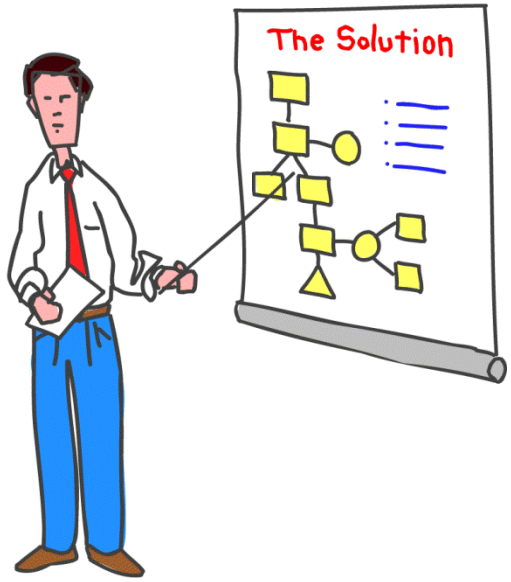
Continuous Improvement Toolkit

FMEA


Managing Risk
PDPC
FMEA
RAID Logs
Fault Tree Analysis
Risk Assessment*
Traffic Light Assessment
Deciding & Selecting
Pros and Cons
Importance-Urgency Mapping
Break-even Analysis
Cost Benefit Analysis
Force Field Analysis
Voting
Pugh Matrix
Decision Tree
QFD
Matrix Diagram
TPN Analysis
Kano Analysis
Prioritization Matrix
Critical-to Tree
Paired Comparison
Cause and Effect Matrix
Pareto Analysis
Planning & Project Management*
RACI Matrix
Stakeholder Analysis
PEST
PERT/CPM
Activity Diagram
SWOT
Roadmaps
Project Charter
Gantt Chart
PDCA
Control Planning
Gap Analysis
Hoshin Kanri
Kaizen
How-How Diagram
Tree Diagram**
Standard work
Lean Measures
KPIs
OEE
Capability Indices
MSA
RTY
Descriptive Statistics
Cost of Quality
Reliability Analysis
Understanding Cause & Effect
Confidence Intervals
Probability Distributions
ANOVA
Graphical Analysis
Hypothesis Testing
Design of Experiments
Scatter Plot
Correlation
Regression
5 Whys
Chi-Square Test
Multi-vari Charts
Relationship Mapping*
Identifying & Implementing Solutions***
Simulation
TPM
Mistake Proofing
Pull Systems
JIT
Ergonomics
Work Balancing
Automation
Bottleneck Analysis
Visual Management
Flow
Value Analysis
5S
Waste Analysis
SMED
Time Value Map
Process Redesign
Understanding Performance
Run Charts
Control Charts
Benchmarking
Sampling
Focus groups
Interviews
Photography
Check Sheets
Observations
Questionnaires
Data Collection
Critical Incident Technique
Fishbone Diagram
TRIZ***
Brainstorming
Analogy
SCAMPER***
Nominal Group Technique
Mind Mapping*
Affinity Diagram
Attribute Analysis
Lateral Thinking
Visioning
Creating Ideas**
IDEF0
Value Stream Mapping
SIPOC
Flow Process Chart
Process Mapping
Flowcharting
Service Blueprints
Designing & Analyzing Processes

- FMEA

- **Failure Modes** are the manners in which a process could potentially fail to meet the improvement intent.
- Failure Mode and Effect Analysis **(FMEA)** is a risk Analysis tool.
- FEMA is a systematic approach that identifies potential failure modes in:
  - **A process.**
  - A product.
  - A system.



- FMEA

- **Product FMEA:**
  Analyze the function, design and potential failure of each component of a product.

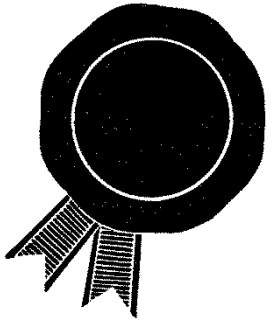
- **Process FMEA:**
  Analyze the key outputs and the potential failure of each step of a process.

- Process FMEA considers the effect of process failure on the product or service concerned.

- FMEA

Benefits:

- Provides a basis for identifying root failure causes and developing effective corrective actions.
- Early identification and elimination of potential process failure modes.
- Prioritize product/process deficiencies.
- Emphasizes problem prevention.
- Documents risk and actions taken to reduce risk.
- Provides a foundation for other maintainability, safety, testability, and logistics analyses.
- Improves process reliability and quality.



- FMEA

- It is widely used in industrial, medical and business areas.
- Requires considerable knowledge of system operation and engineering.
- It is used to rank and prioritize the possible causes of failures to develop and implement preventative actions.
- It identifies critical or significant process characteristics that require special controls.

