I-OS (volume 3). Collected from: <https://www.csb.gov/macondo-blowout-and-explosion/>

- 
11. Ptil (2011). Deepwater Horizon-ulykken – vurderinger og anbefalinger for norsk petroleumsvirksomhet. HOVEDRAPPORT. Collected from:
https://www.ptil.no/contentassets/8c860c31bb6042dca28a99e4b83fef69/dwh_delrapport-1.pdf
 12. Ptil (2014). Avsluttende rapport for oppfølging etter Deepwater Horizon-ulykken. Collected from:
https://www.ptil.no/contentassets/8c860c31bb6042dca28a99e4b83fef69/ptils-avsluttende-dwh-rapport_2014.pdf

APPENDIX A

Questionnaire

Competence Level

- Level of education has a strong impact on the understanding of well control situations
- Well control performance has improved in recent years due to change in character and attitude of personnel
- My well control competence is improved by reviews of well control situations
- There is a logic between the expectations to my well control role and the competence requirements for that role
- My company has set well control competence requirements for my position
- My company ensures my well control competence is maintained
- I am aware of the operators well control competence requirements for my role
- My formal well control competence requirements are fulfilled at all times
- In my operation, there is a matrix that covers competence requirements for all personnel involved in well control
- New people involved in well control have a satisfactory equipment familiarization program
- New people involved in well control have the necessary competence
- New people involved in well control have a mentor in their on the job (OTJ) training program
- When in operation I am always prepared for a well control situation

Understanding of roles and responsibilities

- I understand my role in a well control situation
- Simulator training leads to improvement in handling well control situations
- I have had sufficient simulator training related to well control
- Interfaces between the different roles in the well control team are clear and understood
- There is continuity in personnel that have well control responsibilities
- The well control team leader gives me guidance on how to fulfill my roles and responsibilities for well control
- It is clear who makes the decisions in a well control situation
- In my operation, there are clear expectations to personnel with roles in well control

Training, Exercises and Teamwork

- Onshore well control exercises are more valuable for me than offshore exercises and drills
- Offshore well control exercises and drills are more valuable for me than onshore exercises
- All personnel that have a role in well control situations are involved in exercises and drills
- Service provider personnel with a role in well control are able to influence the quality of well control exercises and drills
- There is a plan for training and exercises including practical and table-top exercises
- The well control exercises and drills that I participate in are realistic and relevant
- There is a review after well control exercises to facilitate learning and continuous improvement
- The plan for well control exercises covers all likely well control events
- Training and exercises consider factors such as stress and fatigue
- There are enough people with well control competence in the team to manage a well control situation
- I have the opportunity to train together with the others in the well control team
- I am familiar with the procedures related to well control
- I understand what I should do and where I should muster if the well control situation escalates to an emergency
- The well control team leader takes control and delegates tasks effectively in a well control situation

Working Conditions, Technical, operational and organisational barriers

- There are reviews of relevant well control incidents to facilitate learning and continuous improvement
- Exercises are used to verify the performance of the well control team


- The role of operational, organisational and technical barrier elements in well integrity is clear
- I am familiar with the operation of and limitations of well control equipment on my present facility
- In my operation, there is a strong focus on well control
- In my operation, I am familiar with bridging documents related to well control
- I understand my role in the prevention of a well control situation
- I understand my role in the prevention of escalation of a well control situation to a major accident
- In my operation, the requirements in the well control manual and relevant bridging documents are clear for all persons involved in well control
- My working conditions allow me to carry out my duties in the prevention of well control situations
- There is good equipment for communication during a well control situation
- There is good communication within the team during a well control situation
- The necessary data I require to carry out my well control duties is easily available and/or displayed
- The critical alarms that are related to well control situations are easily recognized
- There is a system for maintenance of barrier elements (safety and environmental critical elements)
- Handover between shifts always covers well control aspects
- The drilling crew always plan and prepare for the next work sequence in a timely manner
- The handover I receive before I start my offshore trip gives me a good understanding of the ongoing operation
- Changes in units of measurement from operation to operation does not cause confusion
- In my operation, the equipment required for well control is well maintained
- The language used in well control procedures does not cause confusion
- Procedures related to well control are easily understood
- Potential well control situations are addressed in Detailed Operating Procedures (DOP)
- Potential well control situations in each hole section are discussed actively prior to commencement of operations
- Specific well control requirements are considered for each well e.g. HTHP, deep water
- Specific well control requirements are considered for each facility e.g. jack-up, semi-submersible, drillship
- Well control roles and responsibilities are addressed in organisational changes
- In my operation, the role of the safety delegate is understood
- Safety delegates are always invited to participate in serious incident reviews and investigations
- Well kicks and serious incidents related to BOP functions and well control systems are always reported

