

Through Put Yield Improvement Story Durango Plant

TEAM "THRU PUT"

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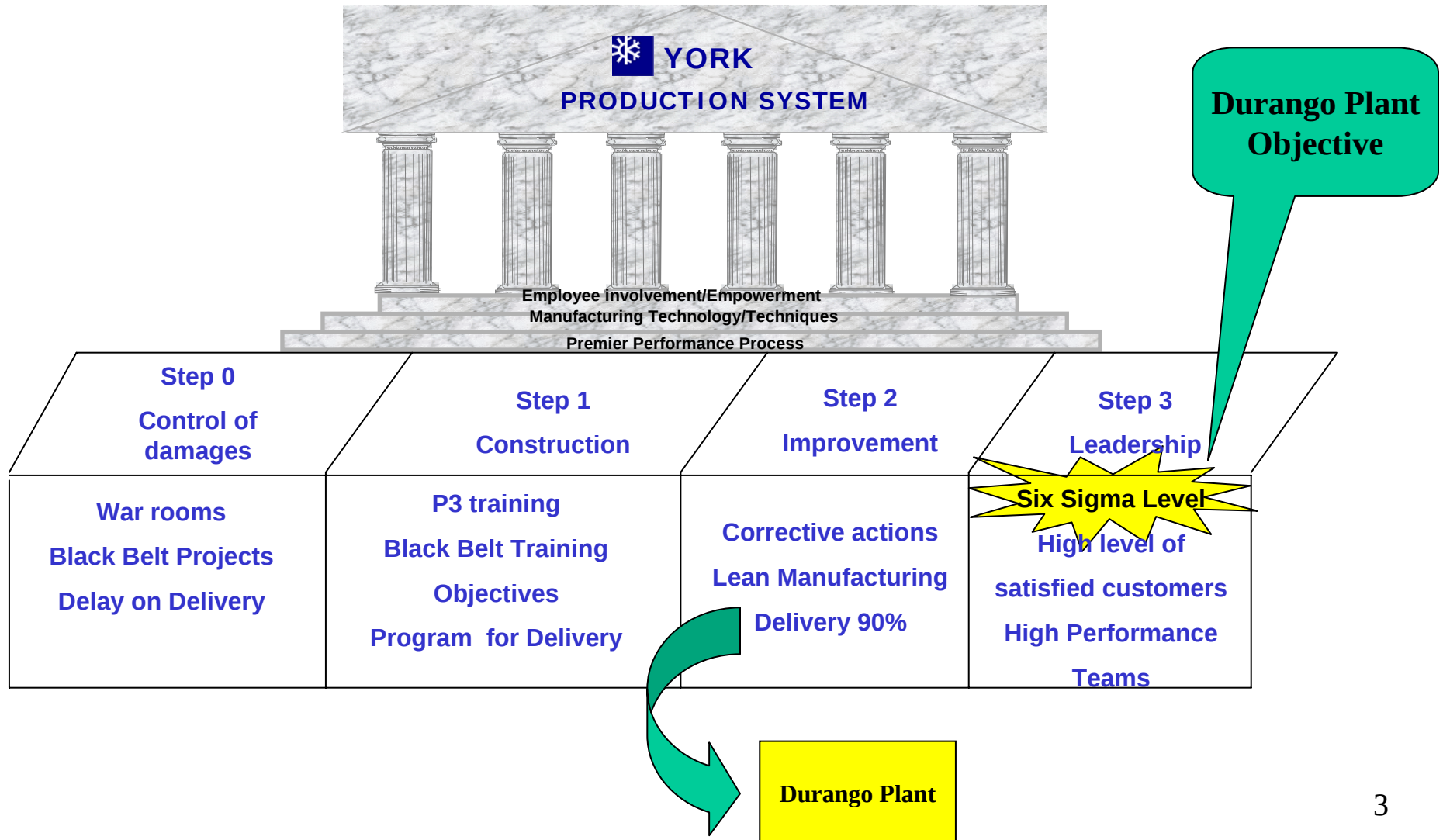
PROBLEM / OPPORTUNITY STATEMENT

Problem: The Six Sigma level in Heat Exchanger line in Durango Plant is estimated around 2.3 and is based on the information from the Non Conformance Report from Q.A. department also exist the effect of "Hidden Factory" (Quality Problems). The Six Sigma level of 2.3 is slow compared with the standard of Premier Companies.

Objective: Implement a system to measure correctly the Sigma level of heat exchanger line and implement changes to increase the Sigma level in the production line from 2.3 to 3.5 in the period of February to November 2000.

