



API STANDARD 53 PROVES IDEAL TRAINING AIDE

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ABSTRACT

This paper portrays the advantages of utilising API Standard 53 as a key training aide in the area of Blowout Prevention Equipment Systems for a “fast-track” or “accelerated” Assistant Driller Training Program for young people new to the Industry employed by a major drilling company here in South East Asia.

The challenge was to educate young people of different backgrounds, nationalities, skill capabilities and language abilities in Blowout Prevention Equipment who have never come across such equipment before so that they clearly understood the design and functionality of their equipment on-board their specific rig.

Given that well control is not an easy subject for people to understand (especially those who are new to the Industry) the task of writing material especially suited for such people is not as easy as it may seem, since the bulk of material available on the subject is at too high and too complex a level.

API Standard 53 was the ideal solution for this training program since it is both clearly and unambiguously written. It also dove-tails perfectly with the new IADC “Wellsharp” well control training program and the OGP Report No.476 which recommends certain enhancements to well control training.

That every trainee scored high marks in the Blowout Equipment Systems section is testimony to the fact that API Standard 53 is indeed the perfect training aide for young people coming into the Industry for the first time and is, furthermore, seen as an ideal standard for future training courses e.g. for Driller’s and Drilling Engineers for example.

OBJECTIVES

To show how API Standard 53 can help with the training of new, young people coming into the Industry and how it dove-tails with the new IADC “Wellsharp” well control training program, the varying levels of IWCF and the contents of OGP Report No. 476 which recommends enhancements to well control training.

BACKGROUND

One of South East Asia's leading, prestigious and forward-think Drilling Contractors based in Singapore and Kuala Lumpur had a requirement, a year ago, for a fast-track Assistant Drillers program which would take suitable young people through to the position of Assistant Driller within a period of approximately 18 months. As training providers, IDEAS Singapore Ltd were approached to discuss the task.

This was a challenging requirement due to the mixture of people. There were male and female personnel, people from a mix of countries i.e. Brunei, Malaysia, Thailand and Indonesia; differing English abilities; differing cultures; differing educational abilities (e.g. some had excellent engineering degrees, some had not, having practical experience instead), there was a range of background skills and an age range.

Despite the differences, all were so keen to learn and hard-working; and all wanted to pass the course with flying colours.

There is an excellent amount of well-written literature on virtually any variety of drilling subjects one might care to source and cross-reference. However, this is not true of well control material, particularly for young people at entry level. (IDEAS has been training drilling personnel for many years now on a variety of courses, including well control). Furthermore, post Macondo, the Industry has really tried hard to promote the *understanding* of the subject as opposed to just passing an exam, and there have been many suggested improvements, not least those contained within the publication of OGP Report No. 476 for example.

Well control is also one of those subjects feared by many drill crew and even drilling engineers. Generally, it's not explained at all well. A complex subject, which should be taught with sympathy and delicacy, it is often taught with all the finesse of a butcher in a butcher's shop.

So, in order to a) reduce the student's fear of well control, b) help them *understand* well control, c) achieve a high exam pass-rate, d) become more in-line with the post Macondo recommendations (e.g. OGP Report No. 476) and e) become more in-line with the differing levels of IWCF and the new IADC Wellsharp programs, IDEAS searched far and wide for the right material as regards BOPE (Blowout Prevention Equipment).

Generally, we found that much of the material readily available on the market and the material used by many well control schools wasn't explanatory enough or wasn't simple enough – in effect, it was neither well written nor was it at the right level.

The only documents / manuals which we could use was the Drilling Contractor's Well Control Manual and API Standard 53. There was also the advantage that, apart from the delegates understanding their own company's well control policies and procedures, they would also, at an early age, learn API Standard 53.

API STANDARD 53

At 112 pages long, of great vintage, containing 43 sections, 18 Figures and 11 Tables, API Standard 53 must be one of the clearest, most succinct and most unambiguous documents in the Industry.

