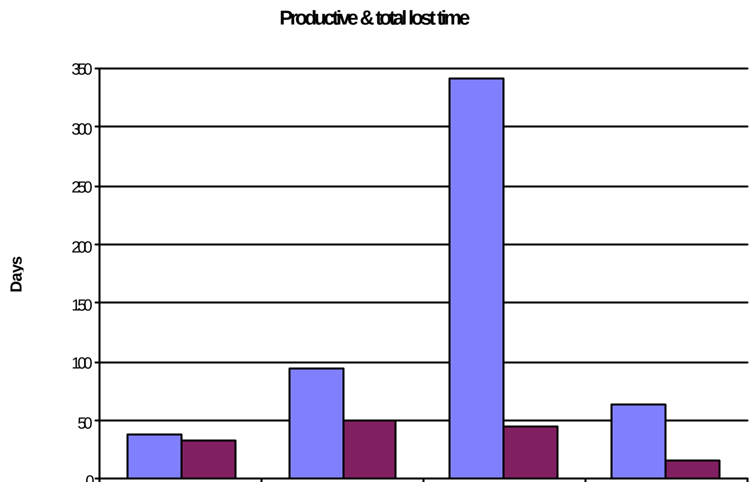
Technical Challenge no 1 : November 1998

Subject: 'Open water drilling operations'

From a study of 21 exploration wells drilled by one operator, using Semi-submersible drilling units in the UK Western margins, with several different rigs over a period of 3 years. It was found that more than 50% of all non-productive time for the well occurred in the open water drilling phases. i.e. From spud to landing BOP's, (see table below)

Q.) What do you consider most fundamental to a trouble free, efficient and effective open water 'riserless' drilling campaign?

Response.



	Conductor	Surface casing	Intermediate csg	Abandonment
Prod days	38.39	93.79	341.14	64.21
Lost days	32.38	50.83	45.28	16.77

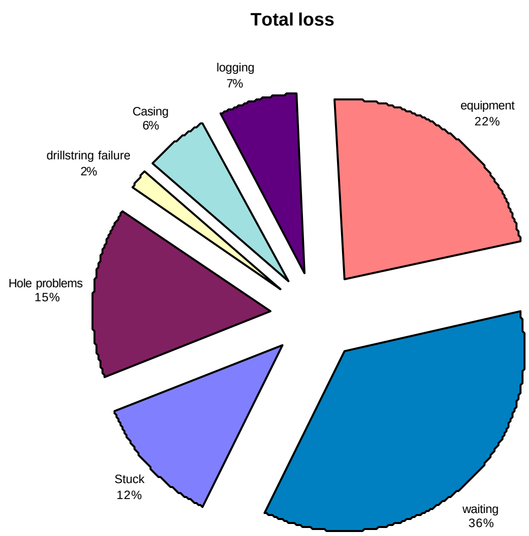
Operational phase

The data reviewed identified where loss occurs in UK Western Margin deep-water exploration drilling operations. *See fig. Opposite*

Well data should always be used as a first analyse to root causation of problems.

The data is then evaluated to provide the necessary preventative solutions to loss and trouble free operations.

A breakdown of loss was then derived from the wells reviewed and is illustrated in the following pie chart.