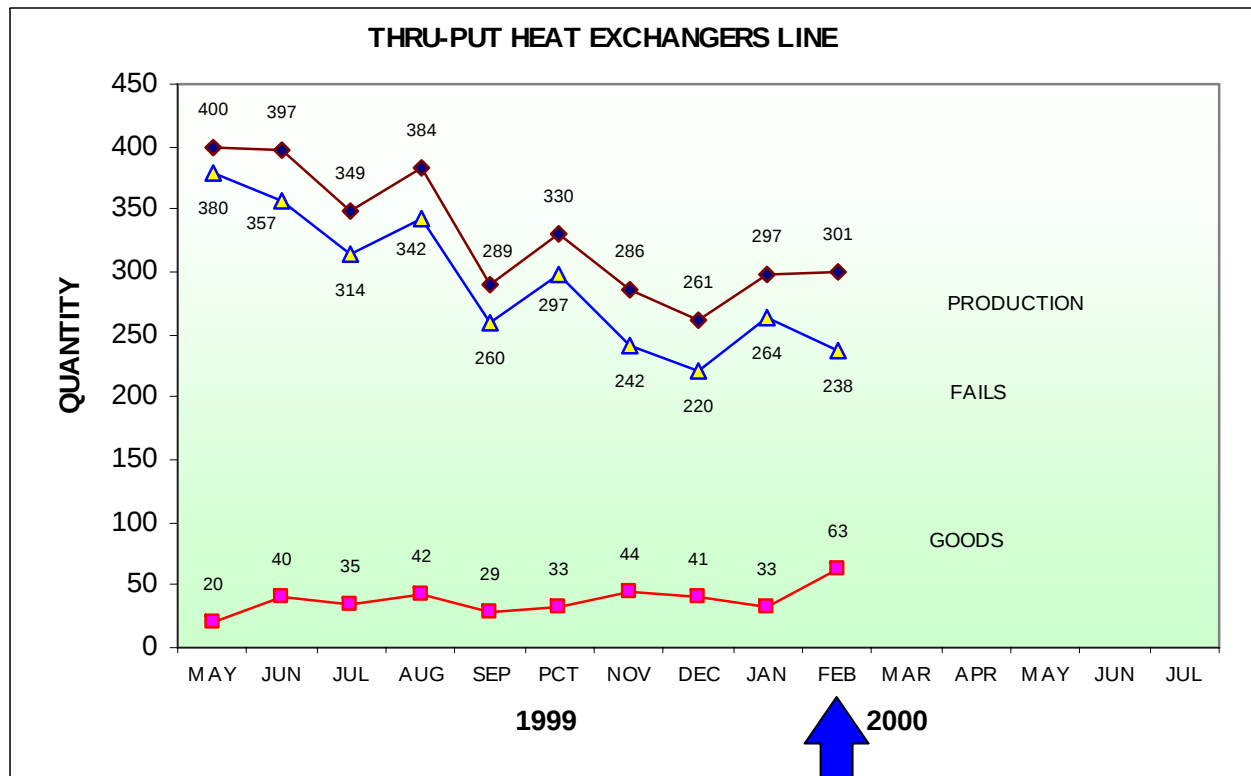
IMPROVEMENT STORY - STEP 1

IDENTIFY THE PROBLEM



IMPROVEMENT STORY - STEP 1

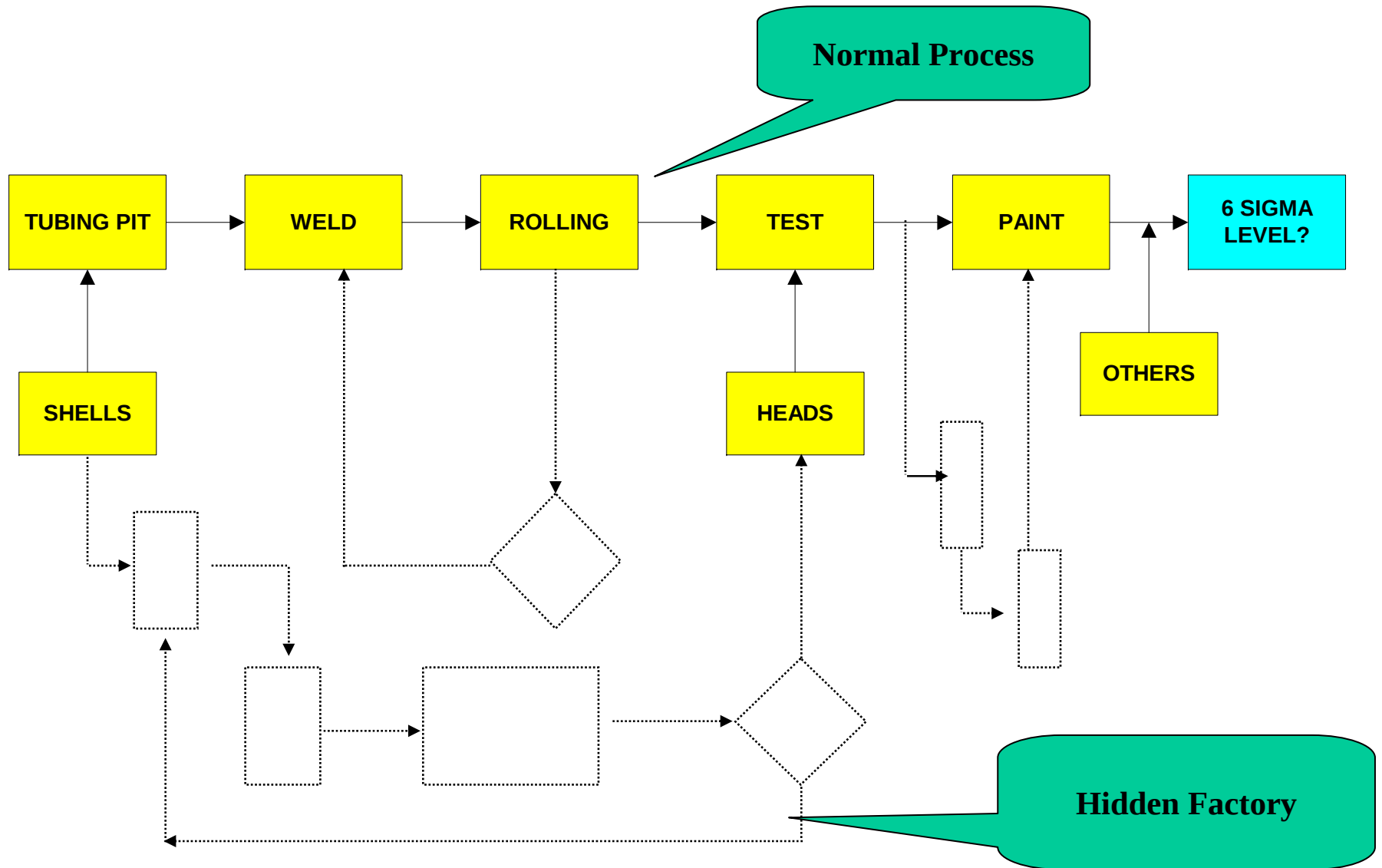
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**The Six Sigma level
is based on the
information from
the NCR's**

**The efficiency is 79 %
or 2.3 Sigma Value
around 211800 DPMO**

IMPROVEMENT STORY - STEP 1 IDENTIFY THE PROBLEM



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	Actual Method	Reason	Other Choices	Method Chosen	Improvement
Purpose 1	<i>What Happens?</i> Quality system measured by Non Conformance Reports	<i>Why do it?</i> To have control in the quality of the products	<i>Can something be done?</i> Measure the Quality Process under a Six Sigma Procedure in order to identify the opportunity areas	<i>What should be done?</i> Change the process to other process controlled by a Six Sigma Strategy	Implement TDU's forms to obtain measurements to establish the Six Sigma Level of the line
Place 2	<i>Where is it done?</i> In Heat Exchangers Line	<i>Why there?</i> Because the products manufactured in this line requires to be in accomplish with different quality requirements	<i>Can it be done somewhere else?</i> In Absorption Line, YCW and SLHX	<i>Where should it be done?</i> In Heat Exchangers Line	Implement TDU's from shell fabrication to shipment area and train people involved
Time 3	<i>When is it done?</i> Established	<i>Why is it done at that time?</i> Since the actual QA systems were established	<i>Can it be done another time?</i>	<i>When it should it be done?</i>	
Person 4	<i>Who does it?</i> Q. A. Personnel	<i>Why that person?</i> N/A	<i>Can another do it?</i> Yes	<i>Who should do it?</i> Nestor Cenicerros	Establish a procedure to implement Six Sigma Process and design different formats
Procedure 5	<i>How is it done?</i> Is the quantity of NCR's divided by the production in a period of time	<i>Why do it this way?</i> Same way than 10 years ago	<i>Is there another way?</i> Yes, using a Six Sigma procedure.	<i>What should be done?</i> Six Sigma Procedure	Identify Critical to Quality Characteristics to establish an indicator, create work teams, evaluate and identify critical areas.

