



*DP PAST PRESENT &
FUTURE*

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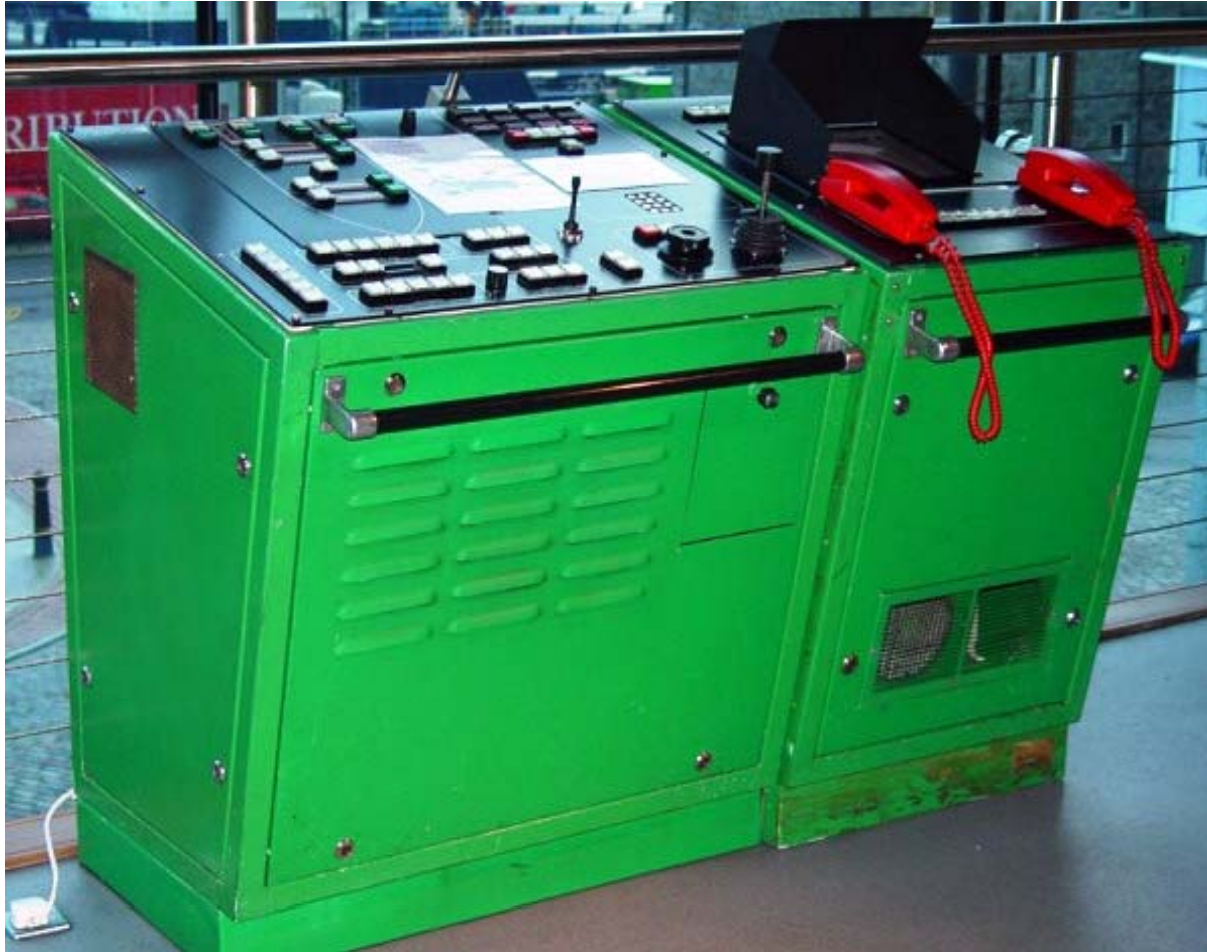


1970s

GEC Simplex
DP Control System

- No UPS
- One DPO
- One Position Reference

1970s



Kongsberg ADP 311
Simplex DP control
system

LATE 1970s

- DOUBLE SINGLE DP CONTROL SYSTEMS
- ONE UPS
- JOYSTICK
- ONE POSITION REFERENCE + ONE STANDBY
- ONE ENGINE ROOM
- JUST ENOUGH POWER AND THRUST FOR WORKING?