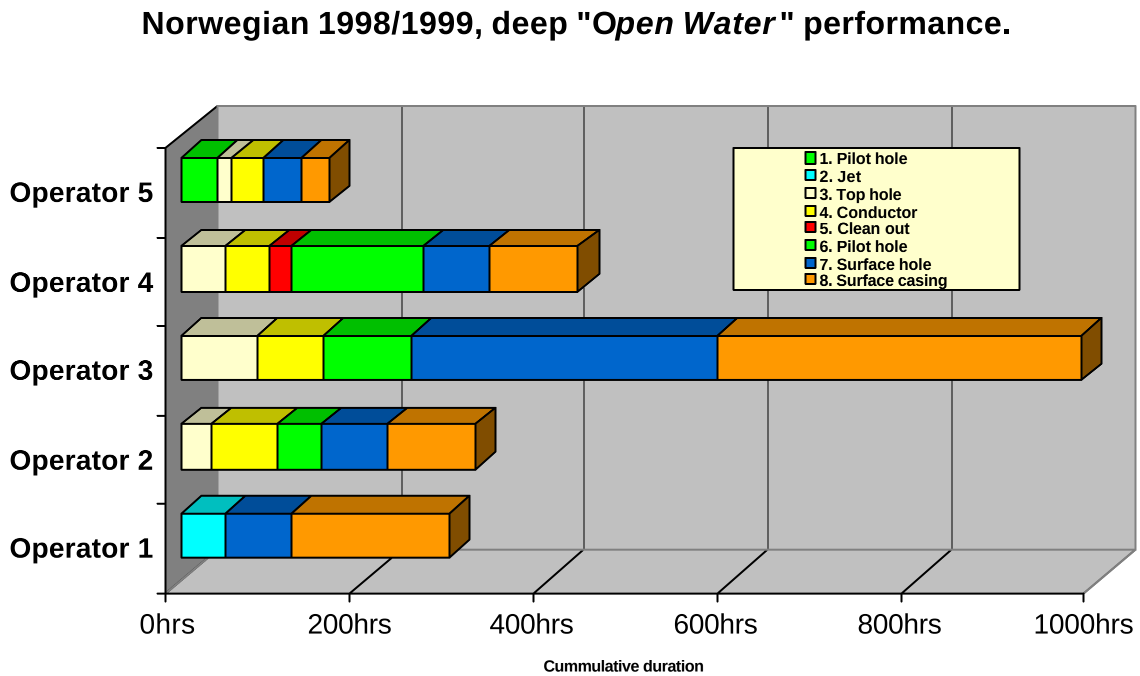


From this pie chart, loss can further be broken down further into three main subject areas. *(i.e. logging, stuck pipe casing problems etc all generally related to poor wellbore conditions.)*

1.) Wellbore conditions (37%),
2.) Waiting (36%), and
3.) Equipment related (22%).

Recent Norwegian deepwater exploration in recent years (see figure below) further highlights the significance of open water loss during the "open water" drilling phases. Here wellbore conditions and equipment related problems predominate. *Waiting was not a problem due to summer campaigns conducted and no difficulties were associated with subsurface current experienced.*

***Note:** Although Operator 5, was required to use a rig that needed upgrading and had never drilled a deepwater well before. This author demonstrated what can be achieved when operations are conducted effectively. (e.g. essentially practising what is preached!)*



Loss Control.

Wellbore conditions.

In deepwater exploration, wellbore related problems have shown to occur in the conductor, surface and intermediate section phases of the well.

- *In Deepwater Norway, 50% of wells have experienced shallow flows.*
- *In UK deepwater margins, there has been no shallow flow, but wellbore instability during riserless drilling, stuck pipe and re-spuds have frequently occurred..*

Why exclusively deepwater? Essentially because deepwater formations by nature of deposition, (can result in shallow flow), by burial and compaction result in loose, unstable, readily enlarged, unconsolidated and/or a collapsed wellbore through essentially unnecessary mechanical or hydraulic agitation.
Simply applying **"Best Practices**", **teach and educate personnel** to problems identified, use **fit for purpose equipment and drilling techniques**, can significantly prevent and reduce such loss.

Waiting.

Especially in the UK's Western margins, waves, wind speeds, resulting heave, subsurface currents, non-compliant and unfit equipment, poorly coached, unawareness amongst personnel, are the root causes resulting in significant "waiting" downtime. Often there is no solution, often having to simply wait on acceptable environmental conditions, e*.g. slack tide, to engage running tools, stab in to the hole etc*. Waiting has been reduced however through **better understanding and monitoring of the environment** and designing more **fit for purpose practices & equipment** to better suit such conditions. *E.g. New generation of ROV's, active/passive heave compensators, using 4^{th} & 5^{th} generation rigs.*

Equipment related.