IMPROVEMENT STORY - STEP 1

IDENTIFY THE PROBLEM

Item	Root Cause	What	How	Who	When			Status
					Initial	Changed	Real	
1	There are not TDU form established	Design TDU format	Team suggest	Cesar Maldonado	Feb/04/00		Feb/04/00	OK
2	NCR's are the only format to colect quality problems	Implement TDU format in the line	25 format per area or work station	Saul Rivera	Feb/08/00		Feb/08/00	OK
2	Missing training for the new method	Train for workers and personnel involved	At the shop floor	Marco Velarde	Feb/10/00		Feb/10/00	OK
5	There are not teams working in increase the Six Sigma Level	Create work teams focused in the areas with lowest quality efficiency	Select people involved in the quality problem of their area	Team	Mar/14/00		Mar/14/00	OK
4	There are not enough information related to the six sigma process	Investigate and look for information related with this issue	Books, Black Belt Training, internet, etc	Nestor Cenicerros	Jul/17/00		Jul/17/00	OK
5	Indefinite Critical to Quality Characteristics	Define CQC's	Reviewing each step of the process and choosing the defects reported in the TDU forms	Team	Jul/17/00		Jul/17/00	OK
4	There are not format to evaluate the quality efficiency	Design format to evaluate RTPY and TPY in the line	Using data collected from TDU's, CQC and production units	Nestor Cenicerros	Aug/11/00		Aug/11/00	OK
5	There are not real Six Sigam Evaluation	Evaluate the Six Sigma Level of the line	Using the efficiency collected from the TPY format	Nestor Cenicerros	Aug/15/00		Aug/15/00	OK
5	Areas not identified with low efficiency	Identify the areas with the lowest quality	Using the information from the TPY format	Team	Aug/18/00		Aug/18/00	OK

IMPROVEMENT STORY - STEP 1

IDENTIFY THE PROBLEM

	Week No.	8	Heat Exchangers				
	Production	72					
Area	Critical to Quality Characteristics	Value	Qty/Week	Total CQC	Defects	TPY	RTPY
Shell Fabrication	Dimentions	1		72	20	97.22%	91.26%
	Holes	6		432			
	Roll	1		72			
	Bevel	2		144			
Tubing	Tube Assembly Quantity	1	27151	27151	31	99.89%	
Initial Assembly	Water Baffle Assembly	1		72	2	99.44%	
	Shell Tack	1		72			
	Travel Sheet	1		72			
	Tube Sheet	2		144			
Weld	Close and Tack Shell	1		72	5	98.37%	
	Coupling weld	4		288	3		
	Circular Weld	2		144			
	Seam Weld	1		72			
	Connections Weld	2		144	2		
	Total Length	1		72			
	Connections Aligned	2		144	8		
	Supports Aligned	2		144			
	Coupling Aligned	2		144	2		
Rolling Tube	Tubes per Tube Sheet	1	54302	54302	7	99.99%	
Test	Torque	1		72	3	98.87%	
	Studs	1		72	1		
	Cleaning	1		72	3		
	Material Marked	5		360			
	Test Plugs	8		576	6		
Paint	Color	1		72	3	99.48%	
	Insulation	1		72			
	Brackets Assembly	2		144			
	Labels	1		72			
	Finishing Touch	1		72			
	Plastic Covers	1		72			
	Nitrogen Charge	1		72			
Heads	Nozzle Weld	4		288	1	99.77%	
	Rectify	1		72			
	Drill	1		72			
Machinery	Diverse	2		144	3	97.92%	
Others	Diverse	1		72		100.00%	