Although the delegates only require to learn about Surface BOP Stacks (the Drilling Contractor specialises in Tender Assist Drilling, example photo below), there's plenty of Subsea BOP Stack information available should the company ever move into semi-submersibles for example.



The West Pelaut Tender Assist Drilling Unit Drilling for Shell Brunei

Apart from the text information, the following proved particularly useful:-

- Annex A – Surface Function Test Worksheet;
- Annex A – Pump System
- Annex A – Accumulator Closing Test
- Annex A – Accumulator Pressure (especially the notes)
- Annex B – Failure Reporting
- Annex C – Accumulator Pre-charge Calculations

- Figure 1 – Example Choke Manifold Assembly for 2K and 3 K Rated Working Pressure Service – Surface BOP Installations
- Figure 2 – Example Choke Manifold Assembly for 5K Rated Working Pressure – Surface BOP Installations
- Figure 3 – Example Choke Manifold Assembly for 10K or Greater Rated Working Pressure Service – Surface BOP Installations
- Figure 4 – Example Kill Line Assembly for 2K and 3K Rated Working Pressure Service – Surface BOP Installations
- Figure 5 – Example Kill Line Assembly for 5K and Greater Rated Working Pressure Service – Surface BOP Installations
- Figure 6 – Example Kill Line Assembly for 5K and Greater Rated Working Pressure Service – Surface BOP Installations
- Figure 7 – Example Standpipe Choke Installation
- Figure 8 – Example Illustration of Surface BOP Ram Space Out

- Table 1 – Surface BOP Pressure Designations (in particular for introducing MPa Units)
- Table 2 – Pressure Test, Surface BOP Systems, Initial Test
- Table 3 – Pressure Test, Surface BOP Systems, Subsequent Tests
- Table 4 – Example Surface MEWSP Calculations Given Well & Equipment-specific Data

The cross-referencing with other publications in the Bibliography also proved particularly useful, namely:-

- API RP 59, Recommended Practice for Well Control Operations
- API RP 64, Diverter Systems Equipment & Operations

INCORPORATING API STANDARD 53 INTO THE TRAINING PROGRAM

During the program's inception phase, well control was identified as a major concern for a variety of reasons:-

- Young people are genuinely apprehensive regarding well control examinations;
- Young people often doubt their ability in this typically complex area;
- Some young people doubt their English ability / capability.

It was thus essential to incorporate API Standard 53 in a sympathetic way; a way in which the equipment side of well control could be readily understood in the first instance. Then, when the equipment side of well control was understood (i.e. what the equipment did, what it was for etc.) the other areas of well control could be studied (leading up to filling out the kill sheet and killing the well through either the Driller's Method or Wait & Weight).

Three ways were selected to incorporate API Standard 53 into the training program:-

- E-Learning Modules
- Offshore Practical Tasks Log
- Classroom Training
- Constant Linked-In Discussion

E-LEARNING MODULES

E-Learning modules are an excellent way to learn anytime, anywhere and are regarded as being both highly flexible as well as informative.

There are a total of 3 E-Learning Modules to the Training Program, and it's within the first module (Drilling Equipment & Systems) that reference is made directly to API Standard 53, asking the delegate to check that he / she has API Standard 53 to hand for ready reference.

