

Tools to Better Implement Root Cause Analyses

This ET Forum Tech Talk Session features Bill Mazurek, President and Managing Director, Maz-Tec and Associates who will walk us through a Typical Root Cause Analysis with some easy tools he has developed that could be used in ET classrooms. Tech-Talk session take-aways include the templates and tutorials to conduct the activity in your classes.

February 26, 2021



Dr. Marilyn Barger

Director

Florida Advanced Technological
Education Center, part of the
FloridaMakes Network

Who we are



Lara Sharp

Program Director of Engineering, Manufacturing,
and Building Arts at St. Petersburg College





Who we are

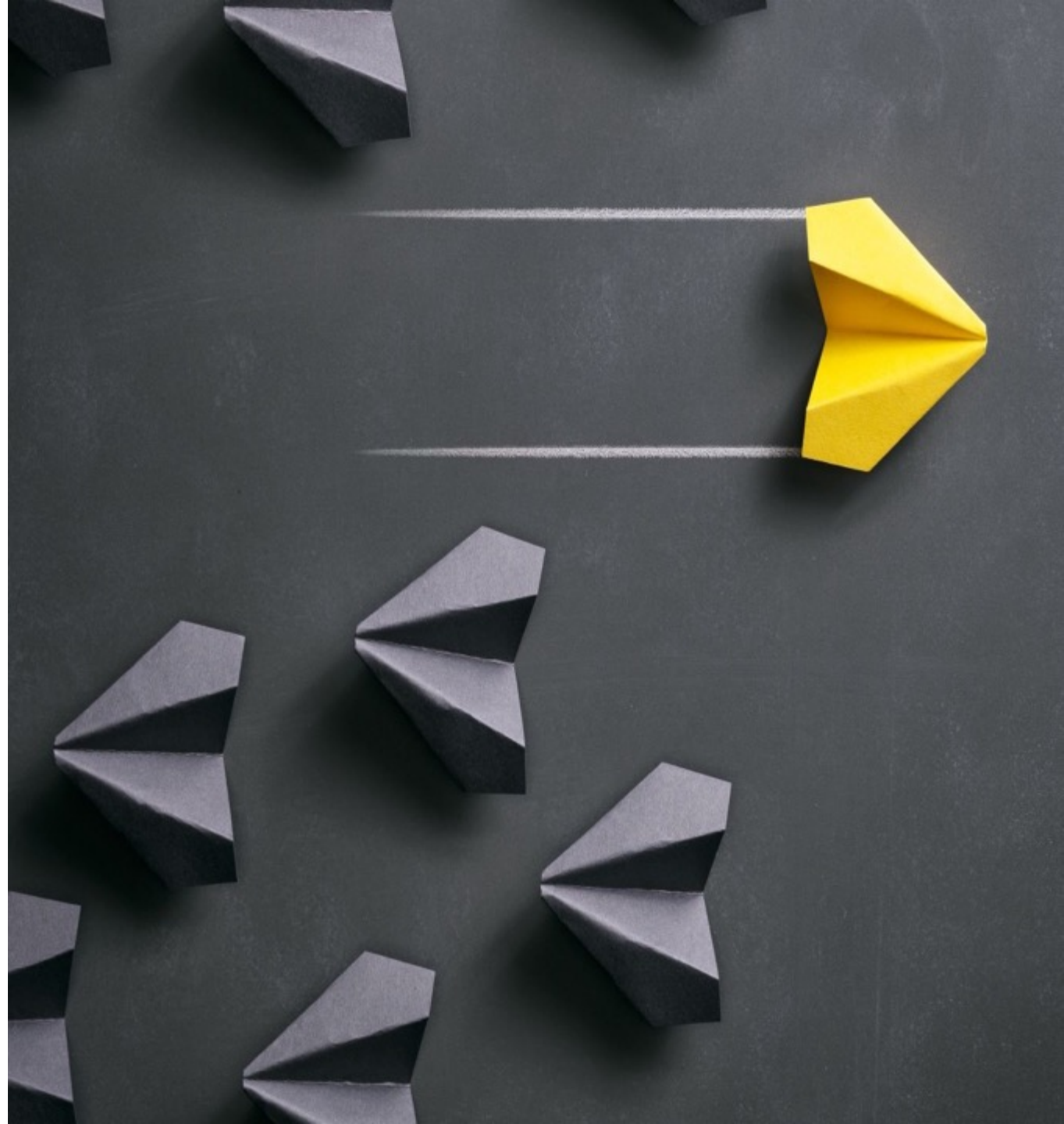
Florida Advanced Technological Education Center



*Strengthening Career & Technical Education for
the 21st Century Perkins V Act, State Leadership*

VISION

FLATE will drive
Florida's World-class
Manufacturing
Workforce Education

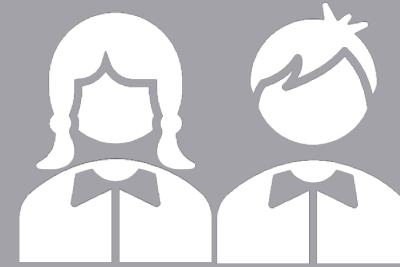




**Curriculum Reform
and Development**



**Educator Professional
Development**



**Outreach and
Student Recruitment**

Impact locally. Lead nationally.

Agenda

Agenda

- Introductions
- Root Cause Analysis presentation
- Resources
- Q & A
- Next session



Guest Speaker



Bill Mazurek

President and Managing Director,
Maz-Tec and Associates



Quantitative

Root Cause & Effect Analysis

Identify, Eliminate & Prevent Problems utilizing a structured approach

‘QC&E Talking Points’

1. Problem Statement with improvement goal.
2. Construct the Q-C&E Diagram
3. Multi-voting *(identify the vital contributors)*
 - Identify ‘vital’ causes *(quartile or pareto)*
4. Construct ‘5 Whys’ for each cause with associated risk priority number.
5. Brainstorm Solutions
6. Impact / Difficulty Solution Assessment
7. Identifying actionable improvements *(project plan for implementation)*
8. Create Control Plan – monitor the results.

Helpful Mechanisms

Acronym's

- Cause & Effect Diagrams (relationship between two things)
 - a) C&E Matrix
 - b) C&E Diagram
 - c) Fishbone Diagram
 - d) Ishakawa Diagram
- QC&E Diagram / QC&E Matrix
(Quantitative relationship between two things)
 - Refer to Q&CE Templates (Workbooks)
- 5 WHY'S (iterative interrogative technique used to explore the cause-and-effect relationships)
- RPN (risk-priority-number - numeric assessment of risk assigned)
- FMEA (Failure Modes & Effect Analysis)
- pFMEA (Process Failure Modes & Effect Analysis)
- Root Cause (a factor that **caused** a nonconformance)
- Control Plan (document describing the critical to quality characteristics)