Critical to Quality Characteristics

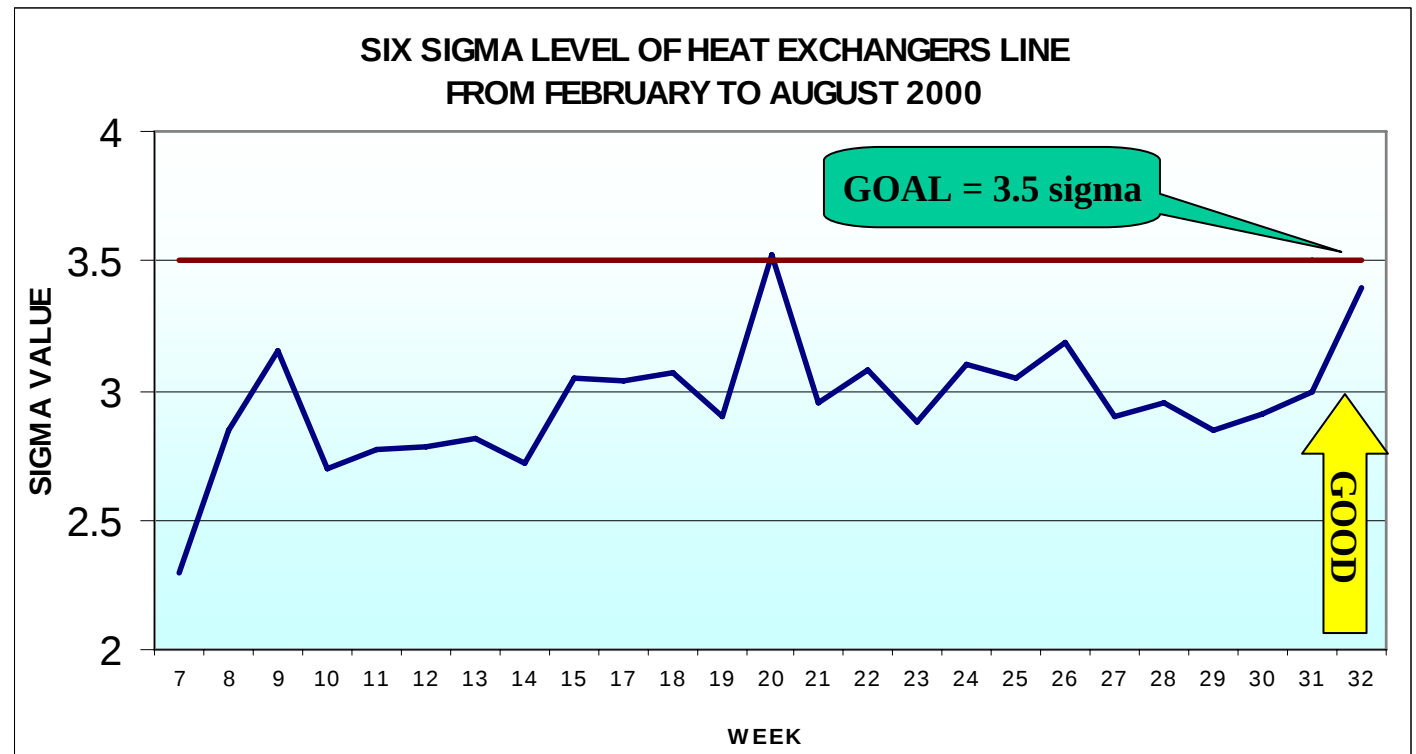
TPY of each work area

RTPY of the line

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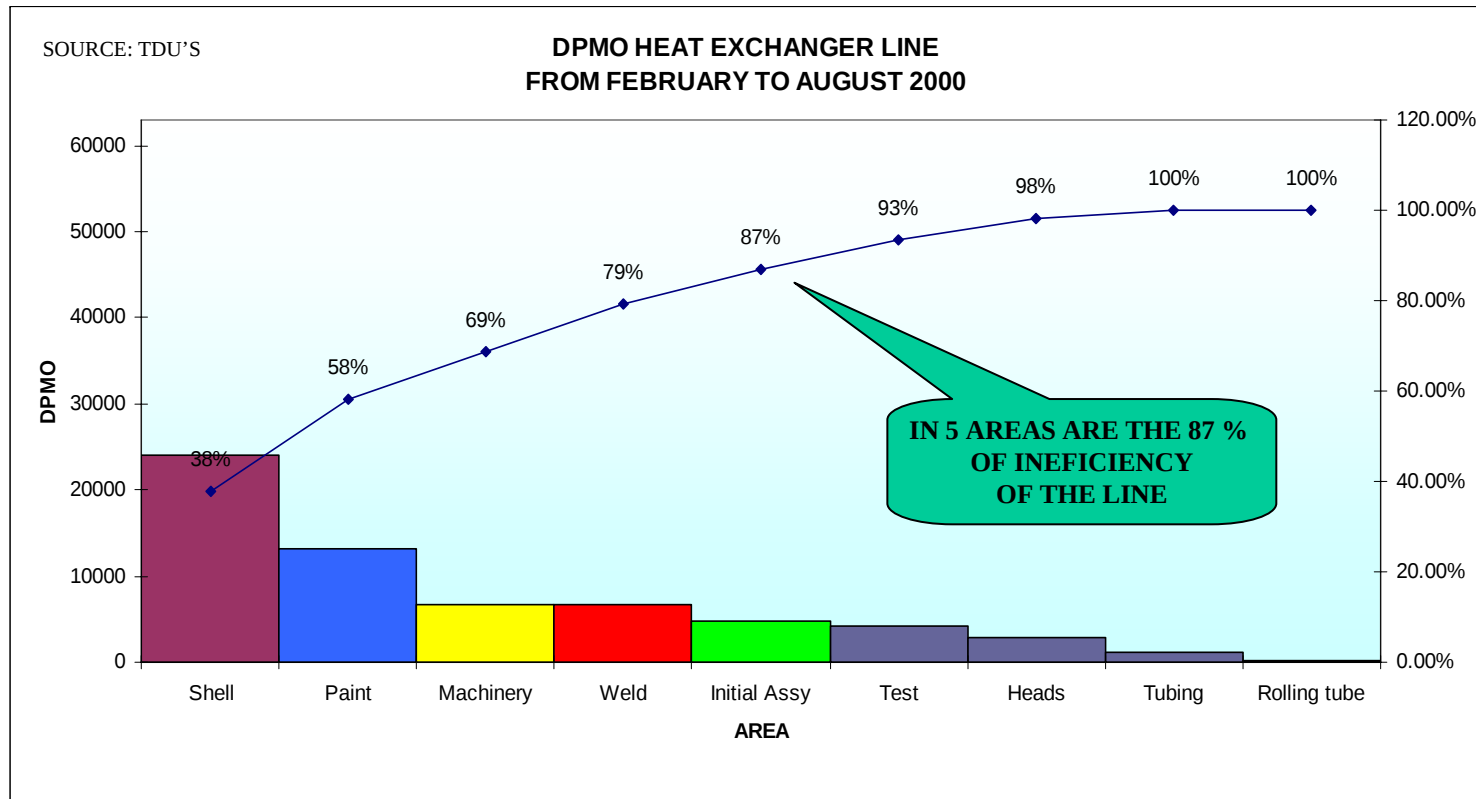
Week	RTPY	DPMO	6 G	GOAL
7	79.00%	211000	2.3	3.5
8	91.26%	87400	2.85	3.5
9	95.12%	48800	3.15	3.5
10	88.80%	112000	2.7	3.5
11	90.04%	99600	2.77	3.5
12	90.08%	99200	2.78	3.5
13	90.47%	95300	2.81	3.5
14	88.76%	112400	2.72	3.5
15	93.82%	61800	3.05	3.5
17	93.55%	64500	3.04	3.5
18	94.23%	57700	3.07	3.5
19	91.88%	81200	2.9	3.5
20	98.12%	18800	3.52	3.5
21	92.78%	72200	2.95	3.5
22	94.14%	58600	3.08	3.5
23	91.16%	88400	2.88	3.5
24	94.62%	53800	3.1	3.5
25	93.81%	61900	3.05	3.5
26	95.42%	45800	3.19	3.5
27	92.19%	78100	2.9	3.5
28	92.28%	77200	2.95	3.5
29	91.34%	86600	2.85	3.5
30	92.27%	77300	2.91	3.5
31	93.40%	66000	3	3.5
32	97.26%	27400	3.4	3.5



The information is collected every week from the TDU's filled by the operators, supervisors and auditors.

