HOW DOES CBM FUNCTION IN THE REAL WORLD?

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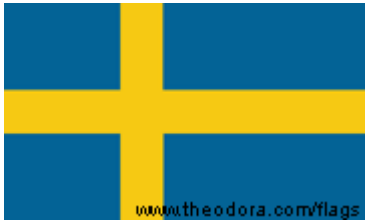


Sunderland

Northumberland
Tyne and Wear
Durham
Cleveland
Cumbria
North Yorkshire

NISSAN

Pharmaceutical

Agenda

- Background to the work
- Data collection
- Analysis
- Results
- Conclusion

Background

- UK government report in 2013 suggested Auto-supply chain in UK suffer from high levels of equipment failure
  - Lack of evidence to support
  - General statement (broad brush)
  - Size of supply chain?
  - 12% increase a year in numbers produced from 2009
- Maintenance mixture of strategies
  - MTTR, MTBF, ROI, RCM

Background to Research cont'd

- Conclusion,
  - high rate of unpredicted failures
  - actions **must** be carried out economically with minimum disturbance to production
- Understand the development of wear and failures
- Managing the measurement and diagnosis of wear
- Wear and failures can be predicted through monitoring

Data Collection
Pan-European

- Survey variety of industries
- Different levels of the organisation
- Discussed why, how, when etc.
- Strategies including CBM
- Failure Distributions
  - Age Based Failures
  - Random Failures

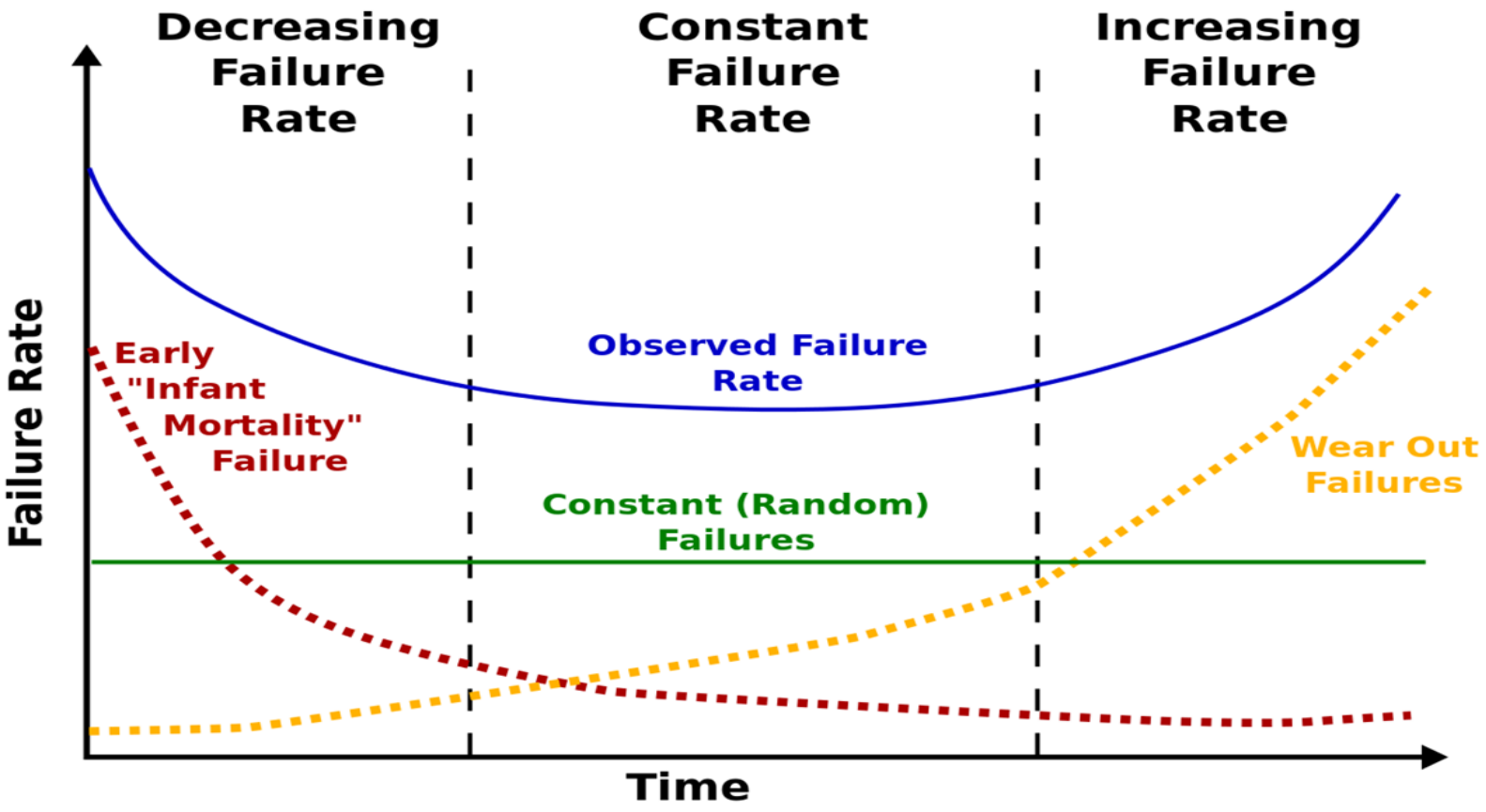
Something different?