Deliverables

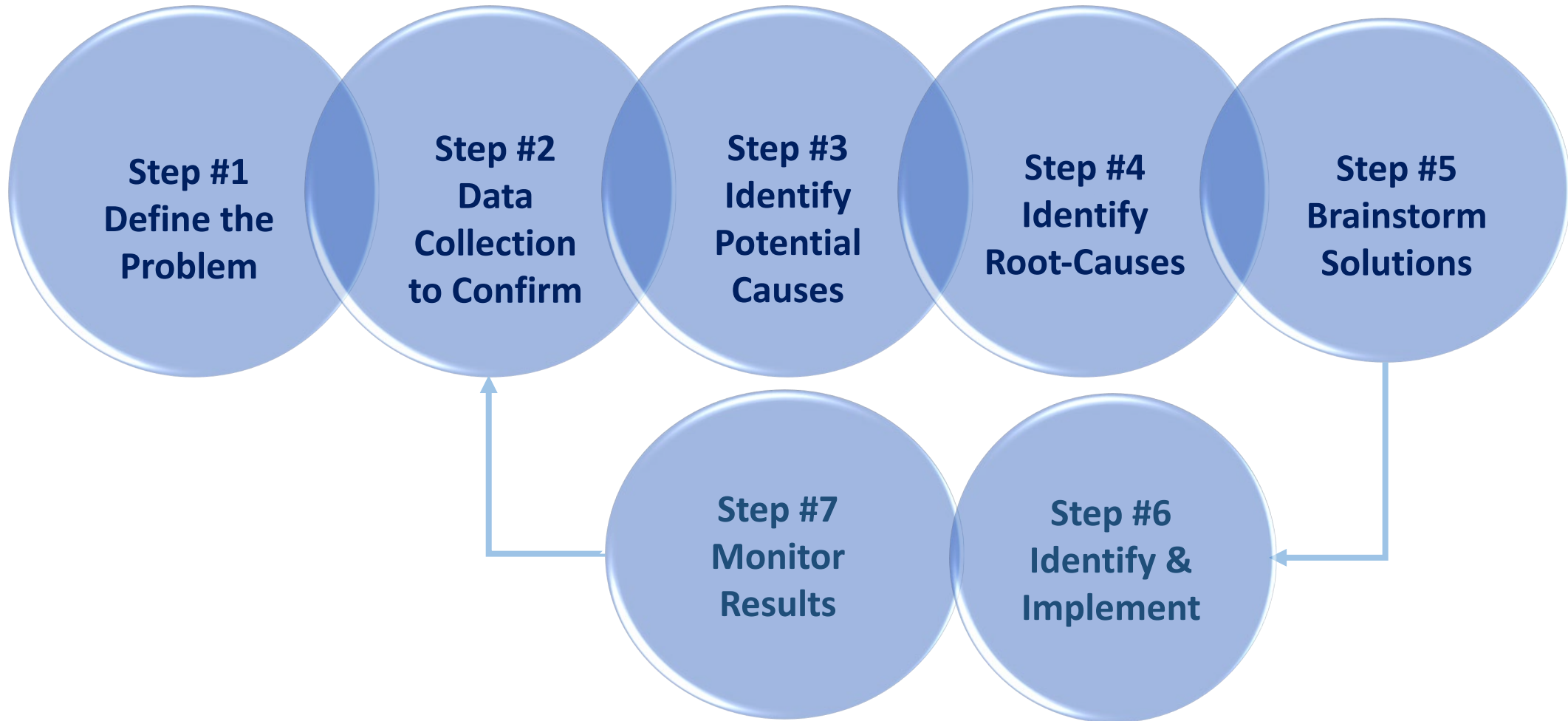
- Power Point Slide Presentation
- Q&CE Templates (Workbooks)
 1. Standard Work
 2. Project Charter
 3. QC&E Matrix
 - Analysis by Quartiles
 - Analysis by Pareto
 4. Quantitative Ranking (multi-voting)
 - Risk Priority Number
 5. 5 Why's
 - Brainstorming Solutions
 6. Impact / Difficulty Scoring
 7. Project Implementation
 8. Control Plan
- Video explanation and teaching guide for using the QC&E Templates (Q&CE Template.MP4)
 - QC&E Example 1

Typically Three Basic *Approaches?*

Root Cause & Effect Analysis is a technique that guides subject matter experts to discover potential causes for:

1. **Current Problems** *(utilizing C&E Diagram, identify root-causes & 5-Why's or similar to mitigate problems).*
2. **New Product Designs or Reengineered Products** *(FMEA mitigation approach – focusing on design specifications and overall performance to a set standard to mitigate potential design weaknesses or failures before they occur.).*
3. **New Processes or Significantly Changed Processes** *(pFMEA's mitigation approach focusing on operator / methods, materials, equipment / processes to mitigate potential problems before they occur).*

Current State Root Cause & Effect Analysis

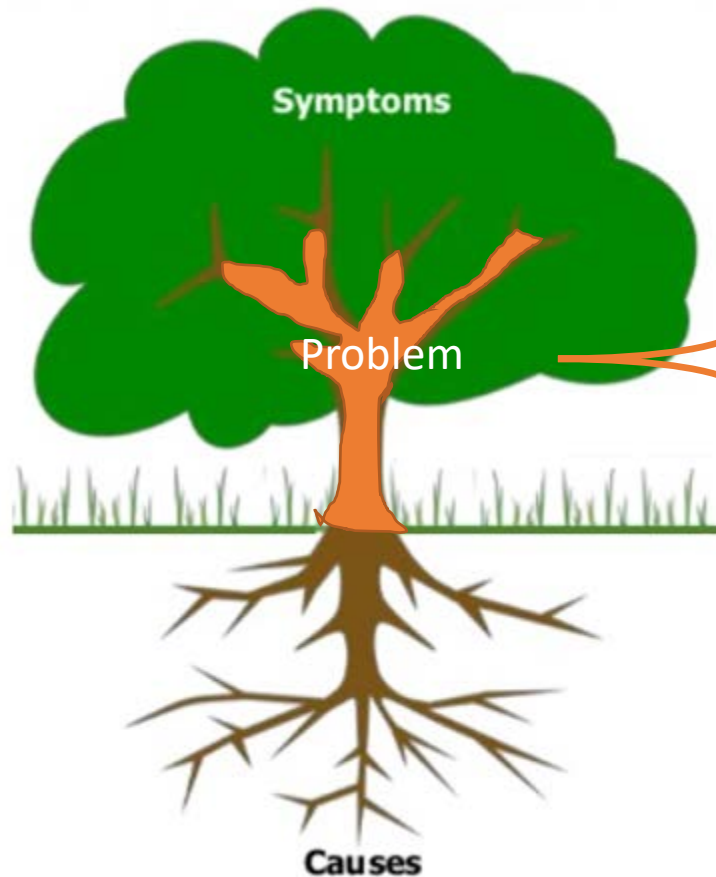


Current State Root Cause & Effect Analysis

1. *Define the problem*

- Ensure you identify the problem and its aligned to a customer and / or business need.
- What are the specific issues you observe and how does this contribute to the overall problem?
- What happens if you do not tackle the problem now – what is the business impact?
- Detail the problem specifics (*problem statement*) and identify the 'improvement goal'.

Current State Root Cause & Effect Analysis



Problem Statement

State a very succinct description of the problem your project is to solve. This must be quantified with a metric that includes units. Do not include financial measures, possible causes or possible improvements in this statement.

Problem Scope and Breadth

Objective

State the objective of your project in terms of the defect you have identified. This needs to be aligned with and in the same units as your Metric and Problem Statement. Must include project end date.

Improvement Goal (quantifiable)

Benefits

Do not confuse this with opportunities.

Benefits are those gains (financial or non-financial) which will be realized when the project objective is achieved.

Improvement Potential (Scrap Reduction, \$ Saved)

Metric

The metric is the measure used to quantify the defect.