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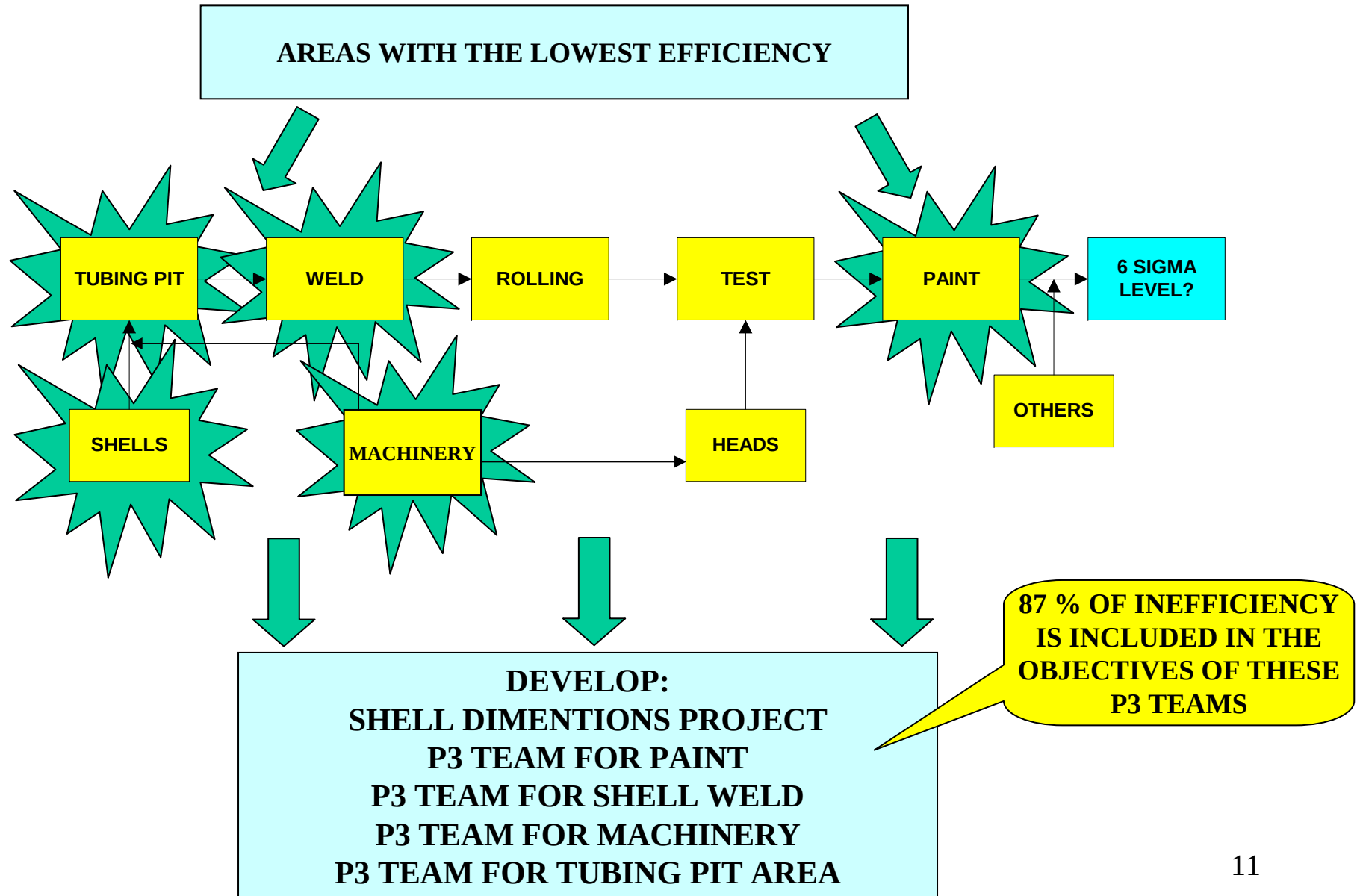
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TPY: Throughput yield is the probability that all defect opportunities produced at particular step in the process will conform to their respective performance standards, “doing all things right at a given point in the process”

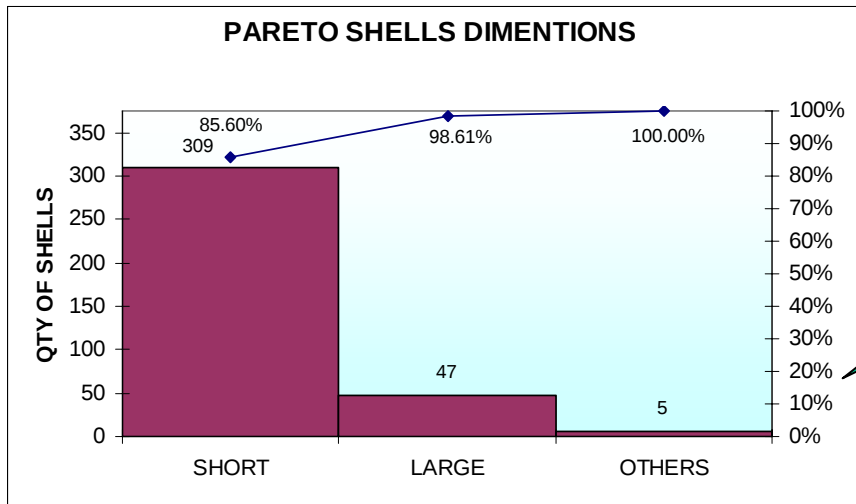
RTPY: Rolled throughput yield is the probability of being able to pass a unit of product or service through the entire process defect-free, “doing all things right at each step across an entire series of process steps.

