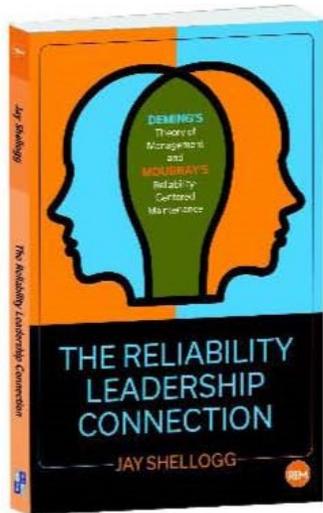


What is a Reliability Engineer?



TAPPI BOOK STORE
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Reliability Leadership

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Who Defines What a Reliability Engineer is?

National Council of Examiners for Engineers and Surveyors (NCEES)
~~National Council of Examiners for Engineers and Surveyors (NCEES)~~

Minimum knowledge for competency – 9 Principles of Reliability



Principles of Reliability Engineering

1. 80 percent (\pm) of all failures occur randomly with respect to age of the equipment.
2. Most equipment failures follow a degradation curve known as the P-F Interval.
3. The human senses are capable of detecting 80 percent (\pm) of failed states.
4. The people who work closest to failing equipment are the subject matter experts (SME).
5. Data are not required to begin reliability work—only the SME's knowledge.



Principles of Reliability Engineering

6. It is vital to consider how a failure affects safety, environment, quality, and/or production, and under no circumstance should the consequence of failure or criticality be allowed to determine frequency of inspection. Consequence and/or criticality should play no role here.



Principles of Reliability Engineering

7. Risk is inherent in everything we do. We must define what level of risk is tolerable.
8. Assets can only perform as well as they are designed, installed, operated, and maintained. We must understand what our equipment "can" do vs. what we "want" it to do.
9. Failure modes (root causes of failure) occur in 3-ways: suddenly, over a period of time, or hidden.



Principles of Reliability Engineering

If you are in, or just coming into, an organization with a history of "reliability" activities, but the efforts are scoffed at by the rank-and-file: I guarantee that if you dig into your reliability program, you will find the understanding or application of several of these principles missing in your organization. These 9 Principles are fundamental and must be adhered to at all times, even if you don't believe them.

These ideas are at least a starting point for someone on the journey to figuring out what being a reliability engineer may mean to them



From Reliability Principles to Maintenance Management

Maintenance Management Concepts
everyone should know.



Maintenance Management Concepts

A. How to motivate people

Treat everyone as an individual—people aren't cattle.

B. Becoming an expert

Become an expert at only a few things—but know who the experts are at everything.

C. How to effectively win an argument in a unionized environment

You win an argument by not arguing.



Maintenance Management Concepts

D. Whose union contract is it?

Organized labor agreements belong as much to management as they do to the union;

E. Never lie, but be sure you know what a lie is...

That sounds simple and easy, but make sure you understand other folk's concept of lying.

F. What do we do now?

When there is an equipment breakdown and a maintenance mechanic (millwright, pipefitter, welder, electrician...) asks you, "what do you want me to do?" ANSWER CAREFULLY.



Maintenance Management Concepts

G. Handling an employee CRISIS!

Everyone's crisis is most important to them and needs resolution *now*.

H. Key Performance Indicators (KPIs)

There is probably more time wasted annually in pursuit of KPIs than any other mill endeavor—especially if you are using them for monetary performance ratings.

I. Zero-based budgeting

This is an effort that every organization I have worked with goes through. Great efforts begin three months before the budget submittal date—meetings with operations, engineering, managers, etc. Eventually, a number is determined for next year's maintenance budget. Maintenance presents its budget to the local management team, which says "You want HOW much?" You plead your case with facts, figures, and estimates, only to hear "cut it down to a 5 percent increase and I'll present that to corporate." But it doesn't end there. Once corporate is done with the budget you're lucky to get a 2 percent increase, meaning that you are not even going to overcome next year's inflation.



Maintenance Management Concepts

J. Who owns that pump...

...Operations or Maintenance? Neither—the shareholders own the pump.

K. Hire more consultants to HELP!

Hiring consultants to tell you how to run your business? That is scary. Talk about letting the fox guard the hen house!



Engineering Design Process = Reliability Engineering Design Process

Engineering Principles

- Newton's Laws



Engineering Design Process

- $M = wl^2/8$
- $Q=CiA$



Manufacture of Design

- Machining
- Construction
- Assembly
- And more

Reliability Principles

- 80%± random failure
- Cans Vs Wants
- P-F interval
- OAPOT, TOMI, Suddenly



Reliability Design Process

- Seven Questions of RCM



Maintenance Plan

- Monitoring & Measuring
- Planning & Scheduling
- Work execution
- Precision Maintenance
- Lubrication
- Defect Elimination
- And many more



What is a Reliability Engineer?

Thank you

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