How the defect is determined & measured

Defect Definition

Stated in a way the process owner would understand

Current State Root Cause & Effect Analysis

2. *Data collection to confirm*

- Conformation of the problem as stated (*problem statement*).
- If no data is available, identify what data needs to be collected (*collect and verify*).
- Speak to customers / employees / stakeholders, seek their voice (*unspoken problems / frustrations*).
- Is it a recurring problem, how frequent has it occurred in the past (*data*).

Current State Root Cause & Effect Analysis

3. *Identify potential causes*

- Identify the underlying cause(s) *(Typically - Fishbone Diagram)*
- What is the factors or combination thereof leading to the failure.
- Identify as many causes as possible, do not think of solutions at this stage.
- Involve your teams / subject matter experts to priorities the 'vital' causes.

Current State Root Cause & Effect Analysis

Ishakawa / Cause & Effect Diagram

The 6 M's

- ✓ **Man** – people performing the process or involved
- ✓ **Machine** – equipment and tools used within the process
- ✓ **Method** – procedures followed (*Standard Work / Instructions*)
- ✓ **Material** – Inputs required within the process
- ✓ **Measurement** – data on input or product specifications
- ✓ **Mother nature** – environment in which men and machines operate

Measurement

Man

Mother Nature

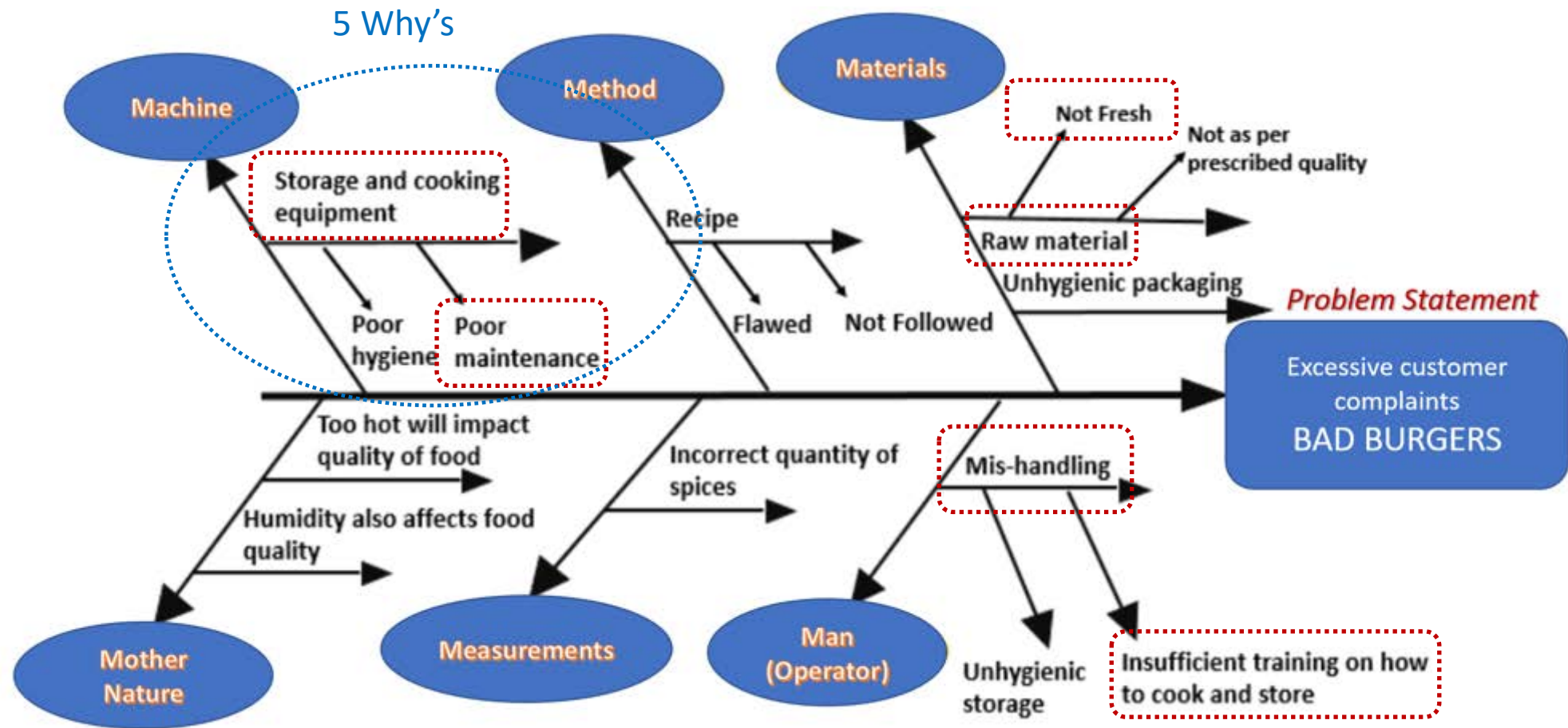
Current State Root Cause & Effect Analysis

3. *Group & prioritize causes*

- Group similar causes (*affinity diagram – similar categories*)
- Identify the significant high-contributors to the problem:
Priorities the 'vital few' & 'useful many' causes by
 - Group-voting
 - Multi-voting

Remember fishbone causes are all 'equally weighted'

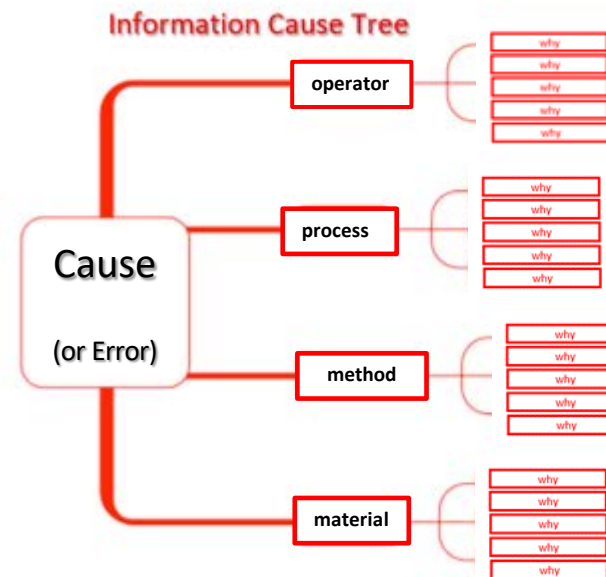
Identify the Root Causes



Current State Root Cause & Effect Analysis


4. Use a structured 5-Whys approach for each priority cause as generated.

The Five-Whys Worksheet	
Defect (or Error)	Cause
Why-1: Why did THE DEFECT occur?	
Why-2: Why did THAT occur?	
Why-3: Why did THAT occur?	
Why-4: Why did THAT occur?	
(Why-5: Why did THAT occur?)	Root Cause?



