DP INTEGRATION AND TECHNOLOGY GROWTH ON WORKBOATS

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Presentation Outline

- Short History and Current Status
- Standard Configurations
- DP Class Notation and Certification
- Regulatory Agency Oversight
- Workboat Modes of Operation
- Operator Training and Retention
- Emerging Computer Technologies
- DP Integration In Ship Systems
- DP as part of Vessel Design Criteria
- DP Integration with Automation
- Cost Impact and Controlling Costs
- Future of DP on Workboats

Short History

- Demand for oil after 1950 required access to deeper water
- In 1961, first manual DP in M/V Cuss-1 and analogue system in M/V Eureka
- Initially all analogue with no redundancy
- Computer Industry maturity in 1970-1980's resulted in increasingly capable DP systems
- 1980 there were over 65 vessels with some form of DP
- 1985 grew to over 150
- By 1999 there were over 500 vessels with DP installations that were increasingly becoming more reliable and redundant

Current Status

- Standard now is for all new construction OSV's, PSV's, to be delivered with some form of DP
  - Mostly DPS-0 in past now going to DPS-1 and DPS-2
- Recent emerging need for DPS on Crewboats servicing the deepwater rigs
- Recent increased demand for backfit of vessels to DP
  - New DPS and upgrade from DPS-0 to DPS-1
- Oil Industry and Regulatory Agencies mandating increased safety and reliability
  - resulting in vessels with higher levels of DP as well as "DP Notation"
  - increases new construction costs

Primary Regulatory Agencies

- ABS Steel Rules for Ships 2002
  - Part 4, Chap 3, Sec 5, Para 15
- DNV Rules for Class of Steel Ships 1990
  - Part 6, Chap 7, Sec 1-7
- Lloyds Rules for Class of Ships 2001
  - Part 7, Chap 4, Sec 1-7
- IMO Maritime Safety Committee
  - Circular 645 dated 6 Jun 1994

Standard Configurations

Subsystem or Component		*Minimum Requirements in Group Designation*			
	ABS	*DPS-0*	*DPS-1*	*DPS-2*	*DPS-3*
	DNV	*AUTS*	*AUT*	*AUTR*	*AUTRO*
	Lloyds	*DP(CM)*	*DP(AM)*	*DP(AA)*	*DP(AAA)*
	IMO MSC/Cr645	*Not Recognized*	*Class 1*	*Class 2*	*Class 3*
Power Systems	Gen and Prime Movers	Non-Redundant	Non-Redundant	Redundant	Redundant separate compts
	Main Switchboard	1	1	1 with bustie	2 with n/o bustie - separate compts
	Bus-Tie Breaker	0	0	1	2
	Distribution System	Non-Redundant	Non-Redundant	Redundant	Redundant separate compts
	Power Management	No	No	Yes	Yes
			Optional - IMO	Optional - IMO	Optional - IMO
Thrusters	Arrangement of Thrusters	Non-Redundant	Non-Redundant	Redundant	Redundant in separate compts
	Hold Station with single thruster failure	No	No for ABS, IMO and DNV; Yes for Lloyds	Yes	Yes

Standard Configurations

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	ABS	*DPS-0*	*DPS-1*	*DPS-2*	*DPS-3*
	DNV	*AUTS*	*AUT*	*AUTR*	*AUTRO*
	Lloyds	*DP(CM)*	*DP(AM)*	*DP(AA)*	*DP(AAA)*
	IMO MSC/Cr645	*Not Recognized*	*Class 1*	*Class 2*	*Class 3*
Control	**Auto Control – No. of Computer Sys**	**1**	**1**	**2**	**2 + 1 in alternate control station**
	Manual Control – Joystick with auto heading	**No**	**Yes**	**Yes**	**Yes**
	Single Levers for each Thruster	**Yes**	**Yes**	**Yes**	**Yes**
Sensors	**Pos. Reference Sys.**	**1**	**1 for IMO, 2 for others**	**3**	**3 with 1 in alt control station**
	Ext. Wind Sensors	**1**	**1 - DNV, IMO;**	**2 for ABS, DNV, Lloyds;**	**2 with 1 in alt control station; 3+1 for IMO**
			2 for Lloyds and ABS	**3 for IMO**	
	VRS/MRU	**1**	**1 for DNV;**	**2**	**2 with 1 in alt control station;**
			2 for Lloyds; ABS, IMO is not addressed	**IMO is not addressed**	**IMO not addressed**
	Gyrocompass	**1**	**1 for DNV 2 for Lloyds and ABS**	**2 for ABS, DNV, Lloyds; 3 for IMO**	**3 with 1 in alt control station**