Failure characteristics

- Important to use an appropriate method for modelling deterioration, the different conditions and their effects, and the optimal selection and scheduling of inspections and preventive maintenance actions.

- Failure characteristics often grouped into a number of categories

Bathtub Curves



In depth data collection

- Questionnaires and interviews.
  - Senior managers, shop floor personnel, maintenance consultants
  - 60 different companies in 12 countries.
- current maintenance practices & justification
- management decisions
- strategies employed to collect and analyse data to inform future maintenance
- **Failure rates**

		infant mortality, useful life with constant failure rate, rapid wear out	Rapid wear out after constant failure rate	Gradual wear out	Increasing failure rate in infancy followed by constant failure rate	Constant failure rate	Infant mortality followed by constant failure rate
Industrial sector	**Country**	**FD:A**	**FD:B**	**FD:C**	**FD:D**	**FD:E**	**FD:F**
Process industry	France	30%	30%	30%	3%	3%	3%
Aerospace	UK	10%	10%	70%	0%	0%	0%
Chemical industry	Finland	10%	10%	70%	0%	0%	10%
Mechanical components	Spain	10%	30%	50%	0%	5%	5%
Tyre industry	Russia	5%	10%	70%	5%	10%	10%
Process industry	UK	60%	15%	10%	10%	5%	5%
Rail	Spain	15%	60%	5%	10%	10%	0%
Process industry	Russia	10%	20%	50%	0%	0%	20%
Mining industry	Canada	30%	20%	30%	0%	10%	10%
Home electronics	UK	30%	37%	13%	2%	0%	2%
Process industry	Sweden	10%	50%	10%	10%	15%	5%
Electric motors/batteries	Spain	5%	35%	30%	0%	30%	0%
Manufacturing	Italy	5%	20%	40%	20%	14%	1%
Mining industry	Sweden	10%	30%	25%	5%	20%	10%
Lifts	Spain	0%	35%	30%	0%	35%	0%
Robotic systems	Spain	0%	30%	30%	0%	35%	5%
Manufacturing industry	Spain	10%	25%	25%	0%	30%	10%
Machine tools	Spain	10%	40%	5%	0%	40%	5%
Cars	UK	10%	21%	22%	10%	13%	14%
Paper industry	Turkey	10%	20%	20%	10%	20%	20%
Process industry	Belgium	10%	10%	15%	20%	5%	10%
Mechanical components	Portugal	5%	10%	15%	20%	25%	25%
Paper industry	Sweden	4%	6%	15%	18%	20%	37%

Review

- Expected and ‘unexpected’ differences
- Majority state “gradual wear out after long useful life”
- Process industry UK / Sweden
  - High infant mortality, useful life, rapid wear out
- Rail industry Spain:
  - Rapid wear out after long useful life
- Process Industry France:
  - 30% all three

Meaning ‘behind’ the data

- Wide range of variations in results
- Lack of ‘credible’ data
- Often unknown, why, how, when
- Lack of Historical data
- Improper use of equipment
- Bathtub curve used as a simple method
- Europe ‘divided’ on how to determine failure

A Conclusion

- Can we trust the data from study?
- Although - expected differences and similarities do exist
- Big difference between countries in same sector
- Organisations need to understand the cause of failure
- CBM could be ‘appropriate’ if the above are addressed

Normal Company Response

"To address this mistake we must use root-cause analysis. I'll begin by saying it's not my fault."

"Look, I'll make a deal with you....You don't tell me your troubles and I won't tell you mine."

Original Question

How does CBM Function in the real world?

Often used as a ‘stand alone’ maintenance concept

As a method for Failure Prediction

However

CBM alone does not provide for reliability

CBM does not prevent failure – it detects and predicts it.

Thank you for your attention