Integrated Operations: remote support, remote control, drilling automation, and cross training

- I have concerns that integrated operations will have a negative influence on risk related to well control
- Drilling automation improves the safety margin in relation to well control
- In integrated operations the roles and responsibilities for onshore and offshore personnel participating in well control situations are clear
- Integrated operations has led to improvements in handling well control situations
- Reduction of personnel offshore through integrated operations has not had a negative effect on handling well control situations
- Is there anything you would like to add to the above as explanation/additional information?
- Consequence of advanced drilling operations
- Robust well control processes are established and implemented for advanced drilling methods, e.g. managed pressure drilling, dual gradient drilling, underbalanced drilling
- I have received special training for handling well control situation related to advanced drilling operations
- When advanced drilling methods are used the well control team has received the necessary training in handling well control situations
- When advanced drilling methods are used the competence and capacity of the well control team is reviewed and adjusted as required
- When advanced drilling methods are used, then the exercises are relevant and realistic

Conditions and agreements between operator, drilling contractor and service companies

- The situation of workload on individuals related to well control has not increased in recent years

- 
- The focus on well control is maintained in new alliances between operator, drilling contractor and service providers
 - The interface between the operator, drilling contractor and service providers representatives and responsibilities in a well control situation is functioning well
 - The conditions, procedures and agreements are clear with respect to competence and capacity for handling well control situations
 - The line of command is clear with respect to roles and responsibilities for handling well control situations
 - The contract and agreements cover roles and responsibilities in well control situations
 - Incentives and bonuses do not have any negative effect on work processes and manning related to well control
 - Sharing responsibility for downtime has a positive influence on factors related to well control (One Team concept)

APPENDIX B

Information to respondents

DNV GL har på vegne av Petroleurstilsynet blitt tildelt oppgaven med å gjennomføre en spørreundersøkelse for å kartlegge forhold knyttet til roller, ansvar og kompetanse knyttet til brønnkontroll innen bore- og brønnaktiviteter (B&B aktiviteter) hos ulike selskaper i industrien.

Spørreundersøkelsen vil i hovedsak dekke følgende tema:

- Kompetansenivå – vedlikehold av teoretisk- og praktisk kompetanse;
- Rolleforståelse og ansvar i stillinger;
- Trening, øvelse og samhandling;
- Tekniske-, operasjonelle- og organisatoriske barrierer;
- Integrerte operasjoner: støtte fra land, fjernstyring, boreautomasjon og krysstrening;
- Konsekvenser av nye «avanserte» boremetoder og;
- Samarbeidsmodell mellom operatør, boreentreprenør og bore- brønnservice

Målet med oppgaven er å kartlegge kvalitetsnivå i utøvelse av roller og ansvar, samt dokumentert opplæring og kompetanse knyttet til brønnkontroll innen B&B aktiviteter, samt identifisere forbedringsområder i gjeldende praksis. Undersøkelsen vil være anonym og vil sendes ut på engelsk.

For å gjennomføre undersøkelsen trenger vi respondenter i følgende kategorier:

- Riggleder - på land (Rig manager onshore)
- Boresjef (Toolpusher)
- Borer (Driller)
- Ass borer (Assistant driller)
- Tårnmann (Derrick man)

Som myndighetskontakt setter vi pris på om du kan sende oss en liste med mulige respondenter (navn, stilling og e-post) innenfor de ulike kategoriene **innen 30. september 2019**. Kontaktinformasjonen vil kun brukes til utsendelsen av spørreundersøkelsen, og deretter slettes. Å svare på undersøkelsen vil ta ca. 20 minutter og for å få et helhetlig bilde setter vi pris på å kunne inkludere ansatte fra din bedrift.



About DNV GL

DNV GL is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification, supply chain and data management services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter and greener.