Current State Root Cause & Effect Analysis

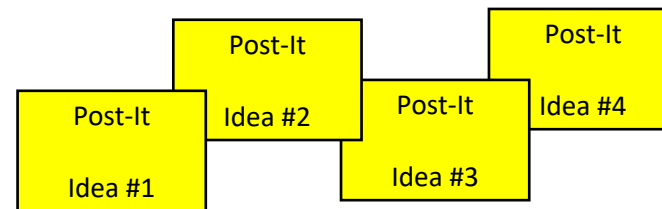
5 Why's ... Storage & Cooking Equipment > Poor Maintenance

	Why	Because ...
1	Why is there poor maintenance (storage & cooking equipment)?	There is no ownership @ Bill's Burgers to perform preventative maintenance.
2		
3		
4		
5		

#7 Quantitative Root-Cause Analysis – Identify Solutions

7 Alternatives Solutions

- Focus is on eliminating the problem so it does not recur
 - Remember the goal is prevention (i.e. poke-yoke solutions)
- Brainstorm Multiple Solutions (*7-Alternatives is ideal*)



- Evaluate solutions (*Prioritization Matrix > PACE or Impact vs. Effort*)



A **PACE matrix** helps your team **prioritize** the ideas and solutions you have generated.

P=Priority
A=Action
C=Consider
E=Eliminate



Current State Root Cause & Effect Analysis

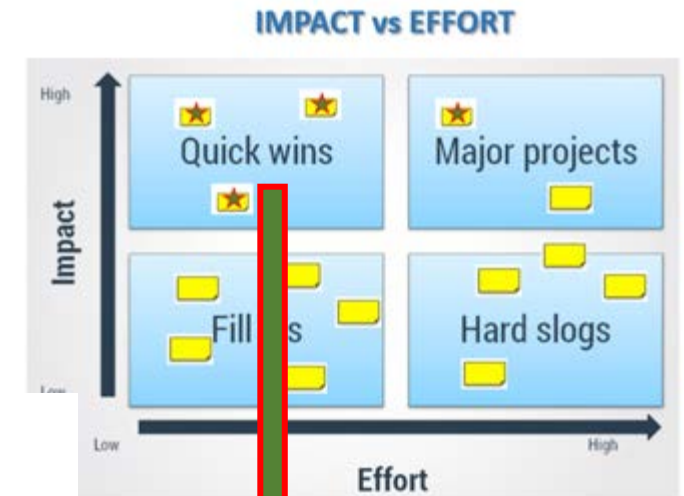
6. Prioritize & Implement Solutions

- Implement the change
(create an action plan)

Solutions & Implimentation Plan

Organization: _____ Project: _____ Date: _____

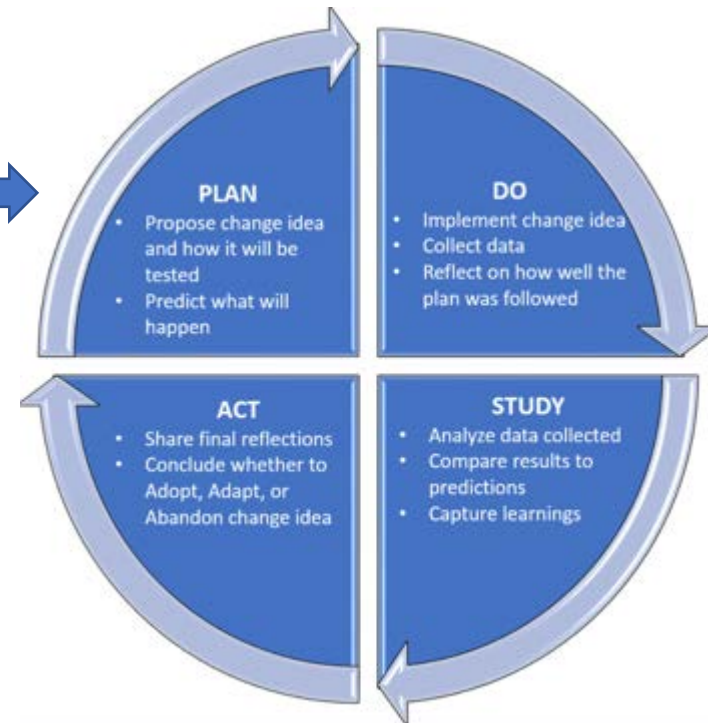
#	Activity / Task	Person(s) Responsible	Date: Due	Date: Started	Date: Completed	Deliverables	Status
1	Create Standard Work for Supervisors	Marilyn Barger	3/12/2021	2/26/2021	TBD	Daily/Weekly/Monthly Std Work	Assigned
2							
3							
4							
5							
6							
7							



Current State Root Cause & Effect Analysis

7. *Monitor results*

- Ensure the actual results meet targeted improvement goals.
- Its all about sustaining the 'gains'



Strengths, weaknesses & best-practices

STRENGTHS

1. Cause & Effect Methodology is proven, established and widely taught.
2. Easy to understand the application of the tool.
3. Ishakawa Diagram has been used and taught for approximately 60 years.
4. 5 Whys became popular in the 1970s (45 years), and also one of the foundational pillars for the Toyota Production System.

WEAKNESSES

1. Application today varies but typically is tool based versus a systems approach for problem identification with root-cause analysis.
2. Cause & Effect Methodology can be applied differently (High-level approach ... Deep-Dive approach).
3. Output results can vary based on the expertise of the team and / or facilitator.
4. Identifying the TRUE 'root-cause' may be dependent again on the expertise of the team and / or facilitator.
5. Solutions may or may not be selected based on impact of solving the problem and difficulty in implementing (labor, design, cost).
6. 5 Whys may not be incorporated with a 'go and see' philosophy to ensure we not only hear what the problem is ... but we actually see what the problem is.

BEST-PRACTICES

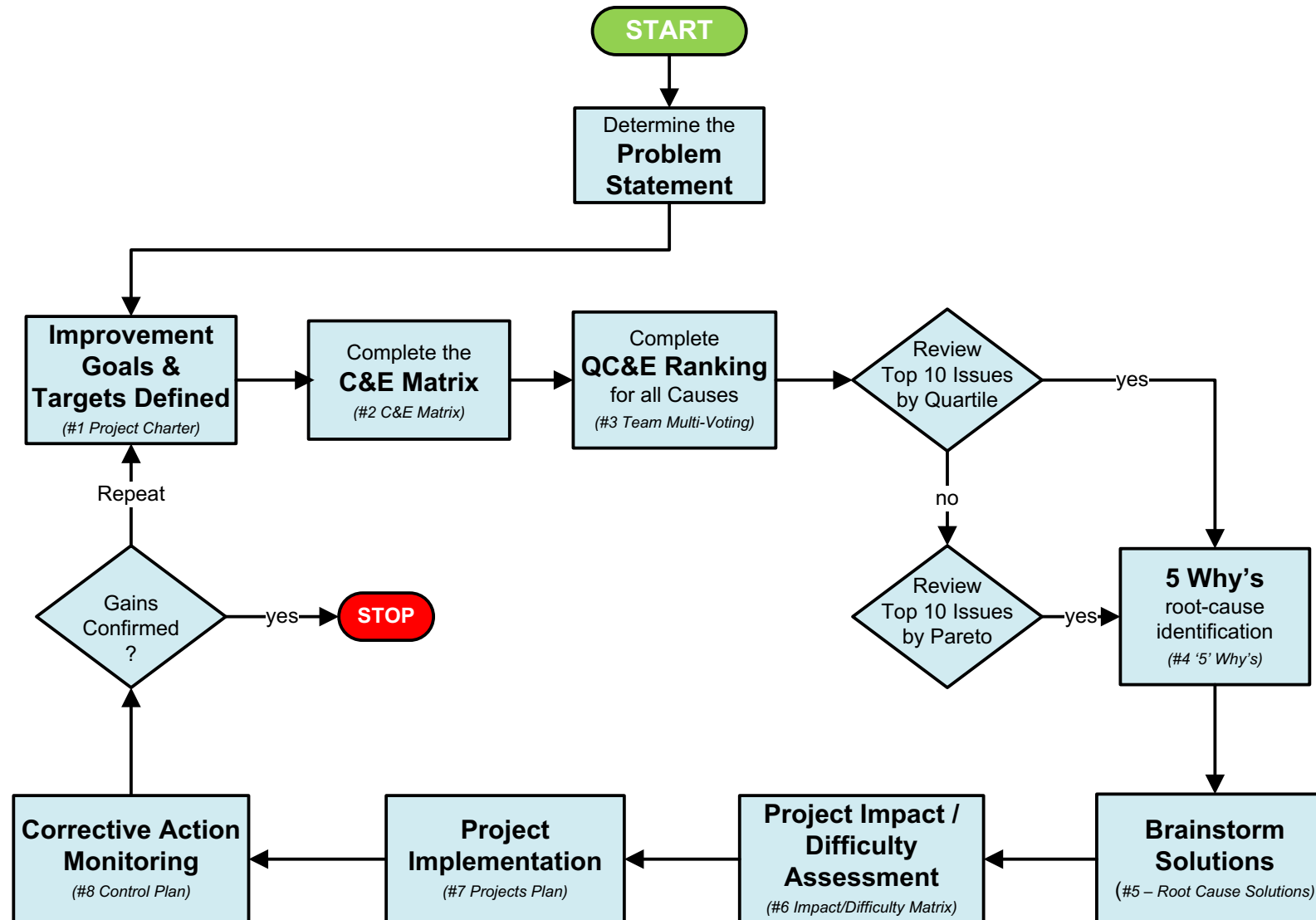
1. Creating standard work for the Root-Cause and Effect process. This is the process and tool box that will be employed every time.
2. Adding a quantitative assessment during the various data phases provides consistent feedback and directional guidance for the team.
3. With standard work and output – ease to memorialize the results to establish a Kaizen Baseline for future improvements.

