

Advanced Maintenance Practices of Complex Manufacturing Assets

Dr. Abdu Shaalan
Industrial Automation programme leader

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Introduction - Presenter

Dr. Abdu Shaalan

Dr. Abdu Shaalan is a PhD holder in the fields of Industrial Automation and Advanced Maintenance practices from the University of Sunderland.

He is a research enthusiast and has held multiple research projects over the years, including a research fellowship with the nursing school, several KTP projects with local manufacturers, and was recently awarded a Teaching Fellowship in AI in Education.

Abdu's research focus is on Industrial Automation and Advanced Maintenance practices in the advances of Industry 4.0 technologies.

Teaching-wise, Abdu held multiple programme lead positions ranging from Undergraduate and Postgraduate levels.

Abdu values the link between teaching, research, and industry through research-led education that bridges the gap between academia and industry, ensuring graduates are ready for industry upon graduation.

Currently a programme leader for Undergraduate and Postgraduate Industrial Automation programmes at ECT, he ensures students are supported and provided with high value education that competes with world class education.



Agenda

- Maintenance Spending
- Trends
- Modern Maintenance Practices
- Subsea cables manufacturing
- Changing Awareness
- Attitudes and Skills
- Maintenance Related incidents
- Maintenance Strategies
- Neglected Maintenance
- What is next?



Maintenance Spending

Europe

- € 300 Billion Annual Spend
- Employs 3 million people

United Kingdom

- £22 Billion Annual Spend

Trends

Assets

- Assets must run longer
- Impact of asset failure can be very large

Expertise

- Downsizing and aging workforce has caused 'skill gap' at plant sites
- Technology is evolving faster than it can be adopted

Working Practices

- Maintenance management is moving from reactive to proactive

Modern Maintenance Practices

Rapid Changes over the past 20 years

- Increase in the value of assets
- Increased complexity of assets
- New maintenance methods
- Changing views of organisations and responsibility of maintenance

Subsea cables manufacturing



Subsea cables manufacturing



Changing Awareness

Growing awareness of how equipment failure affects safety and environment

Awareness of connection between maintenance and product quality

Pressure to achieve increased levels of equipment availability and maintain costs

Attitudes and Skills

1

Maintenance staff need to adopt new ways of thinking

2

Managers are seeking a new approach to maintenance

3

Operator involvement

Maintenance Related incidents

Tube Crash - Chancery Lane, London

- Motor bolt snapped

Electricity Supply Failure - USA, Italy, UK

- Shops robbed and 3 people killed



Hatfield Rail crash

4 killed, rail cracked



Concorde crash

113 killed, poor maintenance

Example: Car Maintenance

What must be done to maintain your car?

- Change the oil every 6,000 miles
- Check and/or change air filter
- Check and/or change hoses and belts
- Rotate tires every 12,000 miles
- Clean inside/wash outside
- Replace brake pads
- Regular inspection



Implications of poor car maintenance?

- Premature failures
- Increased running costs
- Unexpected breakdowns
- Poor operator morale
- Personal injury or death



Maintenance Strategies

Run-to-fail

Time based

Condition Based

Modern Maintenance strategies

- Reliability Centred Maintenance (RCM)
 - › Pen and paper exercise
- Total Productive Maintenance (TPM)
 - › Operator led
- Condition Based Maintenance (CBM)
 - › Technology led