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	Lloyds	*DP(CM)*	*DP(AM)*	*DP(AA)*	*DP(AAA)*
	IMO MSC/Cr645	*Not Recognized*	*Class 1*	*Class 2*	*Class 3*
Misc	**UPS**	**0**	**1**	**1**	**1 + 1 in separate compt**
	Alt Control Station for backup Unit	**No**	**No**	**No**	**Yes**
	FMEA	**Yes for ABS and DNV; No for Lloyds**	**Yes for ABS and DNV; No for Lloyds**	**Yes**	**Yes**
	Consequence Analyzer	**No**	**No**	**Yes**	**Yes**
	Performance Capability Rating (PCR)	**Used only in Lloyds as a factor that gauges the percentage of time the ship can remain on station when subjected to a set of standard environmental conditions with all thrusters and then with most effective thruster inoperative**			
	Environmental Regularity Number (ERN)	**Used only in DNV as a factor used to indicate the position keeping ability of the vessel with all thrusters operating, minimum effect of single thruster failure and maximum effect of single thruster failure**			

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DP Class Notation

- Assignment at specific request and verifies full compliance with all requirements
- Larger than just the DP System
  - Thrusters, engines, steering, controls certificated
  - Extensive Second Tier environmental testing required for all control systems
- Results in considerable cost increase
- Very difficult for backfit DP systems
- Alternative may be IMO Flag State Verification and Acceptance Document (FSVAD)

Regulatory Oversight

- Rules initially developed for Drill Rigs and DP Drill Vessels that operate DP 24/7
- Only recently have they been applied to rapid expansion of DP on Workboats
  - Resulted in some issues relating to interpretation of rules to workboats
  - Owners perceived inconsistent interpretation and enforcement
- Owners feel need to have clear consistent regulations among all agencies
  - Some areas still leave room for interpretation
  - Specific example is ABS definition and requirements for Second Tier Control Equipment

Regulatory Oversight

- Workboat Industry would benefit from clarification of regulatory requirements
- Consider that workboats operate DP differently than Rigs and DP Drill Vessels
  - Rigs operate DP 24/7 – workboats do not
- Regulatory agencies should consider split between Rigs and Workboats to provide
  - Single consolidated set of rules specific to workboats that meets the needs of the oil industry to be safe and reliable at reasonable cost
- Concerns and clarifications should be published
  - Use Internet Websites for any clarifications and responses to questions
  - Benefits all users

Workboat Modes of Operation

- Standard Modes for Workboats
  - Dynamic Positioning
  - Hold Heading or Autopilot
  - ROV Following
  - Joystick
  - OFF
- Consider Enhanced Modes
  - Roll/Pitch/List/Trim
  - Added Navigation Information when not in DP Mode
  - ECDIS or Radar Overlay during OFF/Autopilot/Joystick

Operator Training and Retention

- Training for Rig DP Operators is clearly defined and extensive
- Not the case for Workboat DP Operators
  - No regulation requirement specifies training
- Minimal to no formal training
  - Most is On-The-Job Training under instruction
- Vessel Operators complain of losing trained Captains to other Operators

Emerging Computer Technologies

- Most innovative technology has occurred in the past 5-10 years along with the growth of computers
  - Faster Processors
  - Increased Computer Memory Availability
  - Higher Level PLC's with built in redundancy and "hot backup"
  - Improved Computer Networking and dual networks with higher data speed and greater reliability
  - Remote Access to computers via satellite or cellular links
- "Technology Savvy" Captains and Owners are demanding higher levels of technology and increased systems integration
  - Younger Captains grow up with computers and video games and understand the technology available

DP Integration – Ship Systems

- DP must integrate with controls for engines, thrusters, steering and external sensors
  - Can result in up to 4 different vendor involvement
- Requires “DP Integration Meetings” and Communications among vendors
  - Someone must act as integrator
  - Someone has to provide “The Switch”
- Owners and shipyards are looking for full package solutions from single vendor
  - Moves responsibility for integration away from shipyard
  - Single vendor responsible for all items and warranty results in less personnel callouts at commissioning and during operations
  - Significantly decreases cost of the overall package