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Best Practice

Quantitative Approach

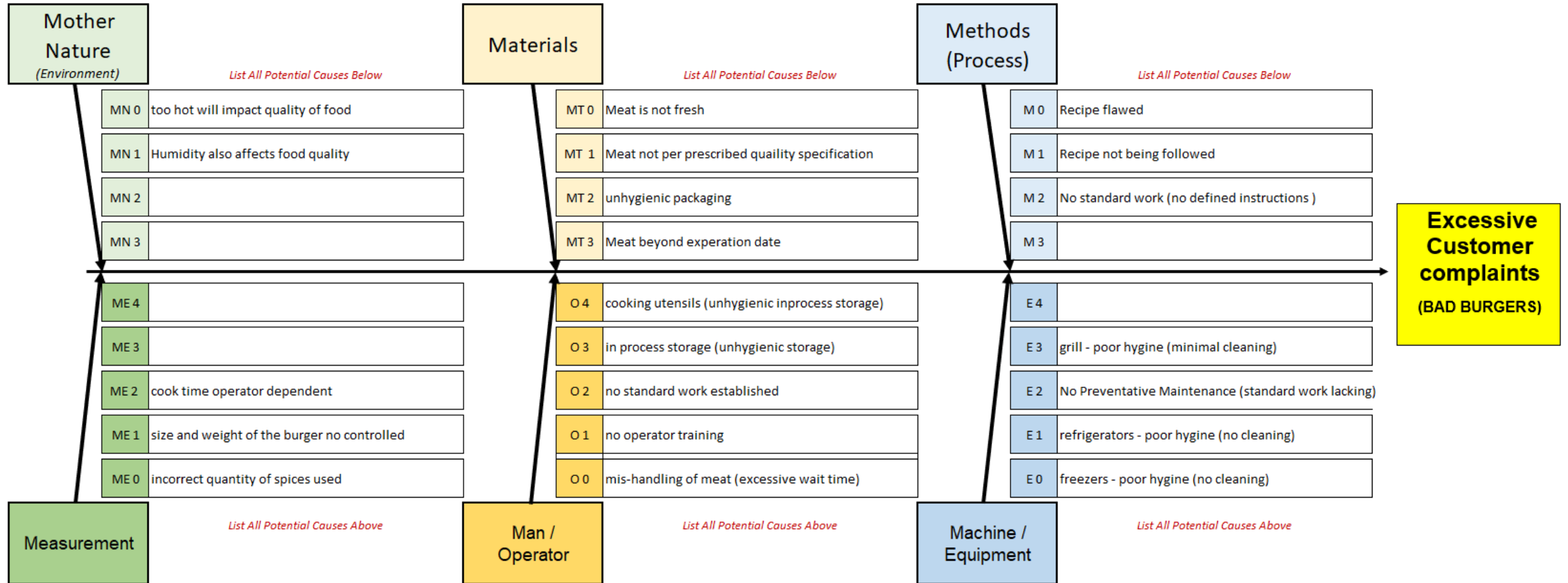
QC&E Root Cause Analysis Standard Work



Step #1 – Create a Project Charter

Project Charter
Project / Area / Process / Owner
Problem Statement State a very succinct description of the problem your project is to solve. This must be quantified with a metric that includes units. Do not include financial measures, possible causes or possible improvements in this statement.
Objective (Improvement Goal & Targets Defined) State the objective of your project in terms of the defect you have identified. This needs to be aligned with and in the same units as your Metric and Problem Statement. Must include project end date.
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Defect Definition Describe the defect or undesired event. Again, do not include causes or potential solutions (you may want to include your measurement or data source.)

Step #2 – Construct the QC&E Matrix



Step # 3 – QC&E Ranking with Vital Causes Identified

Quantative C&E Matrix Team Multi-Voting Template														Top 10 Issues Identified by Quartile																
<div>● Count the total number of causes within a unique category, divide by 2 to establish the number of votes each team associate will cast (i.e. 7 causes / 2 = 3.5 or 4 votes / associate) Each associate may use more than one vote/cause.</div> <div>● Identify the 'top vote getting causes' for each category, then complete a #3 Brainstroming and / or the '5'-Why's for each unique cause.</div>														Associate #1	Associate #2	Associate #3	Associate #4	Associate #5	Associate #6	Associate #7	Associate #8							Total Votes	Vital Few (1st Quartile)	Useful Many (2nd Quartile)
Methods (Process)																														
M 0	Recipe Flawed																			3	-	-								
M 1	Recipe Not Being Followed																				6	Vital Few	-							
M 2	No Standard Work (No Defined Instructions)																					7	Vital Few	-						
Machine / Equipment																														
E 0	Freezers - Poor Hygine (No Cleaning)																					0	-	-						
E 1	Refrigerators - Poor Hygine (No Cleaning)																					3	-	-						
E 2	No Preventative Maintenance (Standard Work Lacking)																					6	Vital Few	-						
E 3	Grill - Poor Hygine (Minimal Cleaning)																					5	-	Useful Many						
Materials																														
Mt 0	Meat Is Not Fresh																													
Mt 1	Meat Not Per Prescribed Quaility Specification																													
Mt 2	Unhygienic Packaging																													
Mt 3	Meat Beyond Experation Date																													
Man / Operator																														
O 0	Mis-Handling Of Meat (Excessive Wait Time)																													
O 1	No Operator Training																													
O 2	No Standard Work Established																													
O 3	In Process Storage (Unhygienic Storage)																													
O 4	Cooking Utensils (Unhygienic Inprocess Storage)																													
Mother Nature (Environment)																														
Mn 0	Too Hot Will Impact Quality Of Food																													
Mn 1	Humidity Also Affects Food Quality																													
Measurement																														
Me 0	Incorrect Quantity Of Spices Used																													
Me 1	Size And Weight Of The Burger No Controlled																													
Me 2	Cook Time Operator Dependent																													