1980s

- 1980 First DP Guidelines (UK)
- 1983 First International Guidelines

'Guidelines for the specification and operation of dynamically positioned diving support vessels'

UK Department of Energy

&

Norwegian Petroleum Directorate (NPD)

First DP Guidelines

- No single fault → Catastrophic Failure
- Never exceed vessels DP Capability
- FMEA
- Withstand loss of 1 thruster or 1 generator or 1 switchboard
- No failure to full thrust
- 3 position references (2 + 1 standby)
- Duplex DP **OR** Simplex DP + Joystick

1990s

- DPVOA & ANNUAL TRIALS
- IMO MSC 645
- DP Equipment Class 1, 2 & 3
- M103
- IMO MSC 738 (MII7)
- IMCA

DP for EVERYTHING



CONSTRUCTION, OFFTAKE,
PRODUCTION, EXPLORATION,
PIPELAY, ACCOMMODATION,
SUPPLY, ETC.....

DP2, DP 2.75 & DP3

- DP2-DP3 All types of vessels
- DP2 says very little about DP
- Spare thrusters and diesel generators
- > 3 position references
- > 3 gyro compasses
- 2 DPOs
- 1, 2, 3 or 4 Engine rooms

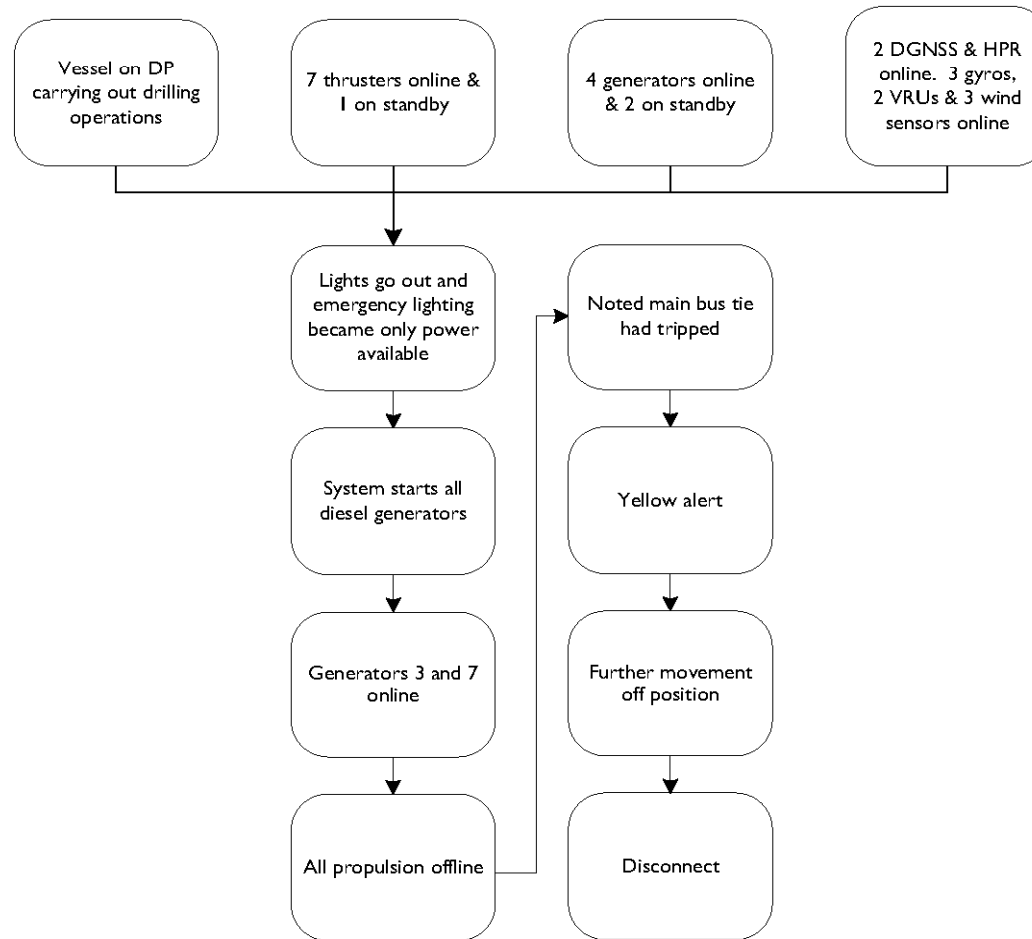
Great Improvements

- DP Control Systems
- High Speed Networks
- Variable Speed Drive Thrusters
- Diesel Generator Response
- Blackout Prevention
- Line of sight Position References
- DGPS
- Acoustics

