



## What is a Digital Twin?

### babcock\*





x\_94.7

## Key elements of a Digital Twin

#### babcock

Black box modelling uses machine learning to understand effect of inputs on system outputs

SYSTEM

Data acquired from existing sensors and loggers unless greater sensitivity / accuracy required



DATA ACQUISITION



Data transmitted back for analysis

More complex white box modelling uses engineering first principles to create algorithms.

DIGITALTWIN ENGINE

644



BLACK BOX MODELLING





Virtualisation allows systems to be rigorously tested against different scenarios



VISUALISATION

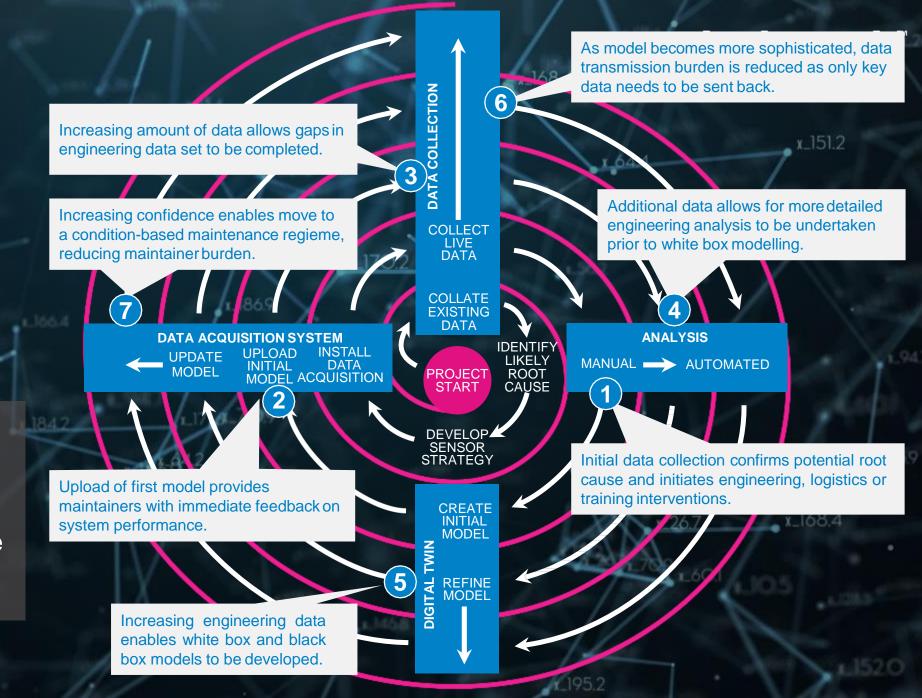
Visualisation, including VR used to help engineers understand system and to train maintainers





An incremental approach Delivering early wins

We accelerate and reduce the time needed to deliver benefits – from as soon as enhanced data is available from the equipment.

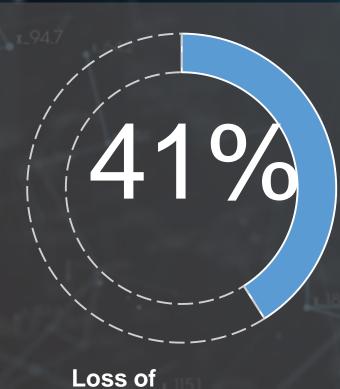


Classification: UNCLASSIFIED

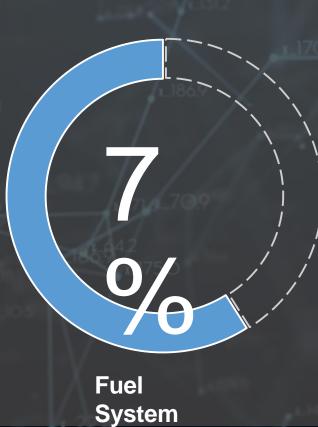


#### **Bulldog Project** Collate existing data 168.4

## babcock\*



compression







## Bulldog Project Collate existing data

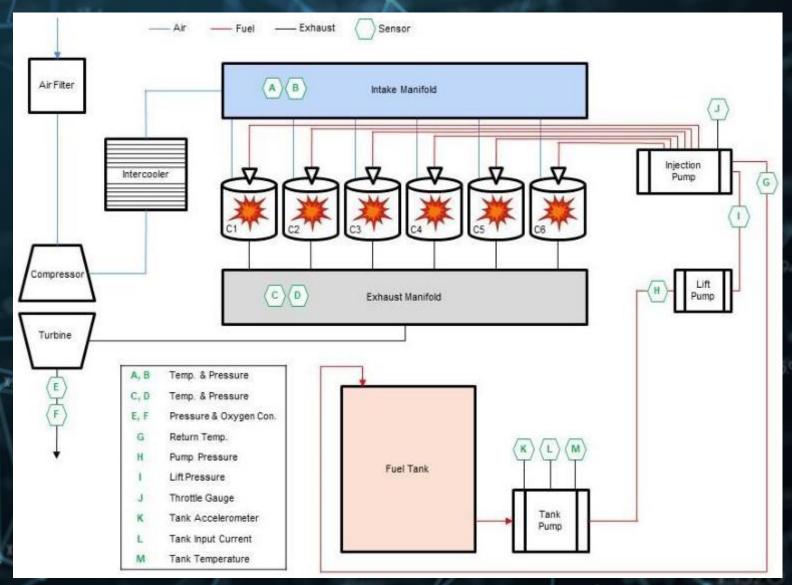
### babcock

#### **Problem Statement:**

Engine compression cannot be measured directly whilst the asset is in service, but needs to be tracked through-life to enable an engine to be withdrawn from service and rebuilt in the lower rebuild cost category.

#### Solution:

Measure low cost parameters outside of the combustion chamber and use a 1-Dimensional combustion model to estimate compression



Classification: LINCL ASSIFIED

x\_195.1



# **Bulldog Project**Collect Live Data

#### babcock\*

#### **Current Status**

- Power pack stripped down
- Full suite of sensors fitted to engine
- Engine testing on Surrey University Dynamometer
- Live data collection
- 1D model being calibrated

#### **Next Steps**

- Finish 1D model
- Fit sensors to a fleet of vehicles
- Collect operational data
- Validate 1D model