Satistical Summary

Max

8

Min

3

Range

8

Causes

18

Cum. Freq. Votes

94

Q1

0 - 24%

2.00

Q2

25 - 49%

4.00

Q3

50 - 74%

6.00

Q4

75 - 100%

8.00

Statistical Summary	
Max	8
Min	3
Range	8
# Causes	18
Cum. Freq. Votes	94
Q1 0 - 24%	2.00
Q2 25 - 49%	4.00
Q3 50 - 74%	6.00
Q4 75 - 100%	8.00

Step # 3 – Pareto Results for the Top Failure Causes



Step # 4 ... 5-Whys

Cause #	Problem Statement:		RPN
E2	Excessive customer complaints - specifically serving Bad Burgers		400
Why?	(Why ...) do you think the Problem / Defect Occur?	Why was it not Detected in the current Process (Because ...)?	Why was it not Prevented in the current Process (Because ...)?
1st why	Why is there poor maintenance (Storage & cooking equipment)?	There is no ownership @ Bill's Burgers to perform preventative maintenance.	lacking understanding of the problem to formalize a structured preventative maintenance routine for the operation
2nd why	Why is there no ownership @ Bill's Burgers to perform preventative maintenance?	No one has been assigned the task	lacking understanding of the problem to formalize a structured preventative maintenance routine for the operation
3rd why	Why has no one been assigned the task?	Mary (supervisor) did not know it was her responsibility to perform or assign the task	unaware this was a requirement
4th why	Why didn't Mary know it was her responsibility to perform or assign the task?	Management (Mr. Big) never aligned operational goals to include preventative maintenance responsibilities.	operational requirements were left to the supervisor to determine
5th why	Why didn't Mr. Big align operational goals to include preventative maintenance?	No standard work was established for supervisors to align operational goals.	Operational goals (to date) were only financial metrics - too narrow.
Direct Process	Severity	Occurrence	Detection
	Can the design or materials impact the end customer and to what degree?	Why did the problem (defect) occur?	Why was the problem (defect) not detected?
	Can the process impact the end customer and to what degree?	Does a process exist that was not followed or needs clarification	Does a detection process exist and if so, was it followed?
RPN#	8	5	10
Enter Score Above for Occurrence / Detection & Severity of the problem			

Burgers to perform

task

Why it was her
assign the task

aligned operational
maintenance

assigned for supervisors

Step # 4 ... 5-Whys

$$RPN = (Severity) \times (Occurrence) \times (Detection)$$

Severity		Occurrence		Detection	
Direct	Can the design or materials impact the end customer and to what degree?	Why did the problem (defect) occur?		Why was the problem (defect) not detected?	
Process	Can the process impact the end customer and to what degree?	Does a process exist that was not followed or needs clarification		Does a detection process exist and if so, was it followed?	
RPN#	8	5		10	

Risk Priority Number: (Serverty Score) X (Occurance Score) X (Detection Score) ... i.e RPN = (7 Serverty) X (3 Occurance) X (5 Detection) = 105

Score	SEVERITY	OCCURENCE				DETECTION
10	Hazardous Without Warning	Very High	1.5 sigma	50% (1 in 2)	500,000 DPMO	Absolute Uncertainty
9	Hazardous With Warning	High	1.0 sigma	33% (1 in 3)	308,000 DPMO	Very Remote
8	Very High	Med. High	2.5 sigma	1 in 8	158,000 DPMO	Remote
7	High	Low High	3.0 sigma	1 in 20	66,800 DPMO	Very Low
6	Moderate	High Moderate	3.5 sigma	1 in 80	22,700 DPMO	Low
5	Low	Moderate	4.0 sigma	1 in 400	6,210 DPMO	Moderate
4	Very Low	Low Moderate	4.5 sigma	1 in 2,000	1,350 DPMO	Moderately High
3	Minor	Low	5.0 sigma	1 in 15,000	230 DPMO	High
2	Very Minor	Very Low	5.5 sigma	1 in 150,000	30 DPMO	Very High
1	None	Remote	6.0 sigma	1 in 200,000	3.4 DPMO	Almost Certain

Step # 6 – Brainstorming Solutions

Brainstroming Solutions Impact / Difficulty Matrix				
INDEX	(Cause Number) & (Cause Description):	Solution or Improvement	IMPACT Payoff Eliminating the Problem	Difficulty of implimenting the solution
1	E2 - No Preventative Maintenance Routine	Create standard preventative maintenance sheet for OEM PM's (based on OEM recommendations)	5	2
2	E2 - No Preventative Maintenance Routine	Alignment of Senior Management Goals with Supervisor Performance Expectations	5	3
3	E2 - No Preventative Maintenance Routine	Create Supervisor Standard Work including equipment preventative maintenance auditing requirment	9	2
4	E2 - No Preventative Maintenance Routine	Operator Training / Preventative Maintenance Certification added as employee job task - as identified	8	4
5	E2 - No Preventative Maintenance Routine	Purchasing to contract OEM maintenance training as well as OEM equipment calibration / maintenance annually.	5	2
6	E2 - No Preventative Maintenance Routine	Replace freezers and refirgarators with new state of the art equipment	6	9
7	E2 - No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Monthly)	8	5
8	E2 - No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Daily)	6	2
9	E2 - No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Weekly)	6	2
10				