EXPECTATIONS

- NO LOSS OF POSITION IF SOMETHING GOES WRONG
- EVERYTHING WORKING ALL THE TIME
- ZERO CHANCE OF BLACKOUT
- INCIDENTS REPORTED, INVESTIGATED & CLOSED OUT
- PERSONNEL COMPETENT IF CERTIFIED

Incident # 0974



Comments

This incident exceeded the red alert limit

Initiating Event

Generator 6 failed from internal short circuit

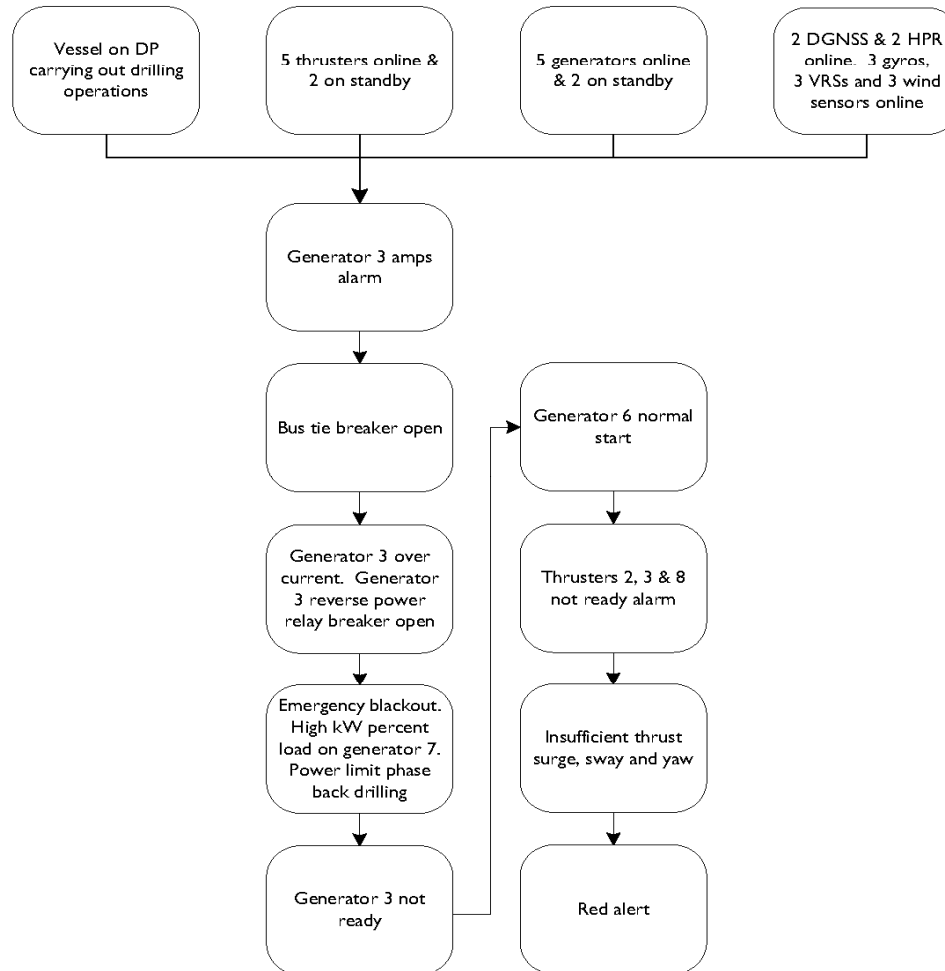
Main Cause

Power – Under voltage until faulty generator cleared resulted in loss of all online thrusters and loss of position

IMCA DP Incident 74/2009

- Lights go out and emergency lighting became only power available = **BLACKOUT = Red Alert?**
- System starts all diesel generators
- Generators 3 and 7 online
- All propulsion offline
- Noted main bus tie had tripped = **was closed?**
- Yellow alert = **violation of WSOG?**
- Further movement off position
- Disconnection

Incident # 0939



Initiating Event

Generator 3 failed from internal short circuit

Main Cause

Power – Under voltage until faulty generator cleared resulted in loss of all online thrusters and loss of position

2009 Incident Summary

- 75 Incidents 33 have loss of position
- 4 Environmental forces (A couple of these the operator should have avoided by earlier action)
- 2 Loss of all gyro compasses (This should never have been possible)
- 3 Fault on one diesel generator (These were serious incidents and could all be blamed on the set up)
- 5 Fault on one thruster (The reports do not state whether they were all CPPs)
- 3 Loss of all DGPS (No other position references so set up can be blamed)
- 2 DP software (No close out to confirm this and no detailed information)
- 2 Design Worst Case Single Failures (Position excursion assumed to have happened)
- 12 Operator Error (This is 2 more than in M211)

