

Subsea Technology Development,
an Increase Systems Functionality
Embracing Obsolescence
Management

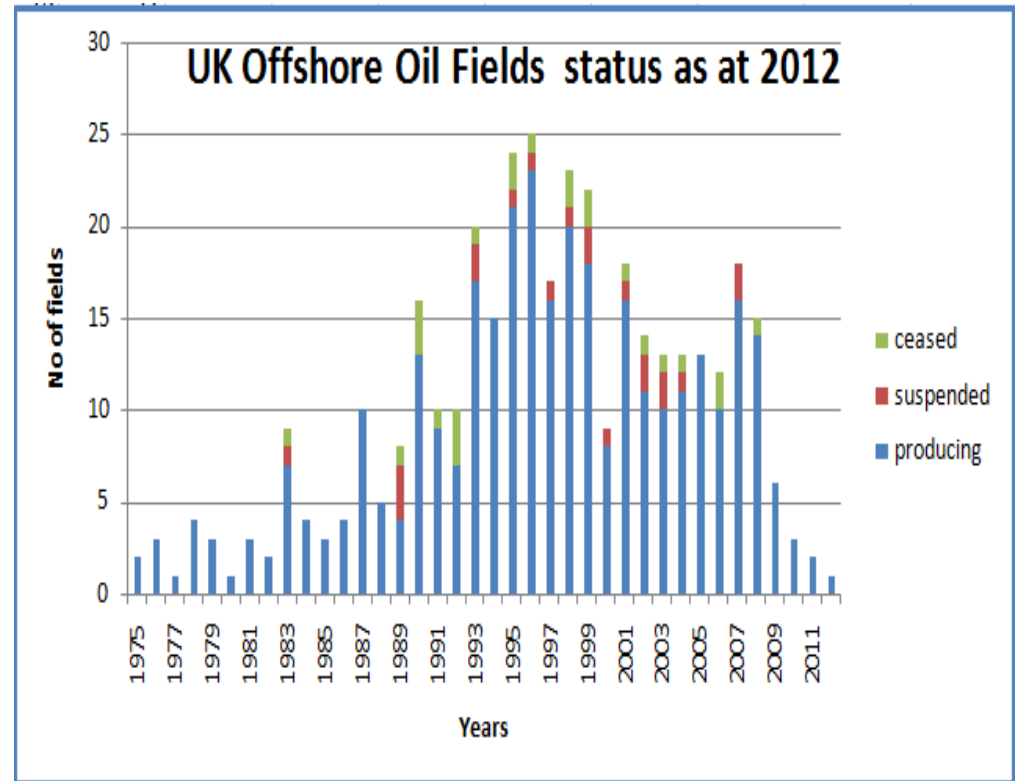
Nimi Abili
Researcher

6th February 2013

- Technological development, where new technology replaces the existing technology;
- New functionality and requirement on the system;
- Innovative life cycles of components shorter than the system life cycle;
- The original equipment manufacturer no longer finds the product viable to produce;
- The original manufacturer no longer in business for any reason;
- Changes in legislation within the industry such as Restriction of Hazardous Substance and Waste Electrical and Electronic Equipment.

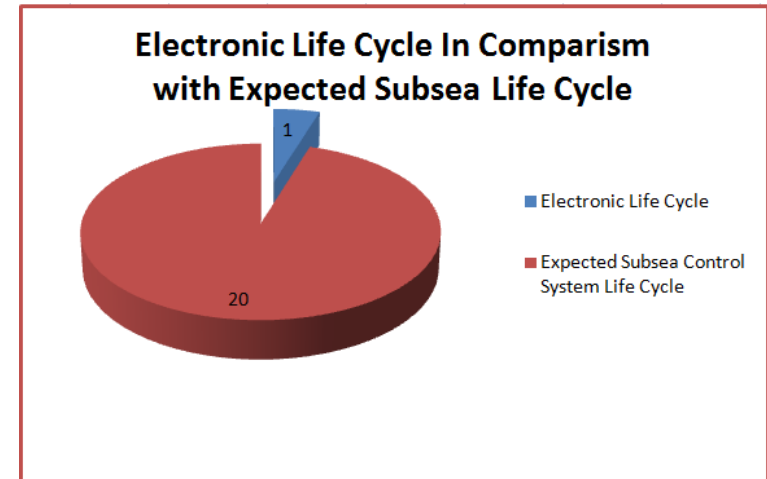
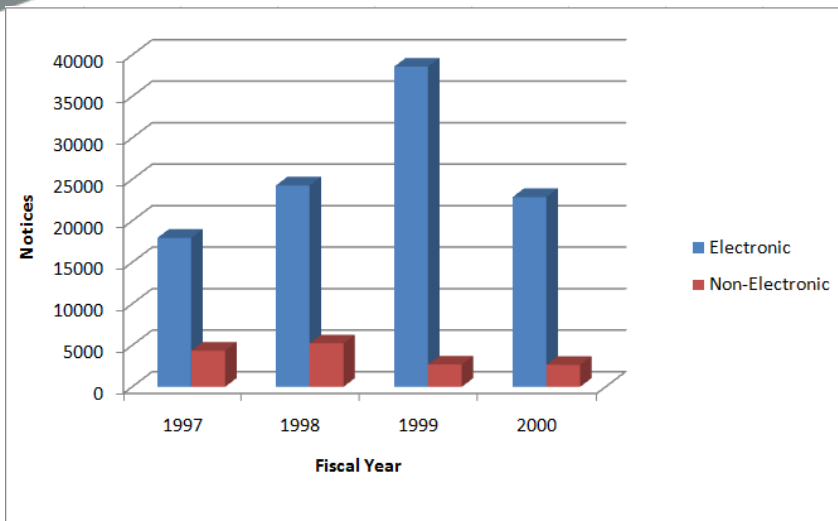
Increased Oil Recovery through Technology Development for Obsolescence Challenge