Repair and equipment failure *Only accounts for only 5% of all loss*. When trips, repairs and impact on total loss is taken into account, 22% of total losses results. It is a simple correlation. The more complex, automated and the more jewellery you use to drill with or run into the hole in exploration wells, then the higher the risk of failure and the more likely loss will occur. On the drilling side, Top drives, BOP systems, handling equipment and ROV's are critical equipment items. Measurement and logging while drilling tools are the most common denominator for bottom hole assembly component failures, resulting in lost time trips. Properly afforded quality controls, maintenance and reliability must be afforded and demonstrated for all critical equipment items. It also simple, **i.e. run what you need**.

The endless pursuit of automation also challenges drilling crews to an unacceptable extent. Simplicity and reliability must be the driving mechanisms in automation of drilling equipment. Anything that can be done to simplify machinery and automation so that it is more readily understood must be seen as beneficial. ***"Automation can improve operations, Complex drilling systems should not be acceptable for drilling equipment – period".***

Risk management & Loss control.

- **Identify** loss (hazards and risk) areas. (see table below.)
- Set **standards** in drilling operations, equipment and drilling personnel to prevent loss.
- **Measure** and **evaluate** well and drilling performance for each well.
- **Commend** what has been successfully and **correct** what has gone wrong.
- **Learn** from past experiences and **feedback** into loss control process.

Typical hazard assessment for a deepwater well.

Location specific.

HAZARD	CONSEQUENCE	PROBABILITY	PREVENTION
Over pressured zone	Shallow flow, loss of containment	50% occurrence so far in region	Identify hazard through pilot hole. Practices and procedures used.
Dynamic positioning	Drift off, loss of station. Significant loss to rectify, re-certify etc.	Low – medium.	DP trials, riserless drilling to ensure all systems fully operational before Bops run.
Hole quality	Hole collapse, Stuck pipe, unable to run casing.	Medium to high from historical data representative.	Training, communication, awareness. Correct practices and procedures to be exercised.
Seabed conditions.	Poor visibility, unable to locate hole. Wait.	Low if correct and proper practices & procedures applied	ROV fully operational. High-resolution sonar. Proper and correct marking of hole.

Rig and equipment

HAZARD	CONSEQUENCE	PROBABILITY	PREVENTION
Equipment failure.	Wait to repair. Lost operating, time, cost, hole quality!	Highest in top and surface hole sections where operating conditions and circumstances are most adverse.	QA checks. BHA design. Planned maintenance of critical components. Back up.
Unfamiliarity	Poor interpretation & evaluation. (e.g.LWD/PWD!)	Medium to high as all personnel are being exposed to a new environment, equipment, practices.	Inform, coach, develop those responsible and accountable for critical operating events. Use RACI charts to delegate and ensure ownership of events.

Organisational

HAZARD	CONSEQUENCE	PROBABILITY	PREVENTION
Inadequate well integrity	Set casing high, and run contingent strings	Wildcat well medium to high.	Early data acquisition to enable best integrity decisions. Pore pressure interpretation, pilot hole to 20" depth.

Operational

HAZARD	CONSEQUENCE	PROBABILITY	PREVENTION
Not meeting well objectives	Very high impact on future strategic decision, development of discovery.	Low – Medium.	Hole quality, preventing equipment failure and personnel properly prepared for all eventualities key elements to meeting well objectives. Best practices for the right reasons.
Problem identification	Operational delays, indecision, incorrect solutions	Medium if preventative measures not fully exercised	Contingencies catered for. Personnel trained and coached to potential problems most likely. Best practices and procedures utilised at all times. Competency seen as a key element.
Lack of contingency	Operational delays, indecision, incorrect solutions	Medium to high	All group members asked to plan for critical problems and contingencies to be initiated. Up front planning viewed as essential