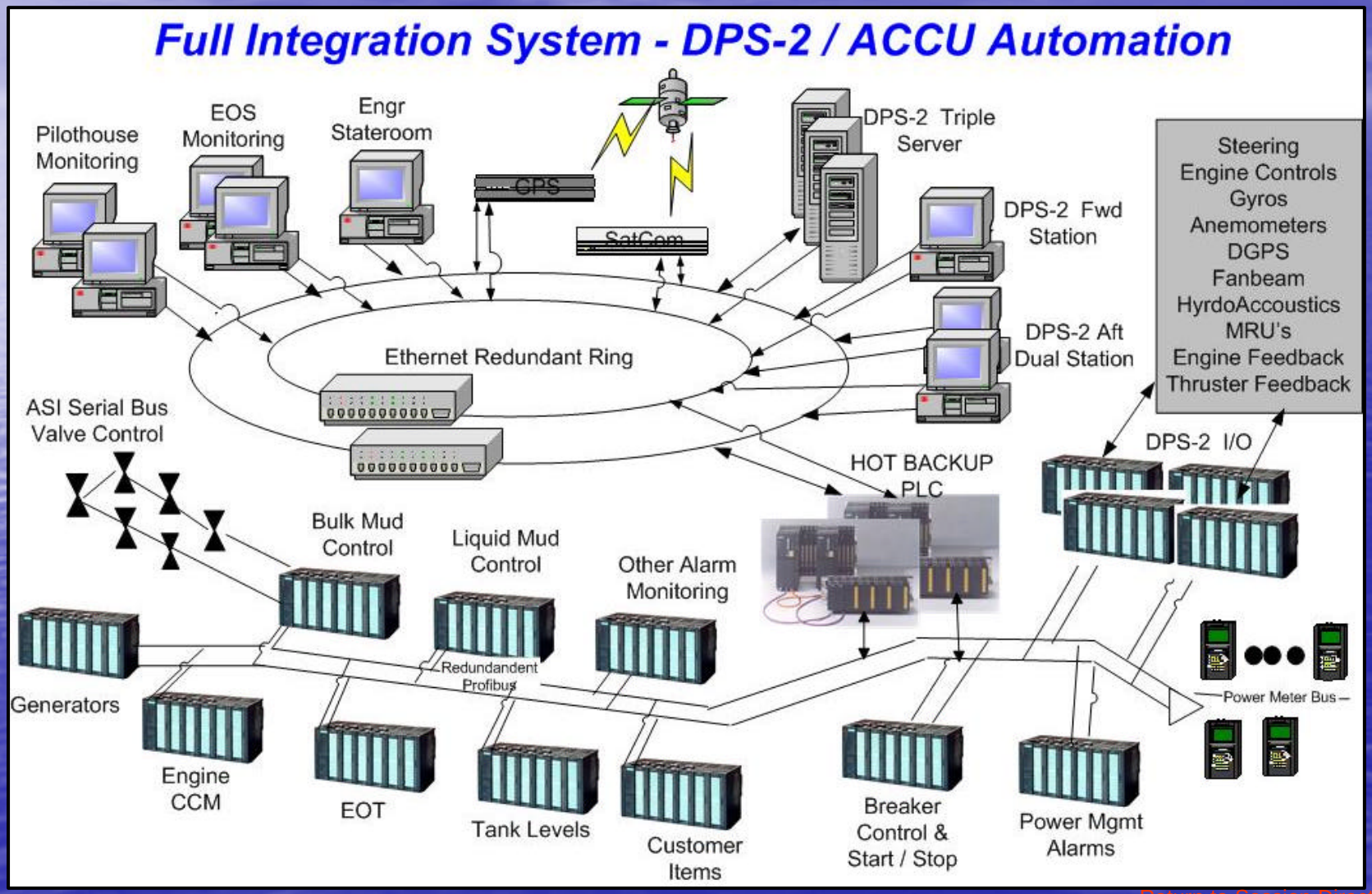
DP As Vessel Design Criteria

- Currently vessels are designed and built without consideration for DPS – just another added system
- DP is major portion of the vessel's mission and is affected by many ship design factors
  - Thruster Type, Location and Power
  - Hull Design Factors
  - Sensor Type and Location
- With increased demand for DP – vessels should be designed from bottom up with DP considered
  - Design Naval Architects need to become more familiar with DPS and design impact on DP Operations
  - Will increase the DP capability and environmental operational envelope and could reduce fuel and basic operating cost

DP Integration - Automation

- Along with demand for increased levels of DP there is now demand for increased Automation
  - More control from the pilothouse
  - Decreased Manning in Engineroom – ACCU Notation
- Result is use of redundant alarm and control system using Dual Network technology
- Multiple dual redundant networks will be installed if DP is also networked
- Consideration must be given to integrating the DP into the ship Automation network or vice versa
  - less cable to run on the vessel – less cost
  - Less components to maintain – less cost
  - Increased reliability of the dual system

DP Integration - Automation



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DP Impact on Vessel Cost

- Two Primary Cost Drivers
  - Level of the DP selected
  - “Notated” or not “notated”
- Related Costs - Increased Level of DP
  - More labor due to more complex installation
  - Additional sensors and thrusters for redundancy
  - Increased Operating Costs of additional equipment

DP Impact on Vessel Cost

- Related Costs – DP Notation
  - Second Tier Testing Requirements of Controls
  - Additional certifications for thrusters and engines
  - Additional Plan Submittal Requirements
- Additional Cost due to use of Multiple Vendors
  - Loss of any Single Vendor Discounts
  - Additional Techs on vessel during checkout and trials
  - Additional Tech callouts required from different vendors during operational problems

Controlling Costs

- Design the vessel from the “bottom up” as a DP Vessel to reduce vessel operating costs
- Network multiple systems together to reduce cable runs and mitigate complexity
- Use Single Source DP Integrator responsible for all aspects of the DP installation and post-delivery operation and maintenance

Future of DP on Workboats

- Expect DP on all new construction workboats and many larger crewboats
  - Primarily DPS-1 with increased DPS-2
- Demand for Safe and Reliable Operations by Oil Industry will
  - increase regulation and Notation Requirements
  - Increased Computer redundancy necessitating DPS-1 with two full computers or DPS-2
  - Result in tighter audits and verification of DP
- Concurrent Trend of Increased Automation resulting in more Systems Integration
  - More use of Dual Network technology
- Increased cost of higher level systems and integration could result in necessity for higher dayrates