- Status of field producing since 1975 in the UK continental shelf;
- Average recovery factor is 32-35%;
- Possibility of Increased Oil Recovery;
- Subsea Processing - a solution;
- Obsolescence is inevitable.



Source: UK Dept. of Energy & Climate Change

Electronic Life Cycle and Subsea Production System (SPS) Life Cycle



- Electronics and Microcircuit components are increasingly becoming obsolete;
- Increase use of COTS Items by many industry.

Electronic COTS Items components has barely one year life cycle as compared to average 20 year SPS life cycle

Obsolescence Subsea System Critical Items

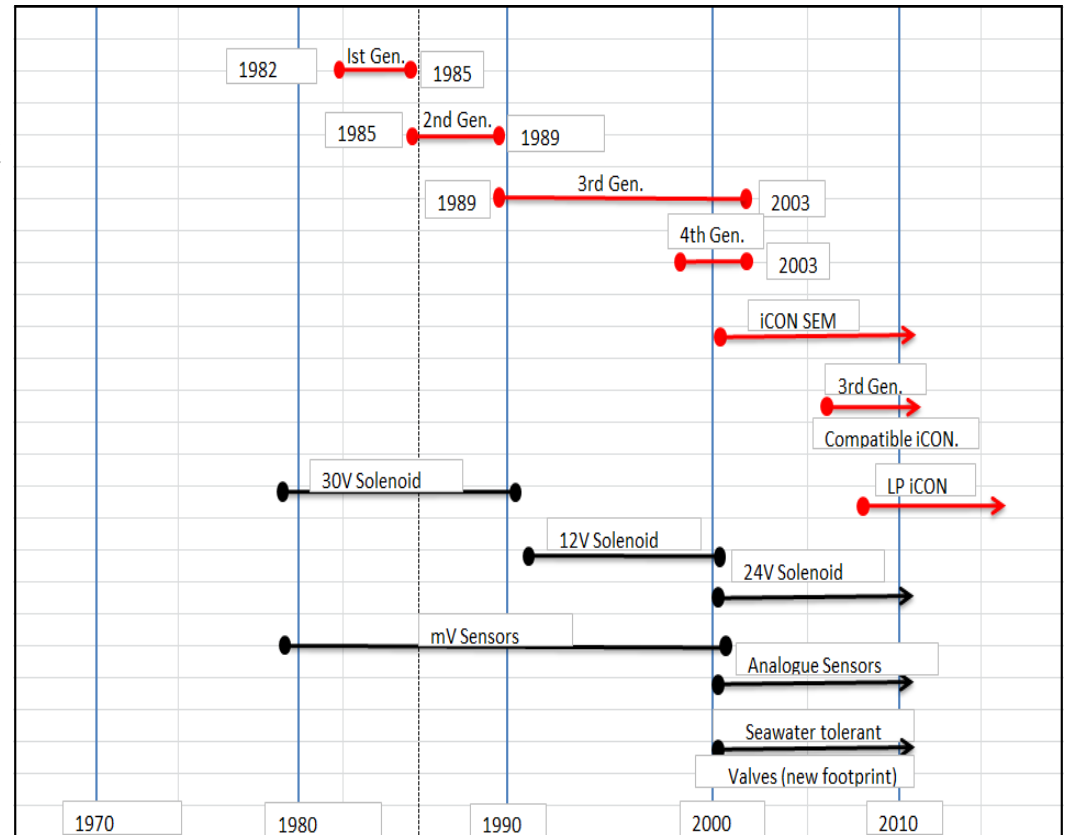
- Several Subsea System or Equipment can become obsolete;
- Subsea Control System is a major obsolescence item; Main component SEM comprises of semi conductors and microchip which are electronics;
- SCM is a key Obsolescence focus.

