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Modernize Your Warehouse

FMEA 101

An introduction to Failure Mode and Effect Analysis (FMEA)

and its application to warehouse design and implementation projects

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Purpose

- This deck provides a short introduction into FMEA and how to use the Risks tab on the GoBlock RAID Log
- Each concept is followed by an Exercise using a hypothetical WMS design and install project
- Please use the RAID log to complete these hypothetical Exercises
- Or, use your own project for the Exercise and begin using FMEA!

- You can also read more about FMEA with this book:

https://www.amazon.com/Basics-FMEA-Raymond-J Mikulak/dp/1563273772

Overview

- Begun in the 1940s by the U.S. military and for the space program, **Failure Modes and Effects Analysis (FMEA)** is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service. (*American Society for Quality*)
- FMEA focuses on determining the **Cause** of the Risk, the **Mitigation** of the Risk, and the **Control** of the Risk.



FMEA Grid

- Use the grid to record Risks over time
- There are four major building blocks of the FMEA grid

Process Function (Project Phase or Step)	Potential Failure Modes (Risks) What could go wrong? What should we worry about?	Potential Failure Effects what is the consequence? Effect on project objectives? What wont get done on time or to planned cost or quality?	SEV	Potential Causes of Failure Why might this happen? What is the cause ? One time event or ongoing?	OCC	Current Process Controls How likely is it that we know this will going to occur? What do we measure to predict onset of Risk ?	DET	RPN
		1		2		3		4

Failure Mode vs Failure Cause

DEFINITION: Failure **MODE** is **WHAT** will fail. What should we worry about? What could go wrong?

1

This is an "action" or "event"

DEFINITION: Failure **CAUSE** is **WHY** it will fail. Is this a one time WHY or an on-going WHY?

2

This is a "condition" or "state"

EXERCISE: Which are Cause and which are Mode?

A. Rocket Explodes
B. Fuel Tanks not pressurized
C. Pressure valve stuck

EXERCISE: Which are Cause and which are Mode?

A. WMS cannot process non-PO receipts
B. Inventory from inbound POs is recorded incorrectly
C. Item costing is incorrect

Failure Mode Effects

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DEFINITION: What is the consequences of the Failure Mode coming true? What won't get done on time? Will there be a sacrifice to cost and/or quality?

SEVERITY Scale:

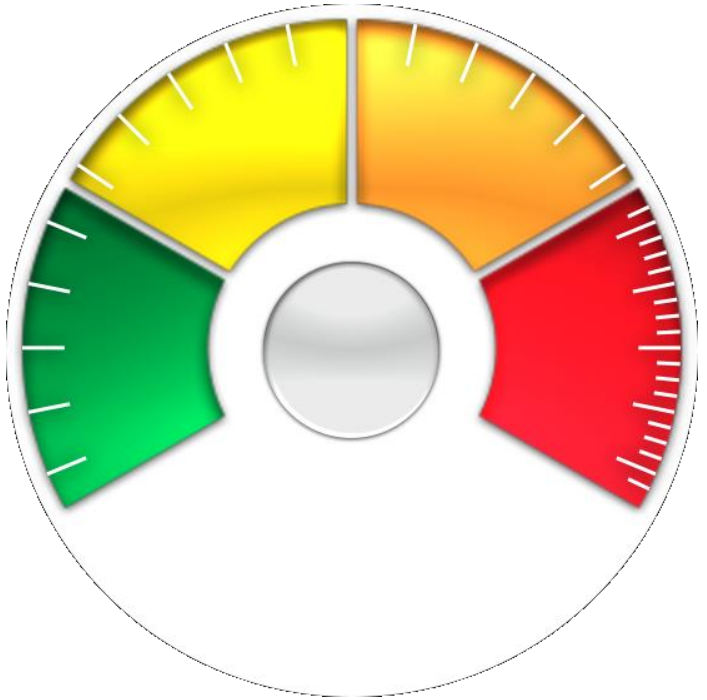
1= limited to no impact to schedule/cost/quality/safety

10 = severe impact to schedule/cost/quality/safety

1

EXERCISE: What are some the Failure Modes of the WMS "not working", their Effects, and their Severity Rating?