Barriers to a 'New' strategy

Limited staff

Lack of training

Inadequate
diagnostic
equipment

Missing
technical
documentation

Budget issues

Inadequate
monitoring of
equipment

Lack of
management
commitment

Poor morale

Neglected Maintenance

Operating
equipment in
manual override

Incorrectly
adjusted
equipment

Inefficient
operations

Inoperative
equipment

Steam, air, water
leaks

Faulty control
systems

Increased costs

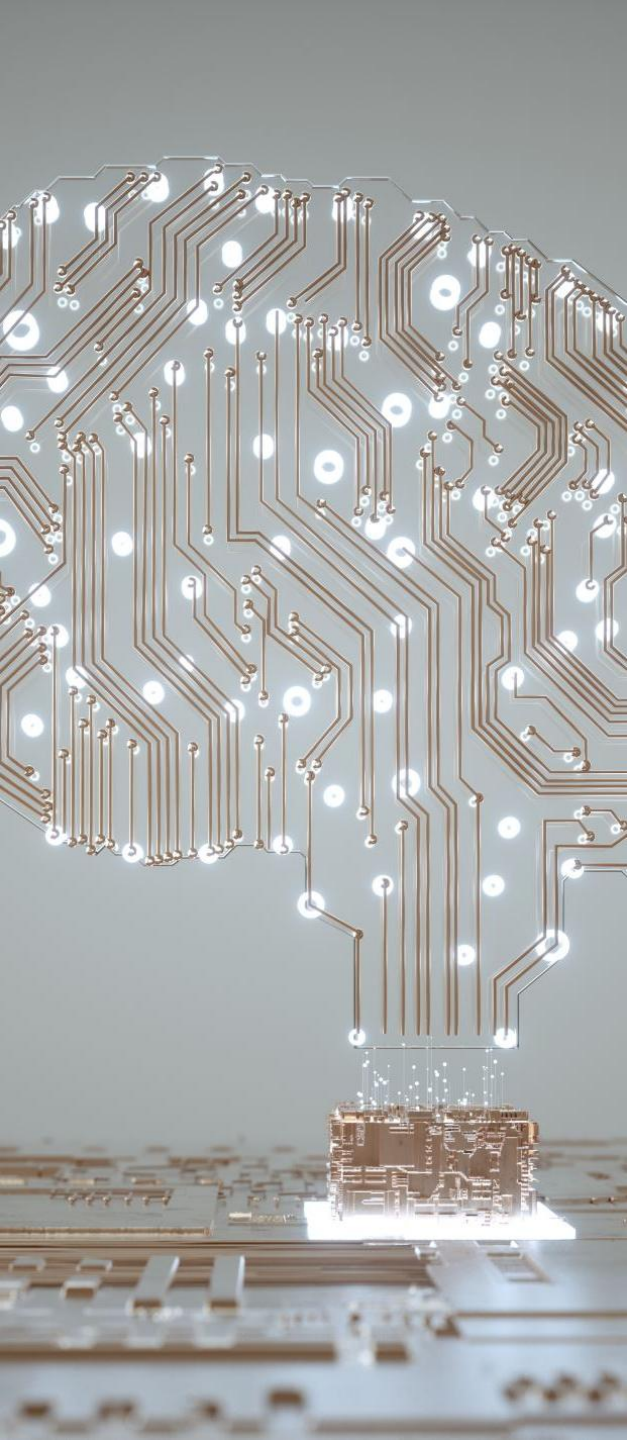
Safety problems



Benefits

- Improved equipment efficiency
- Increased product quality
- Identify equipment defects
- Reduced equipment failures
- Increased production
- Improved safety
- Minimize damage to equipment
- Provide guidelines for new equipment purchase
- Effectively prioritize decreasing resources
- Improve staff morale
- Reduce energy consumption (28% increase year on year)
- Develop an energy management culture





What is the next 'Big Bang' maintenance strategy

- Artificial Intelligence (thinking / smart machines)
- Augmented Reality
- New technologies
- Data collection and analyses



Thank You!

Upcoming Courses



Engineering College of Technology (ECT) <i>UK-Recognised Qualifications</i>	Start Date
Bachelor of Engineering (Honours) in Industrial Automation	September 2026
Bachelor of Engineering (Honours) in Electrical Engineering	September 2026
Master of Science (Power System Analysis and Renewable Integration)	June and October 2026
Master of Science (Industrial Automation and Instrumentation Control)	June and October 2026

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