Unit/ Equipment	Core component	Technology evolution	Replacement alternatives	Obsolescence
HPU	Electrical	Moderate	Less difficult	Low
EPU	Electrical	Moderate	Less difficult	Low
Umbilical & UTA	Mechanical	Low	Less difficult	Low
Electrical/ hydraulic flying lead	Mechanical	Low	Less difficult	Low
Subsea Booster pump	Mechanical	Moderate	Difficult	Moderate
Subsea separator	Mechanical	Moderate	Difficult	Moderate
Software	programme	High	Less difficult	Moderate
SCM	Electronics	High	Very difficult	Very high

Scoring Factors for Obsolescence

SEM Obsolescence

- SEM generations showing impact of obsolescence;
- Brownfields are mostly affected;
- Can impact heavily on OPEX;
- Obsolescence management is key to reduce cost.



Source:Aker Solution

Resolution Cost Metrics

- Obsolescence can be resolved following a reactive and proactive strategy;
- Reactive strategy will react to the problem;
- Proactive will try to find resolution to obsolescence before failure occurs.

Resolution	(BY1999) Mean (US\$)	(BY2012) Mean (US\$)	Weeks to resolve (Avg)
existing stock	0	0	0
Reclamation	1884	2581.08	12
Alternate Source	6384	8746.08	11
Substitute	18111	24812.07	25
LOT buy	43684	59847.08	10
Aftermarket Manufacture	47360	64883.2	21
Emulation	68012	93176.44	26
Redesign minor	111034	152116.58	42
Redesign major	410152	561908.24	64

Resolution Application to Tordis Field

- Proactive and Reactive resolution strategy application on Tordis field;
- This is based on Tordis extended field life by subsea processing for 17 years and increased recovery of 35 million barrels;
- Proactive will require a budgetary provision for obsolescence monitoring.

Resolution Cost for Proactive Approach

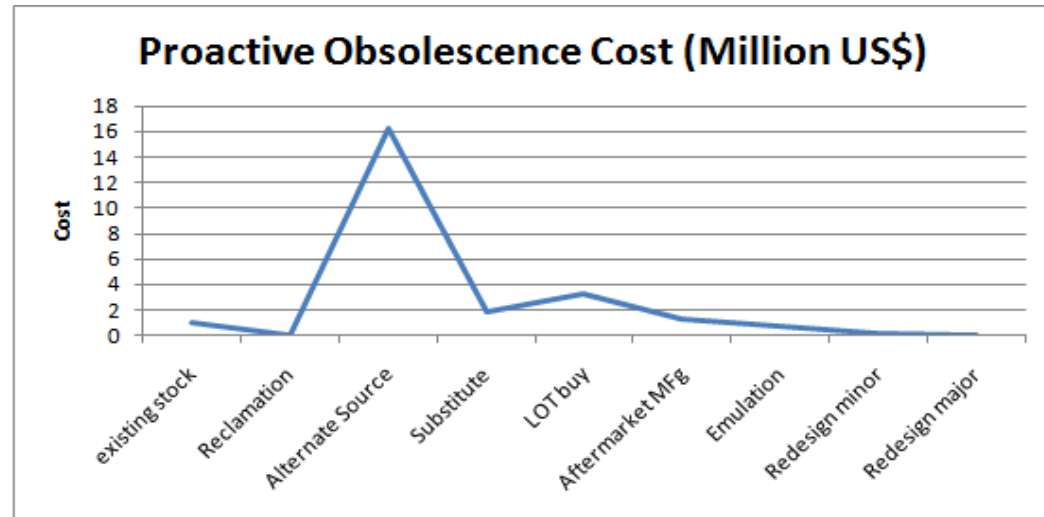
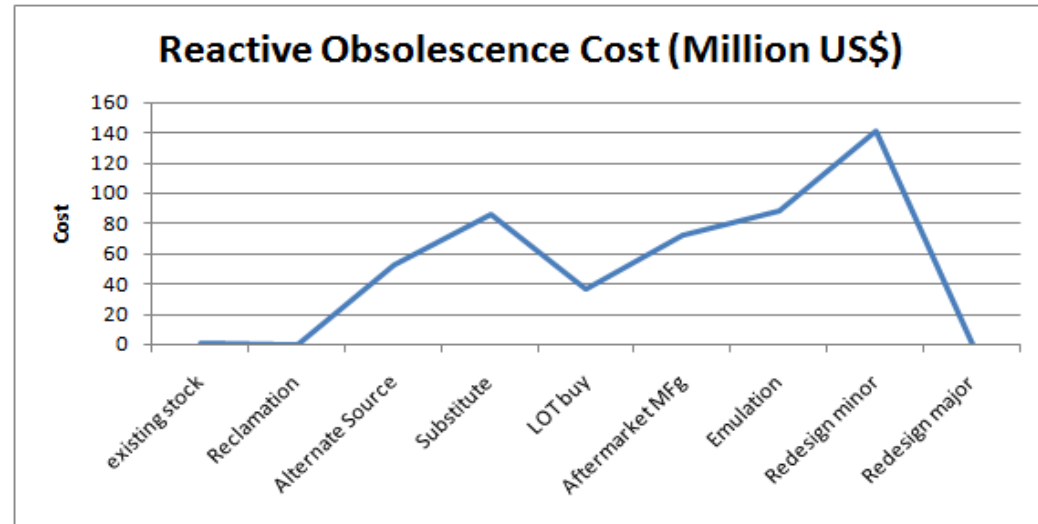
Resolution	Cost (Million US\$)
existing stock	1.036190476
Reclamation	0
Alternate Source	16.22171513
Substitute	1.77084869
LOT buy	3.204806475
Aftermarket Manufacture	1.323287771
Emulation	0.773333292
Redesign minor	0.170571141
Redesign major	0
Contract sum for Proactive Management.	1.7
Total	26.20075298