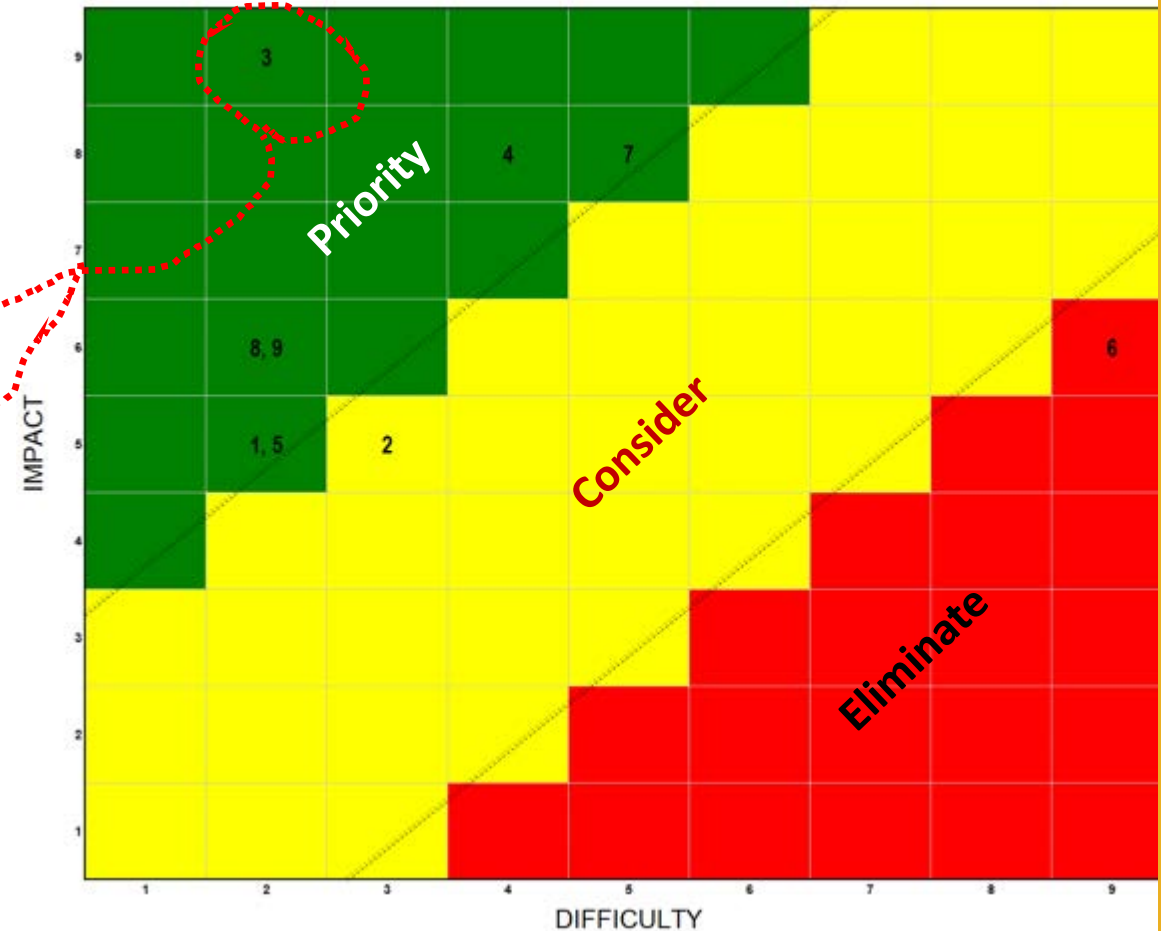
Step # 6 – Impact / Difficulty Assessment

Brainstroming Solutions Impact / Difficulty Matrix

INDEX	(Cause Number) & (Cause Description):	Solution or Improvement	IMPACT Payoff Eliminating the Problem	Difficulty of implementing the solution
1	E2 - No Preventative Maintenance Routine	Create standard preventative maintenance sheet for OEM PM's (based on OEM recommendations)	5	2
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5	E2 - No Preventative Maintenance Routine	Purchasing to contract OEM maintenance training as well as OEM equipment calibration / maintenance annually.	5	2
6	E2 - No Preventative Maintenance Routine	Replace freezers and refrigerators with new state of the art equipment	6	9
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8	E2 - No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Daily)	6	2
9	E2 - No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Weekly)	6	2

PCE Prioritization Matrix

IMPACT vs. DIFFICULTY of Improvement Initiatives



Step # 7 – Project Implementation Plan

Solutions & Implimentation Plan

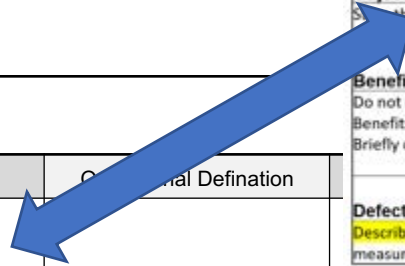
Organization: _____ Project: _____ Date: _____

#	Activity / Task	Person(s) Responsible	Date: Due	Pre-RPN #	Post-RPN #	Deliverables	Status
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Step # 8 – Control Plan

Control Plan				
Project:				
	What to Measure (CTQ)	Type of Data	Target Performance	Control Definition
1				
2				
3				
4				
5				
6				
7				
8				
9				

Project Charter
Project / Area / Process / Owner
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Defect Definition Describe the defect or undesired event. Again, do not include causes or potential solutions (you may want to include your measurement or data source.)



Common Root Cause Analysis guidelines:

1. Follow your 'Standard Work'
2. Engaging **Subject Matter Experts** is foundational.
 - ✓ Operators, Technicians, Engineers, Quality Professionals
3. Identify then Confirm the Problem (Gemba, SIPOC).
 - ✓ Understanding the birth of the problem ... where, when, how often (data...data...data)
4. Identifying Causes of Variability
 - ✓ **Special Cause** - *are unusual, not previously observed, non-quantifiable variation.*
 - ✓ **Common Cause** - *also called natural patterns, are the usual, historical, quantifiable variation in a system.*
5. Counter Measures and Solution Monitoring
 - ✓ **Prevention** / **elimination** / **error-proofing**


‘QC&E Summary’

1. Problem Statement with improvement goal.
2. Construct the Q-C&E Diagram
3. Multi-voting *(identify the vital contributors)*
 - Identify ‘vital’ causes *(quartile or pareto)*
4. Construct ‘5 Whys’ for each cause with associated risk priority number.
5. Brainstorm Solutions
6. Impact / Difficulty Solution Assessment
7. Identifying actionable improvements *(project plan for implementation)*
8. Create Control Plan – monitor the results.

Structured Problem Solving Process

1) Define the Problem

Go See.
Ask Why?
Show Respect.



SUPPLIERS

INPUTS

PROCESS

OUTPUTS

CUSTOMERS

Problem/Goal Statement

Problem: Describe problem in non-technical terms
• Statement should explain why project is important; why working on it is a priority

Goal: Goals communicate "before" and "after" conditions
• Shift mean, variance, or both?
• Should impact cost, time, quality dimensions

• Express goals using SMART criteria
• Specific, Measurable, Attainable, Resource Requirements, Time Boundaries

• Explain leverage and strategic implications (if any)

	IS	IS NOT	POSSIBLE CAUSES
WHAT			
WHEN			
WHERE			
EXTENT			

2) Identify Potential Causes:

Mother Nature (Environment)

MN.0 Too hot will impact quality of food

MN.1 Humidity also affects food quality

MN.2

MN.3

Materials

MT.0 Meat is not fresh

MT.1 Meat not per prescribed quality specification

MT.2 Unhygienic packaging

MT.3 Meat beyond expiration date

Methods (Process)

ME.0 Recipe flawed

ME.1 Recipe not being followed

ME.2 No standard work (no defined instructions)

ME.3

Measurement

ME.4

ME.5 Cook time operator dependent

ME.6 Size and weight of the burger not controlled

ME.7 Inconsistent quantity of spices used

Man / Operator

OP.0

OP.1 No operator training

OP.2 No handling of meat (excessive wait time)

Machine / Equipment

E.0

E.1

E.2

E.3

E.4

Problem Statement

3) Prioritize, Organize, and Verify the Vital Causes

Quantitative C&E Matrix
Team Multi-Voting Template

Count the total number of votes within a unique category, divide by 3 to establish the number of votes each team associate will cast (3, 2 votes / 1, 1/2 or 4 votes). Associates may vote more than one vote (cause).
Identify the top 10 voting causes for each category, then brainstorm A-B Brainstorming and/or the 5-Why for each unique cause.