OFFSHORE PRACTICAL TASKS

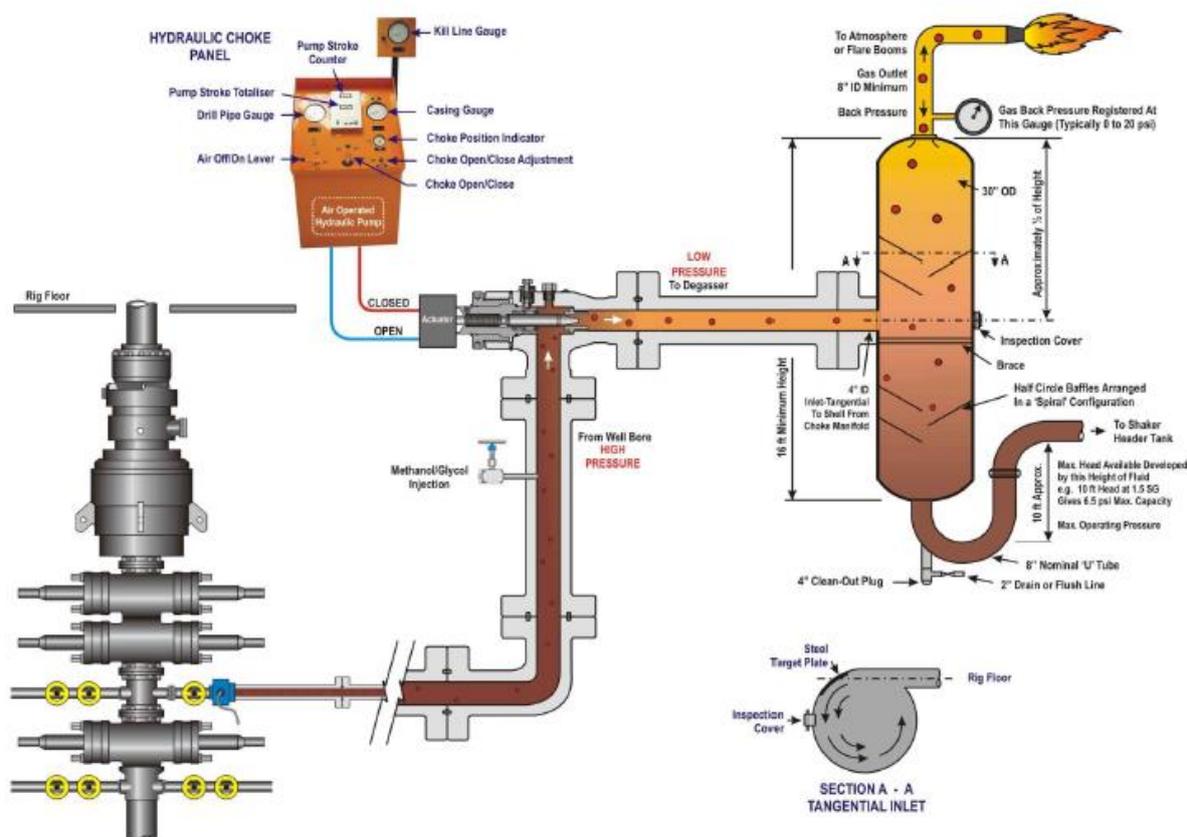
Following each E-Learning module the students had a number of tasks to carry-out offshore which both "tied-into" and "expanded" the learning value of the module. Essentially "hands-

on” and “practical”, the tasks were contained in a conveniently sized “Offshore Practical Tasks” Log Book. Examples of the tasks are given at the end of each module.

MODULE 1

E-Learning

The first module began with direct reference being made to the Drilling Contractor’s schematic of their “typical” well control system, below:-



Drilling Contractor’s Typical Well Control System contained within Well Control Manual

Pressure Control

The E-Learning module then continued with a video as to why pressure control is so important, covering, in particular, the following areas:-

- Hydrostatic Pressure
- Formation Pressure
- Kicks / Influxes
- BOP Stack
- Blowouts & Consequences
- Reasons for Kicks / Influxes

Referenced Equipment

Following the video, direct reference was then made to the following items of well control equipment:-

- Diverter Systems
- BOP's – General
- Annular BOP's
- Ram BOP's (Pipe, Variable Bore, Shear & Blind)

A second video (BOP's & Equipment) concluded this first module with the following topics:-

- Overview
- Pressure Ratings
- Annular Preventers
- Ram Preventers
- Choke Line & Manifold
- Mud Gas Separator
- BOP Stack Operation