Conclusion

Expectations are not being met despite some significant improvements in DP equipment and systems

Future Optimistic

DP vessels irrespective of DP Class technically assessed properly before hired

Key DP Personnel experienced, interested and tend to serve same vessel for long period

Safest Mode of Operation used and WSOG or ASOG are common practice so DP vessels do not exceed the DP capability they will be left with after the design worst case failure

FMEA relevant, active and right

DP trials relevant, active and findings closed out

DP operational manuals relevant, regularly revised and read

Several small DP incidents that are reported, followed up and closed out

No serious loss of position so that a safe situation can be successfully achieved with no more than lost time and/or minor damage

Future Pessimistic

DP vessels hired by contract departments from basic vessel details and DP Class

Key DP personnel bored and just counting the days on board before the next 3 or 4 weeks leave or the next job on a different vessel

Safest Mode of Operation used without thought and equipment degradation not given the risk assessment needed to amend the WSOG/ASOG

FMEA old and irrelevant

Trials reduced to simple function tests and box ticking

Generic DP operations manual used with a few copy paste edits that provide doubt that is not questioned

Several small DP incidents that are discussed on board but not reported, followed up and closed out

A serious loss of position that causes pollution and/or loss of life and/or equipment damage and significant liability to vessel owner's management and oil company client

Future More Likely?

DP vessels increasingly assessed technically before they are hired

Contractors systems for the management and retention of personnel are good and usually effective

Awareness increases about the safest way to set up for DP work and errors are rare

FMEA reasonable but not very detailed and focus is more on DP manuals

Most DP trials done except some that are difficult or take too long

DP Operations manual has withstood the test of time and nobody has energy to fight to change it

Several small DP incidents; some are reported and followed up but closed out uncertain

Either way possible



		Worst Possible Effects		
DP Vessel Type	Work Assumed	Drive Off	Drift Off	Large Excursion
Supply	Close to structure	Collision and major damage	Collision but minor damage	Contact; damage negligible but downtime
Dive Support	Divers in habitat	Death to 2 or 3 divers	Injury to 2 or 3 divers	Minor injury to 1 or 2 divers
Accommodation	Gangway in use	Injury to 2 or 3 personnel on gangway at auto-lift and damage to gangway	Minor injury to 2 or 3 personnel exiting gangway	Gangway auto-lift and downtime
Rock Dumping	Close to structure	Collision and major damage	Collision but minor damage	Contact; damage negligible but downtime
Pipe S-Lay	Pipe lay with high tension	Pipe damage (running buckle) if tension lost	Pipe damage and minor injury to 1-2 personnel in firing line	Pipe over tension and downtime for close out
Drilling	Well Testing in <500m	Blowout, Loss of life, pollution and fire	Blowout, Loss of life, pollution and fire	Downtime
Heavy Lifting	10,000t load stabbed	Loss of life structure and DP vessel	Injury and major damage	Injury and major damage

'Events, my dear boy, events'

- DP history very good..... but
- Several significant near misses
- BOPs have been pulled over and dragged across the sea bed but luckily no blow-out took place.
- Emergency disconnections have failed and risers have been stretched and broken.
- Offshore installations have been hit: one holed a DP vessel that had to go into dry dock another caused a platform fire.
- DP vessels have also caught fire (Engine rooms) but there was no loss of life.
- Divers have been dragged around but there have been very few deaths from position loss

Coronal Mass Ejection

2012-13
11 year
100 year....1859
30 minutes warning

NASA



Best Area for Attention

- From hundreds of DP incidents >30 years
- The one point that would make the most difference is making sure that the key DP personnel know the DP system on their vessel exceedingly well.
- If this was met to a very high level many unwanted situations would not occur.
- The many differences between vessels in terms of power and thrust and position references would all be properly compensated for and the assessments for WSOG or ASOG would stand up to any audit or enquiry.

Way Forward

- Make the FMEA process better
- Get involved at or before FAT
- Add analysis value at the FAT
- Get documentation to be meaningful
- Focus on the safest mode of operation
- Teach risk assessment
- Use WSOG/ASOG developed with key DP personnel involvement
- Scenario Engine Initiative/ESV Notation Challenge

Present Status

- DNV Response with respect to ESV Notation
- Work Done
- Results
- Future