- FMEA

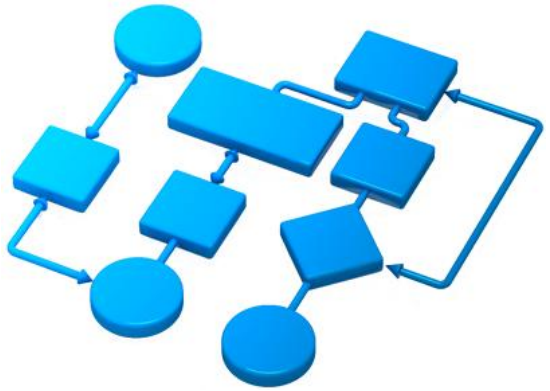
- FMEA helps identifying every possible failure mode then determine the **frequency** and **impact** of the failure.
- FMEA helps recommend actions to reduce the impact and/or likelihood of problems.

- **To reduce the risk:**
  - Reduce the failure effect severity.
  - Lower the probability of the failure.
  - Both.

- FMEA

Approach:

- Describe the process and its function.
- Identify the process steps (process mapping).
- List the different failure modes that can occur (brainstorming).
- Rate their severity (SEV).
- For each failure mode, consider the potential causes that might cause the failure (brainstorming).
- Rate their occurrence (OCC) or how likely they are to occur.



- FMEA

Approach:

- For each potential cause, consider the controls in place to prevent it happening (or to detect the failure if the cause occurs).
- Rate the likelihood of detection (DET).
- Calculate the **Risk Priority Number** (RPN).
- Assign actions to tackle the highest RPN's (Act on the results).
- After actions have been taken, re-assess the severity, probability and detection to re-evaluate the failures.
- Update the FMEA as the process changes.

- FMEA

Step	Failure	Effect	SEV	Causes	OCC	Controls	DET	RPN	Action	Who	When	RPN

Completed during the first draft

Used to track actions

- FMEA

Non-manufacturing Example:

Failure Mode and Effect Analysis (FMEA)															
Project #:			**Project Title:**						**Date:**						
Process/Product:			**Process Owner:**						**Revision:**						
First Draft									**Recommended Corrective Actions**						
Process step / product part	Potential Failure Mode	Potential Failure Effect	Potential Causes	Current Controls	S E V	O C C	D E T	**R P N**	What	Who & When	S E V	O C C	D E T	**R P N**
Take order	Missing of some info.	Incorrect order	Lack of attention	Using of an order-taking checklist	3	4	2	24	Provide stronger validation (order taking system)					
Prepare order	Wrong amount of ingredients	Defective product	Broken of equipment	Periodic inspection of equipment	4	1	3	12						
Deliver order	Takes too long to deliver	Delayed delivery	Traffic jam or too many orders	Using of GIS technology	3	3	3	27	Hire more people to delivery & buy more delivery cars					

- FMEA

Tips:

- The FMEA is meant to be a "before the failure" action.
- Upon completing the FMEA, a report is written to document the team’s accomplishments.
- It’s a living document and therefore it should be continually updated as changes occur or more information is gained.
- The ratings are usually on a scale of 1 to 10.
- Apply your rating scales consistently.

- FMEA

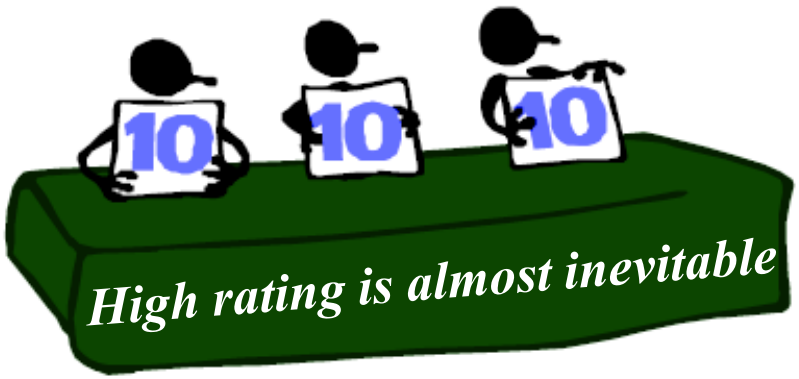
Severity Rating:

- (1-2) Minor failure which is not noticed by the customer.
- (3-4) Failure that could be noticed by the customer without negatively affecting customer satisfaction.
- (5-6) Moderate failure that may result in some customer dissatisfaction.
- (7-8) Major failure that may generate high level of customer dissatisfaction.
- (9-10) Safety issue, adverse impact on end-user, etc.

- FMEA

Occurrence Rating:

- (1-2) The cause of the failure is unlikely to occur.
- (3-4) The cause of the failure occurs sometimes.
- (5-6) An occasional occurrence of the cause of the failure.
- (7-8) A frequent occurrence of the cause of the failure.
- (9-10) The occurrence of the cause of failure is very probable.



- FMEA

Detection Rating:

- (1-2) Reliable detection control to detect failure mode.
- (3-4) High likelihood that the current control will detect failure mode.
- (5-6) Moderate likelihood that the current control will detect failure mode.
- (7-8) Low likelihood that the current control will detect failure mode.
- (9-10) No control available to detect failure mode or ineffective control.