	Associate A1	Associate A2	Associate A3	Associate A4	Associate A5	Associate A6	Associate A7	Associate A8	Associate A9	Associate A10	Total Votes	Top 10 Issues Identified by Quantity
Methods (Process)												
M.0 Recipe flawed	1	1	1	1	1	1	1	1	1	1	10	Vital Few
M.1 Recipe Not Being Followed	1	1	1	1	1	1	1	1	1	1	10	Vital Few
M.2 No Standard Work (No Defined Instructions)	1	1	1	1	1	1	1	1	1	1	10	Vital Few
Materials												
MT.0 Meat is Not Fresh	1	1	1	1	1	1	1	1	1	1	10	Useful Many
MT.1 Meat Not per Prescribed Quality Specification	1	1	1	1	1	1	1	1	1	1	10	Useful Many
MT.2 Unhygienic Packaging	1	1	1	1	1	1	1	1	1	1	10	Vital Few
MT.3 Meat Beyond Expiration Date	1	1	1	1	1	1	1	1	1	1	10	Vital Few
Man / Operator												
ME.0 Recipe flawed	1	1	1	1	1	1	1	1	1	1	10	Useful Many
ME.1 Recipe Not Being Followed	1	1	1	1	1	1	1	1	1	1	10	Useful Many
ME.2 No Standard Work (No Defined Instructions)	1	1	1	1	1	1	1	1	1	1	10	Vital Few
ME.3 No Operator Training	1	1	1	1	1	1	1	1	1	1	10	Useful Many
ME.4 No Handling of Meat (Excessive Wait Time)	1	1	1	1	1	1	1	1	1	1	10	Useful Many
ME.5 Cook Time Operator Dependent	1	1	1	1	1	1	1	1	1	1	10	Vital Few
ME.6 Size and Weight of the Burger Not Controlled	1	1	1	1	1	1	1	1	1	1	10	Vital Few
ME.7 Inconsistent Quantity of Spices Used	1	1	1	1	1	1	1	1	1	1	10	Vital Few
ME.8 No Standard Work (No Defined Instructions)	1	1	1	1	1	1	1	1	1	1	10	Vital Few
Machine / Equipment												
E.0 Recipe flawed	1	1	1	1	1	1	1	1	1	1	10	Vital Few
E.1 Recipe Not Being Followed	1	1	1	1	1	1	1	1	1	1	10	Vital Few
E.2 No Standard Work (No Defined Instructions)	1	1	1	1	1	1	1	1	1	1	10	Vital Few
E.3 No Operator Training	1	1	1	1	1	1	1	1	1	1	10	Vital Few
E.4 No Handling of Meat (Excessive Wait Time)	1	1	1	1	1	1	1	1	1	1	10	Vital Few





4) Analysis each Vital Cause to determine the 'Root Cause'

Why?

Why?

Why?

Why?

Root Cause!

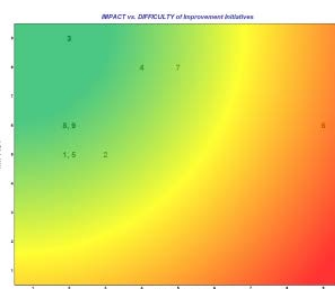
Cause #	Problem Statement	RPN	
E2	Excessive customer complaints - specifically serving bad burgers	400	
Why?	Why...? do you think the Problem / Defect Occur?	Why was it not Detected in the current Process (Because...)?	Why was it not Prevented in the current Process (Because...)?
1st why	Why is there poor maintenance (dirty or cooking equipment)?	There is no ownership @ Biff's Burgers to perform preventative maintenance.	Lacking understanding of the problem to formulate a structured preventative maintenance routine for the operation
2nd why	Why is there no ownership @ Biff's Burgers to perform preventative maintenance?	No one has been assigned the task	Lacking understanding of the problem to formulate a structured preventative maintenance routine for the operation
3rd why	Why has no one been assigned the task?	Many supervisors did not know it was her responsibility to perform or assign the task.	unaware this was a requirement
4th why	Why didn't Mary know it was her responsibility to perform or assign the task?	Management (GM, Big) never aligned operational goals to include preventative maintenance responsibilities.	operational requirements were left to the supervisor to determine
5th why	Why didn't GM, Big align operational goals to include preventative maintenance?	No standard work was established for supervisors to align operational goals.	Operational goals (to date) were only financial metrics - too narrow.
Severity	Occurrence	Detection	
Can the design or materials impact the end customer and to what degree?	Why did the problem (defect) occur?	Why was the problem (defect) not detected?	
Can the process impact the end customer and to what degree?	Does a process exist that was not followed or needs clarification?	Does a detection process exist and if so, how is it followed?	
RPN#	8	5	10

Enter Score Above for Occurrence / Detection & Severity of the problem.

5) Determine Corrective Actions

Brainstroming Solutions Impact / Difficulty Matrix

INDEX	(Cause Number) & (Cause Description)	Solution or Improvement	IMPACT Payoff Elevating the solution	Difficulty of implementing the solution
1	E2: No Preventative Maintenance Routine	Create standard preventative maintenance sheet for OEM PM's (based on OEM recommendations)	5	3
2	E2: No Preventative Maintenance Routine	Alignment of Senior Management Goals with Supervisor Performance Expectations	5	3
3	E2: No Preventative Maintenance Routine	Create Supervisor Standard Work including equipment preventative maintenance auditing requirement	5	3
4	E2: No Preventative Maintenance Routine	Operator Training / Preventative Maintenance Certification added as employee job task - as identified	5	4
5	E2: No Preventative Maintenance Routine	Purchasing to conduct OEM maintenance training as well as OEM equipment calibration / maintenance annually	5	3
6	E2: No Preventative Maintenance Routine	Replace freezers and refrigerators with new state of the art equipment	5	5
7	E2: No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Monthly)	5	4
8	E2: No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Daily)	5	3
9	E2: No Preventative Maintenance Routine	Create standard preventative maintenance sheet for Operators PM's (Weekly)	5	3
10				




6) Implement, Standardize, Verify and / or Validate Solutions

IMPLEMENTATION SCHEDULE

PRIORITY	INDEX	Improvement Solutions and Recommendations	Start Date	End Date	Pre-RPN #	Post-RPN #	Deliverables	Status
1	3	Create Supervisor Standard Work including equipment preventative maintenance auditing requirement	8/2	8/2	400	32		
2	9	Create standard preventative maintenance sheet for Operators PM's (Monthly)	8/2	8/2	400	32		
3	8	Create standard preventative maintenance sheet for Operators PM's (Daily)	8/2	8/2	400	32		
4	4	Operator Training / Preventative Maintenance Certification added as employee job task - as identified	8/4	8/4	400	32		

Solutions & Implementation Plan

#	Activity / Task	Person(s) Responsible	Date Due	Pre-RPN #	Post-RPN #	Deliverables	Status
1	Create Supervisor Standard Work			400	32		
2	Create Preventative Maintenance Standard Work						
3	Operator PM Training & Certification						
4							





Q & A

Bill Mazurek

President and Managing Director,
Maz-Tec and Associates



Related Resources

All resources are in the handout section of the control panel:

- Presentation slide deck
- Excel of worked example and template worksheets
- Links - to Bill's site where these files also reside
- Link to you tube tutorials for using the templates

TECH TALKS

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Friday April 23, 9-10 am EST

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Advisor at the Manufacturers Association of
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Thank You!

Dr. Marilyn Barger

marilyn.barger@flate.org
Florida Advanced Technological
Education Center (FLATE)

Lara Sharp

Sharp.lara@spcollege.edu
St. Pete College



Bill Mazurek

President and Managing Director
Maz-Tec & Associates LLC

bill@maz-tec.com

www.maz-tec.com

Presentation and link to the recording available at www.flate.pbwiki.com