Examples of Offshore Practical Tasks

- Sketch the Diverter System on-board your rig (if you have one) including where the overboard gas lines go. Become familiar with the diverter element closing system and the overboard line valve opening system. Note the Working Pressure and where the hydraulic fluid comes from to close the element.
- Sketch the BOP Stack on-board your rig, noting, in particular, what rams are below the Annular Preventer. Note the Working Pressures of the Annular and the Rams and where the hydraulic fluid comes from to close them.
- List the distances from below the rotary to the Annular Preventer (AP), the Rams and the Wellhead. Note if there is a surge bottle for the AP and what type of AP you have (e.g. DL or GK).
- Witness the Testing of the BOP Stack and make notes as to the test pressures achieved, the time period they were achieved for and the frequency with which these tests are carried out. Copy the test charts.
- Sketch the pipework, valves and gauges which constitute the choke manifold on-board your rig. Annotate your sketch with information as to what goes where in terms of flow-path and note the pressure ratings.

MODULE 2

E-Learning

This module began by showing a video on Surface BOP equipment, of the following topics, making specific reference topic by topic to API Standard 53:-

- Overview
- The Driller's BOP Control Panel
- Accumulators
- Hydraulic Lines
- Operating Lever on Accumulator
- Choke Manifold and Chokes

- Mud Gas Separator
- Mud Gas Separator Operation
- Flare Line
- Trip Tank
- Trip Tank Operation

Another key advantage of API Standard 53 is the standard of the drawings / schematics. It's far easier for the student to understand the schematic below prior to going onto the rig floor.

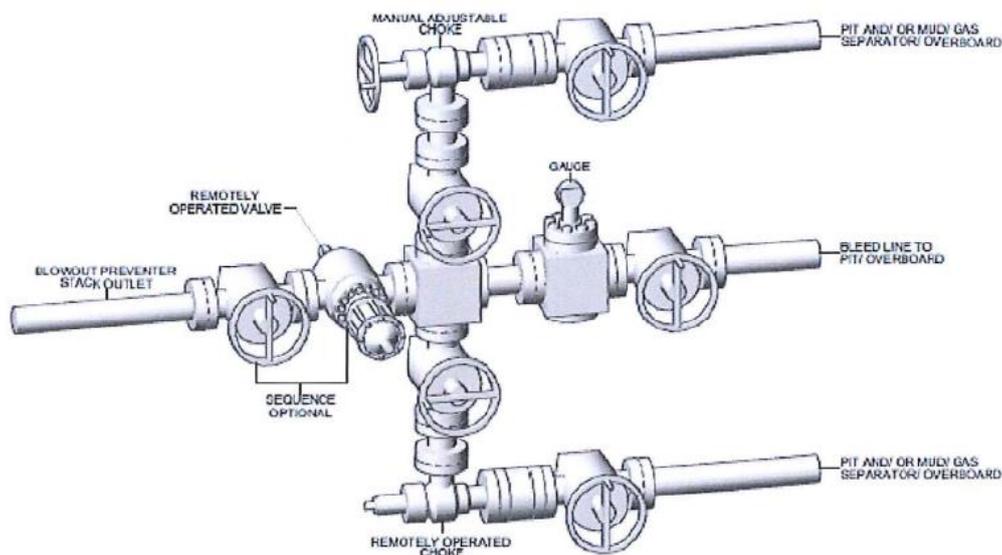


Figure 2—Example Choke Manifold Assembly for 5K Rated Working Pressure Service—Surface BOP Installations

API Standard 53 Schematic: Straightforward to Understand



On the Drill Floor: Rather More Difficult to Understand

Module 2 also covered the following areas:-

- Drilling / Spacer Spools
- Choke & Kill Manifolds & Flow Path Requirements
- Choke & Kill Piping & Flexible Lines
- Choke & Kill System
- Hydrate Suppression: Glycol Injection
- Standpipe Manifold
- Cement Manifold

Examples of Offshore Practical Tasks

- Sketch where the glycol injection point is and where the glycol injection pump is. Explain to your Supervisor / Mentor just why the injection of glycol is so important during well killing operations. State what must injection pressure be and the flow rate of glycol.
- Sketch the hook-up of all of the lines and what the functions are of each line. State the Working Pressure.
- Draw the hook-up of the line from the cement unit. State when this line might be used and what its pressure rating is.
- Study the BOP / Diverter Control System and list your observations. State the function of the Control System. State how actuation of the valves at the choke manifold is carried out.
- Find out what is inside an accumulator bottle and what the principles of operation are. Explain the operation to your Supervisor / Mentor, particularly the pressure / volume relationship.