Resolution Cost for Reactive Approach

Resolution	Cost (Million US\$)
existing stock	1.036190476
Reclamation	0
Alternate Source	53.18171513
Substitute	85.77084869
LOT buy	36.80480647
Aftermarket Manufacture	71.88328777
Emulation	88.13333329
Redesign minor	141.2905711
Redesign major	0
Total	478.100753

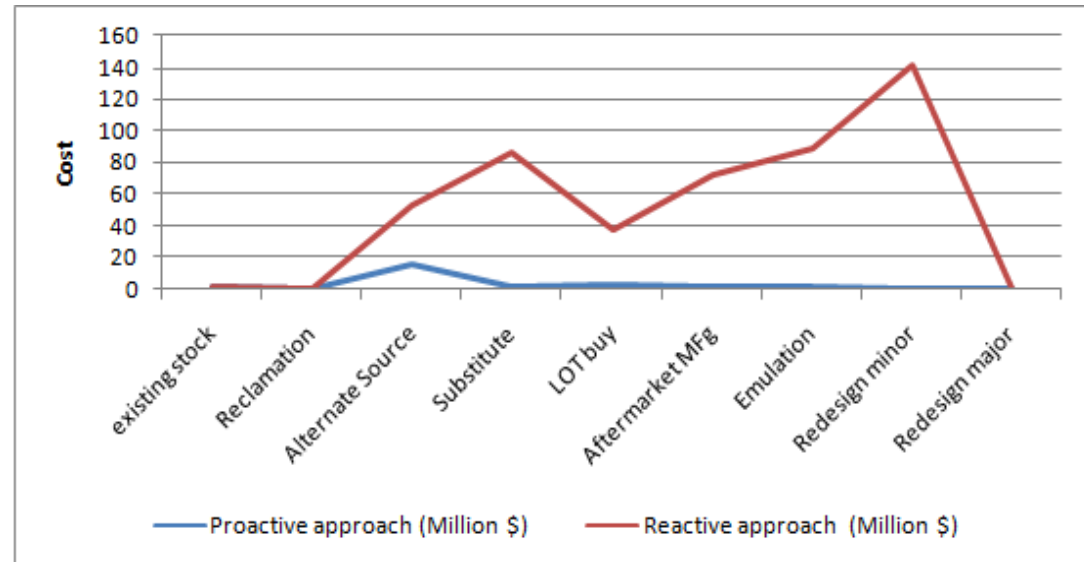
Resolution Cost on Tordis Field

- Reactive Obsolescence cost for Tordis = US\$478 M;
- Proactive Obsolescence cost for Tordis = US\$26.2 M;
- Loss production following a reactive resolution strategy can imply high OPEX.



Proactive and Reactive Cost Comparison on Tordis

- Proactive strategy requires a Budgetary provision \$100,000 per year, it however proves very profitable;
- Proactive management is demonstrated to be the most cost effective approach.



Conclusion

- The case study demonstrated that while a reactive approach to obsolescence management in subsea facility can be very risky and costly, a proactive strategy is more appropriate and less expensive as regards the OPEX contribution;
- Electronic obsolescence is unavoidable but an implementation of proactive strategy in the early design phase through open architecture and modular structure has the ability of reducing impact of component obsolescence;
- System upgrade is a vital key for obsolescence management of legacy controls system for Brownfield development which allows for improved availability during the extended field life.

Subsea Technology Development,
an Increase Systems Functionality
Embracing Obsolescence
Management

THANK YOU

Questions!!!