- [list at least 3 on the grid]



Probability of Occurrence

DEFINITION: What is the probability that the WHY will occur in the current state of information?

OCCURANCE Scale:

1= very unlikely; has never happened

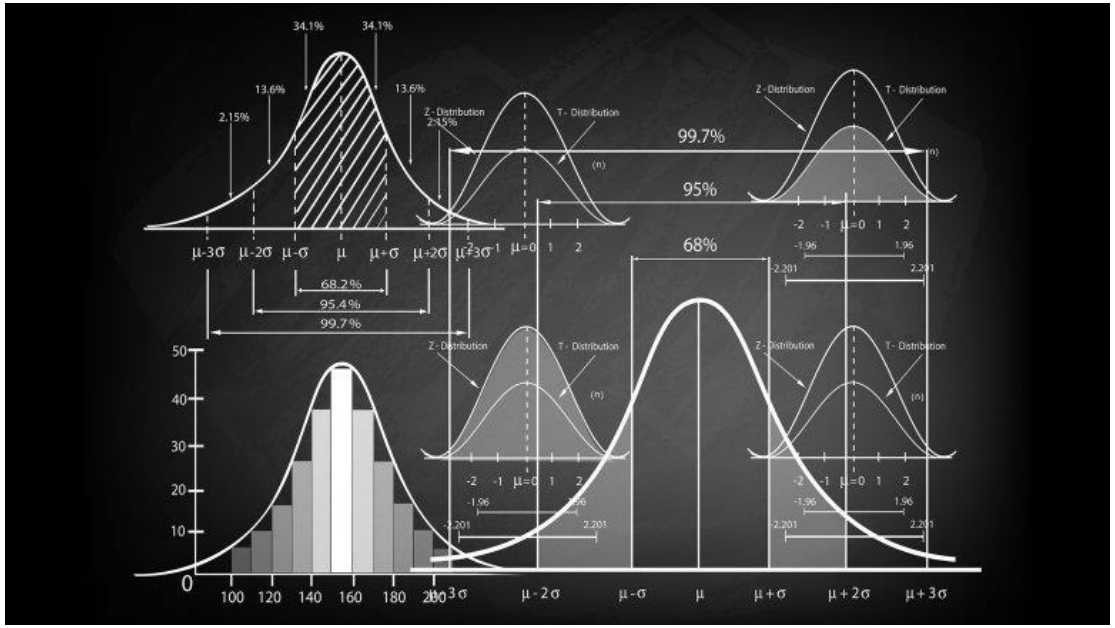
5 = likely; this has happened before

10 = it is happening now

2

EXERCISE: For each line in the FMEA grid, assign an OCCURANCE rating

Note that the Occurrence rating may change for each WHAT even with the same WHY.



Current Control Process

DEFINITION: What processes, measurements, data, feedback etc do we have in place today to detect the risk before it happens?

DETECTION Scale:

1 = rock solid data and indicators

5 = controls in place, but sporadic

10 = no controls or data in place

3

EXERCISE: What are possible Control processes to pre-warn the risk of WMS failure?

For each line in the FMEA grid, assign a DETECTION rating.



A primary Goal of FMEA is to develop a control process for EACH risk, and then monitor that risk

Risk Priority Number (RPN)

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DEFINITION: The RPN is calculated by multiplying the *Severity x Occurrence x Detection* to arrive at one number to categorize the risk

Using this method, Risks can be force ranked against each other

RPN Scale:

1 = no risk at all

1000 = extreme/highest risk



4

EXERCISE: Calculate the RPN of each line on the FMEA grid

Note that the RPN can be lowered by lowering any one of the three (Severity, Occurrence, Detection)

- Severity (S)
- Severity X Occurrence (S X O)
  - Criticality
- Severity X Occurrence X Detection (S X O X D) = RPN

Improvement over Time

- By maintaining a baseline RPN, you can show how you have improved the risk of the project over time.

Baseline **Improvement**

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Improving the RPN

- Determine Actions to improve the Severity, or Occurrence, or Detection
- Assign WHO owns those actions and by WHEN
- **Regularly review** the Taken Actions **and re-rate** the RPN to see if there has been any improvement.
- Repeat…

Recommend Actions	Risk Owner & Target 'no later than' Date	Taken Actions	SEV	OCC	DET	RPN