

Poor preparation and processes at start-up/ commissioning can result in damage to hydraulic components. This damage can be catastrophic at start-up, or may not become apparent until many years later. Damage can be prevented by:

SUBSEA CONTROL SYSTEMS

- Flushing
 - Hygienic assembly practices
 - Flushing at a sufficient pressure and flow rate to ensure turbulent flow is achieved
- Testing
 - Confirm fluid cleanliness via patch test kit
 - Remove sensitive equipment prior to flushing
 - Loop hoses to reduce flushing time
 - Use non-bypass filters



- Fluid Compatibility
 - Component material
 - Seal material
 - Operating conditions
- Fluid Contamination
 - Bacteria growth
 - Gas migration/ contamination (emulsification)
 - Moisture contamination (humidity/ emulsification)
- Fluid Cleanliness Standards
 - NAS1638
 - SAE AS4059 Rev E
 - ISO (ISO4406-1999)

COMPONENT CONSIDERATIONS

- Pipework
 - Cleanliness during manufacture is critical
- Hoses
 - Pig hoses before end fittings are applied
 - Installation is critical (abrasion/ kinking/ environmental issues)
- Accumulators
 - Store with partial fill
 - Charge gas slowly
- Pumps & Motors
 - Pre-charge/ bleed to provide adequate lubrication
 - Ensure motor case is full
 - Perform rotation checks with no load



- Cylinders
 - Ensure system is fully bled
- Regulators
 - Screw down to near maximum pressure
 - Prime at a low pressure
 - Cycle to check repeatability
- Pressure Relief Valves
 - Remove from systems during flushing and testing
 - Set and certify off-line

START-UP RISK REDUCTION

- Initial build cleanliness
- Factory Acceptance Testing (FAT)
 - Individual component is tested
- System Integrity Testing (SIT)
 - Full stack up testing
- Pre-Commissioning
 - Checks on all components off line



- Commissioning Procedures
 - Detailed procedures and check lists should be developed in consultation with the OEM's for each system and subsystem.
 - Staged commissioning
 - Baseline HPU systems
- Post Start-up
 - Ongoing Monitoring

Fluid Cleanliness is the key to success