**Digitalization**

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The development of digital technology over the last decade has led to Industry 4.0, the 4th industrial revolution, which is enabled by the Industrial Internet of Things (IIoT). Remote monitoring and on line machine monitoring is not new so the advantages of IIoT is not initially obvious, plus with concerns over cyber security and ownership of data means that Oil and Gas and Power Generation industries have been cautious in adopting digitalization. Business IT networks and business procedures would need to be evolved to take advantage of digitalization. For this to happen the benefits of digitalization need to be examined and understood and it is not yet fully clear what these benefits are, the suggested topics here should be aimed to investigate and answer the conserns and highlight benefits to the end users.

In this context, the required research activities may be listed as follows.

Development of Digital Twins

Digital twins of gas turbine power systems refers to a digital replica of the coresponding physical systems that will be sued for power generation. They represent numerically the detailed elements of the physical systems, the dymanic behaviour and their operation and degradation throughout their lives.

The section should look at advanced computer modelling technologies for gas turbine power generation systems, adaptation of computer models to the physical systems using field data, the integration of computer modelling, artificial intellence, machine learning and software analytics with data to create digital simulation models that update and change as their physical counterparts change.

Data Management

Gas turbine power generation systems may produce large data out of their operations. It is important to manage the large data and extra useful information out of the data for efficeint, reliable and safe operation of the power systems. This section should develop and evaluate the technologies for data storage, data transfer via internet, data receiving, data security and information extraction and processing.

Cyber Security

This section should consider remote connectivity, hardware firewalls, business risks, cloud solutions vs client side networks, ownership and location of data, implementation of applications, Quality Assurance.

Life Cycle Management

With the support of digital twins, this section should look at the development and evaluation of the technologies for optimal control, operation, condition monitoring, condition based maintenance and life management of gas turbine power generation systems.

Review potential architectures

Not all digital solutions will be suitable to industries involved with ETN, remote locations, off shore installations, FPSO ships ETC. Some will work better than others, this sections will review the connectivity opportunities digitalization/cloud access technologies may bring to end users. Technology is already present how can this be best used.

Benefits

When machine data plus asset and business data comes together the opportunities of analysis increases to a point we have not been used to. The affect of machine performance on a whole business and network can be analysed, reliability data and production forecasting can be performed quickly and more accurately. Some of the benefits may not be known yet. ETN should look into the ways in which digital solutions can help its end users.

Software as a service

Having data in one place means that analysis tools and services can be deployed differently, the days of buying and installing software on a PC have evolved into deliverable of a service which provides business benefits with a monthly fee or charge per use business model. This section should look at what these options are for ETN members and what business KPI’s these can solve.