MCE Deepwater Development

DIGITAL AS AN ENABLER OF EVOLUTION



MODEC Evolution in the business

MODEC has grown from **EPCI** to enter the **charter business**, fueled by **demand in Brazil**

In the beginning, it was a significant **challenge** to move from **building to operating** FPSOs

We needed to transform from charter-for-EPCI ... to EPCI-forcharter

We set a goal to go from **being a cost provider** to **being a revenue partner** for our clients

FPSOs evolution as main field development tool

- MODEC started FPSO from 25,000 bopd simple oil producing facility in 1986
- In 10 years, oil production became 31,000 bopd with gas lift system and turret mooring
- After another 10 years, Suez-max based FPSO was filled of its deck space by disconnectable turret system accommodated 80,000 bopd oil production with water injection/gas lift and injection
- After another 10 years, VLCC based FPSO was filled of its extended deck space by 150,000 bopd oil production with water injection/gas lift and injection



FPSOs evolution: facility integrity challenges due to the lack of understanding on operability/maintainability

Our newest FPSO compared to the smallest one we produced in the past...

OIL PROCESSING IS THE SMALLEST CONTRIBUTOR TO FPSO UNAVAILABILITY

Charles - State - Stat

>10X OIL PRODUCTIO

>100X TOPSIDE WEIGHT

>5X CHARTER PERIOD

SUSTAINABLE WATER INJECTION AND GAS HANDLING DEMAND

The transformation

Performance

Health, Safety & Environment

People



Client Voices

"Digital transformation in the Oil and Gas industry could unlock approximately \$1.6 trillion of value for the industry, its customers and wider society."

> Digital Transformation Initiative Report for the Oil & Gas Industry, published by the World Economic Forum

"Petrobras intends to adopt the

born digital strategy to generate high value added businesses. However, there is still a long way to go."

Orlando José Soares Ribeiro, Executive Manager of the Petrobras Research and Development Center (Cenpes)

"We believe artificial intelligence will be one of the most critical digital technologies to drive new levels of performance across the industry."

> Morag Watson, Chief Digital Innovation Officer at BP (about BP investing \$20 million in AI start-up)

"I have been over there [MdB] and I have seen it working. This is not the stuff of sci-fi. This is actually happening now – artificial intelligence is being applied to production operations. What we can do now is rapidly adopt this technology and

implement it in 2019 onto Tullow's facilities."

Gary Thompson, Tullow's Executive Vice President, West Africa

"Shell is using data to drive its own organizational change. Analytics and the transformation of a skilled analyst workforce into the next generation of citizen data scientists are the keys to Shell's growth."

Dan Jeavons, General Manager of Shell's Advanced Analytics Center of Excellence

"Oil and gas is one of the most automated segments. Practically no platforms or refineries are operated manually, which means that a digital transition is already well under way."

Claudio Makarovsky, Head of Oil & Gas at Siemens

"Towards 2020 **Statoil** (Equinor) expects to invest NOK 1-2 billion in new digital technologies, accelerating the digital roadmap work."

Eldar Sætre, Equinor's Chief Executive Officer, and Jannicke Nilsson, Equinor's Chief Operating Officer

"Much of the discussion I am having with clients from the four corners of the world is centered on the digital transformation of Oil and Gas and adjacent industries."

> Luq Niazi, IBM Global Managing Director, Chemicals & Petroleum Industries

But how can we use **digital** to better **serve our clients?**



We simply went to **Work**

The program was holistic and with clear guidance towards impact and sustainability



 $\frac{1}{7 \cdot \sqrt{1}}$ Impact oriented with clear business case, incorporated in the Transformation Program

IP and Capability Building built within MODEC 53



Customized solution based on MODEC's reality



Clear stage gates after key deliverables

First pilot results

10 live applications





offshore monitoring and feedback channel established





Delivering predictions sufficiently in advance



Making model outputs ationable

Getting the data we **need when** we need it



First challenges

Scalability challenge



Extension of pilot	MV20	MV22	MV23	MV24	MV26	MV27	MV29
Main A							
SWIP							
Gas Re-injection Compressor							
GTG							
Molecular Sieves							
Scaling							

Scope challenge

Actuals	scope		MV20			MV22				MV23				MV24				MV26				MV27				MV29			
Aotual Soope	Α	В	С	D	Α	В	С	D	Α	В	С	D	Α	В	С	D	Α	В	С	D	Α	В	С	D	Α	В	С	D	
	Motor/GT-MV22																												
Main A	Gearbox																												
	Compressor																												
	Motor																												
	Gearbox																												
Main B	Compressor																												
	Process																												
	DGS																												
SWIP	Coupling/Gearbox							I																					
SRU Membrane dp Simulation CIP optimization																													
	CIP optimization																												
SRU Feed Pumps	Coupling																												
VRU Compressor 1st Stage Compressor 2nd Stage	Compressor 1st Stage																												
	Compressor 2nd Stage																												
GTG	Combustion																												
	GLO																												
	Pump 1145																												
	Pump 1155																												
	Pump 1180																												
	LCV Open vs Flowrate																												
Scaling	LCV Open vs dPressure																												
	Crude Crude dP1A																												
	Crude Crude dP2A																												
	Crude Heater TempA																												
	Crude Heater dP																												
Other Applications	Long-term Abnormality																												

Scope challenge

From Infrastructure to the way we work

Model Development Automation Model Innovation & Replication

New way of working: Agile



Multidisciplinary collaboration







The initial approach would not be enough...



...so we evolved









100 Trillion calculations to build one model

EXAMPLE 200+ Applications

predicting failures on critical equipment

4000+ combinations tested to build









...to partner with clients and improve our service, including production increase



...to improve **safety** and provide a better experience to **our people**



We see **digitalization** as an **enabler...**



...to achieve end-to-end integration, connecting charter and EPCI as a full lifecycle

