

Digitalization & Advanced Analytics Overview

FOR PRESENTATION ONLY June.2018 Modec do Brazil





AGENDA

- 1. Quick introduction
- 2. What & Why is Advanced Analytics
- 3. What Modec is doing



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FPSO digitalization is in an important lever in MODEC group's 2018-2020 mid-term business plan





Modec 2018-2020 mid-term business plan



Digitalization opportunity: AI, RPA, Digital Twin...



SOURCE: Icon created by Bakunetsu Kaito, Denis Klyuchnikov, Siraj C, Vectors Market, Creative Stall, Mahmudxon, Eugene Dobrik, Lero Keller, NOPIXEL, iconcheese, Wilson Joseph, Olivier Guin, Chameleon Design, Dinosoft Labs, Seb Cornelius from Noun Project



Digitalization opportunity in Modec: already ongoing at Brazil



SOURCE: Icon created by Bakunetsu Kaito, Denis Klyuchnikov, Siraj C, Vectors Market, Creative Stall, Mahmudxon, Eugene Dobrik, Lero Keller, NOPIXEL, iconcheese, Wilson Joseph, Olivier Guin, Chameleon Design, Dinosoft Labs, Seb Cornelius from Noun Project



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Very rough explanation

What is Advanced Analytics



Advanced Analytics (AA) = ML + DL



Since an early flush of optimism in the 1950's, smaller subsets of artificial intelligence - first machine learning, then deep learning, a subset of machine learning - have created ever larger disruptions.



"Does the flap of a butterfly's wings in Brazil set off a tornado in Texas?"

- Philip Merilees, at the 139th meeting of the American Association for the Advancement of Science in 1972



"風が吹けば桶屋が儲かる"



Concept of AA: there *could be* many butterflies that leads to tornado





Concept of AA: AA reveals the "important" butterflies





Concept of AA: example





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>

Concept of AA: example

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Source: www.amazon.co.jp



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これで解決。働くママが必 ず悩む36のこと > 毛利 優子 ★★★★☆ 9 単行本 ¥ 1,404 √prime







Concept of AA: example





Source: Google, Tesla



Source: https://www.jscore.co.jp/score/technology/



Concept of AA: example

金融不正検知	オークションサービス 商品自動 認識 & 情報入力/不正出品 検知	迷惑メールフィルタ
サービス解約者予測・退職予測	旅館・ホテルの稼働率予測 & 価格決定	タクシー需要予測・配車支援
スマートスピーカー(Amazon Echo, Google Home, Apple HomePod, LINE Clova)	医療画像(CT等)診断	機械翻訳 (Google Translator等)



Why

AA - different from convectional analytics







Computing Power





https://thenextweb.com/shareables/2011/12/26/this-is-what-a-5mb-hard-drive-looked-like-is-1956-required-a-forklift/ http://designbeep.com/2010/09/30/55-vintage-computer-ads-which-will-make-you-compare-today-and-past/ amazon.com

Source:



Evolution of algorithm

Human Teach the Rule





Machine Learns the Rule



Deep neural networks learn hierarchical feature representations



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Concept of AA: Advanced Analytics reveals the "important" butterflies



Concept of AA: in our case, Butterflies = Pressure, Temp, Vibration..., & Tornado = future Trip of the equipment





statistical / mathematical approach

Concept of AA: moreover, it explorers not only raw but also computational values that affect the trip





Concept of AA: we created a system to monitor important values to predict failure in advance for FPSO MV22







Where we are now

Digitalization opportunity in MdB: We are piloting failure prediction models



Model development



Implementation



Data collection

- Collect main operational data since 1st oil
 - Sensors registry
 - Cost reports
 - Daily / Monthly reports
 - Lab reports
- Interview key operation team to understand vessel's challenges

- Select key areas for model development based on criticality and operational costs
- Develop models, through advanced analytics, to support improvements in operational efficiency and maintenance spend
- Evaluate the model performance for PoC

- Fine tune models in the field
- Develop dashboards for field deployment
- Set IT infra-structure to host models and dashboards
- Have models implemented with real time data
- Train ops team to use new tools



We've already started this effort on MV22 and are preparing to roll out to the rest of the fleet in 2018



Target issue / system on

MV22		Prediction scope	Failuer warning time	Model quality
(ع)	Scale Risk	Early signs of conditions leading to scale build up	5 days in advance	R ² : 0.92 (subsurface) R ² : 0.73 (surface)
Σ	Water Injection Pump	Trips or stops in seawater injection pump	24 hours in advance	Accuracy 99% Precision 97%
8	Molecular Sieves	Early signs of molecular sieve dehydration failure	5 days in advance	Accuracy 90% Precision 74%
D	Main A compressor	Trips or stops in main A compressor	12 hours in advance	Accuracy 92% Precision 89%
\square	Reinjection compressor	Trips or stops in gas reinjection compressor	24 hours in advance	Accuracy 99% Precision 99%

We've already completed the PoC on MV22, are now under implementation phase (2/3)





We've already completed the PoC on MV22, are now under implementation phase (3/3)







Model will soon be implemented in real world





Thank you for your attention