MODULE 3

E-Learning

This module covered the following areas in particular, again cross-referencing in detail with API Standard 53:-

- BOP Control Systems / Accumulator Units
- BOP Handling Systems
- Mud Gas Separators (especially design, vent line, the liquid seal, hot mud line)
- Trip Tanks / Stripping Tanks
- Degassers
- PVT Systems
- Mud Return Flow Volume Meters
- Safety Valves / FOSV's
- Upper / Lower Kelly Cocks
- Float Valves
- Gray Valve / Hydril Drop-in Dart Valve.

Examples of Offshore Practical Tasks

- What should the Koomey pressures be for the following :-
Accumulator _____
Manifold _____
Annular _____
- Describe the internal workings of the BOP stack and its different functions from top to bottom.
- Describe and perform the line-up for drilling and tripping operations.
- Identify the locations of all the BOP Control Panels and gauges.
- Identify HCR valve operating handle.

CLASSROOM TRAINING

At the end of each 6-month training session a week's classroom training was organized. The purposes of this session were four-fold:-

- To ask the delegates if they had any questions relating to the E-Learning Modules and API Standard 53 / Well Control Equipment
- To ask the delegates if they had any difficulties with their Practical Tasks Offshore
- To explain the material in more detail
- To relate the learning to actual well control situations

The classroom also gives the delegates the opportunity to discuss related issues as well.

CONSTANT LINKED-IN DISCUSSION

The social media platform chosen for individual / group chat was Linked-In. This proved quite satisfactory, with delegates having their questions answered usually within 24 hours.

RESULTS

As expressed by Management, the results of the program 12 months "in" are "excellent", with Senior Management at Director level expressing their continued satisfaction with the course. Students are passing the equipment sections of their Level 3 IWCF well control exams with rates in the region of 95%, which is quite remarkable.

CONCLUSIONS

It may be concluded with accuracy that this novel training program is proving to be highly satisfactory, as borne out by both the student's results and Management's comments. It may be further concluded that API Standard 53 is just the right quality for such training purposes, its excellent quality contributing most notably to the success of the course.

REFERENCES

1. API Standard 53, Fourth Edition, November 2012
2. SKD Well Control Manual
3. IADC Drilling Manual
4. Institute Francais du Petrole Drilling Data Handbook

5. SKD Rig Specific Data Sheets

AUTHOR'S BIOGRAPHY



Michael Gibson PhD has 35 years international oilfield experience working in a wide variety of disciplines ranging from drilling engineering through to drilling operations and, latterly, drilling consultancy and training.

A champion of lateral thinking, new technology, risk analysis and inter-disciplinary teamwork, he studied at The Robert Gordon University in Scotland. He holds Master's Degrees in Offshore Engineering and Engineering Technology and a PhD in High Pressure High Temperature Drilling.

He currently advises and teaches a wide-range of clients worldwide and is based in Singapore.

FOOTNOTE

IDEAS Singapore Pte Ltd was established in Singapore in order to transfer its North Sea, Atlantic and Gulf of Mexico experience to South East Asian operators, drilling contractors and service companies. Focusing upon well performance, risk reduction, efficiency and cost-effectiveness, IDEAS Singapore Pte Ltd advises a number of clients, including deepwater operators and drilling contractors, ranging throughout South East Asia. IDEAS also teaches a great deal throughout South East Asia, and this Abstract refers to a very large drilling company based here in South East Asia.