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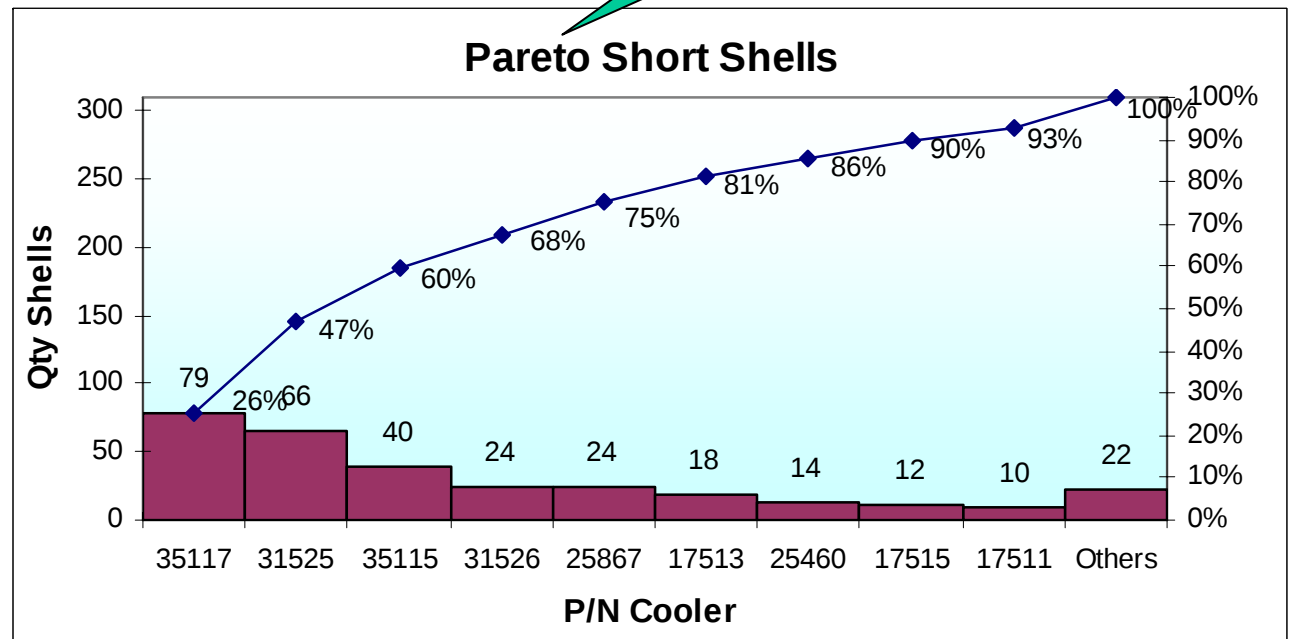
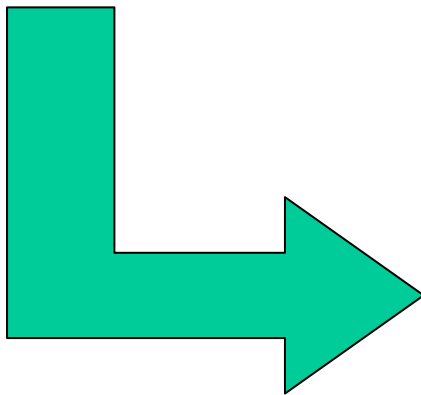
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**Pareto Chart for Shells
Second Level**

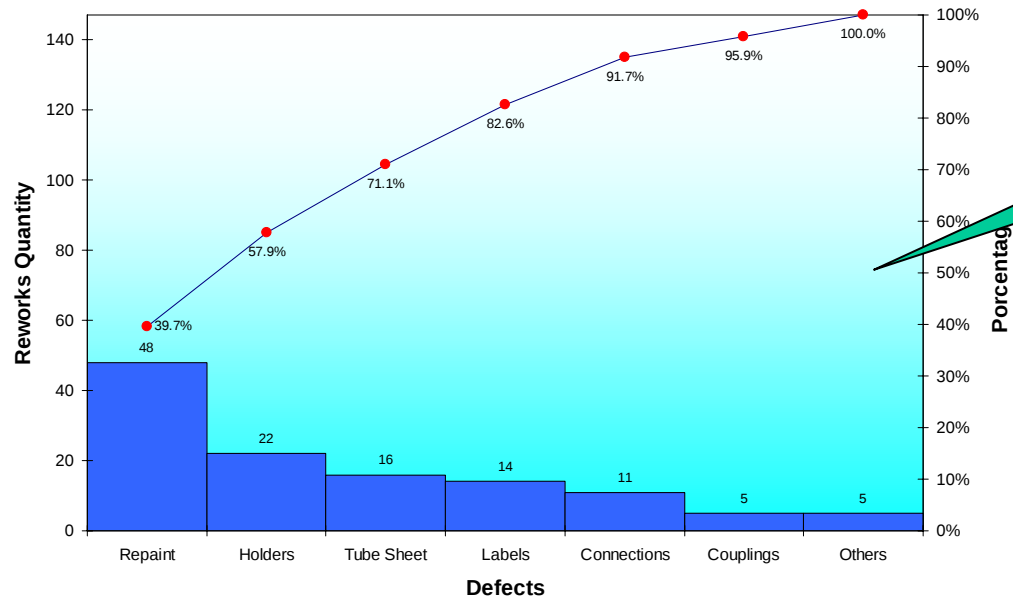
**Pareto Chart for Shells
Third Level**



IMPROVEMENT STORY - STEP 1

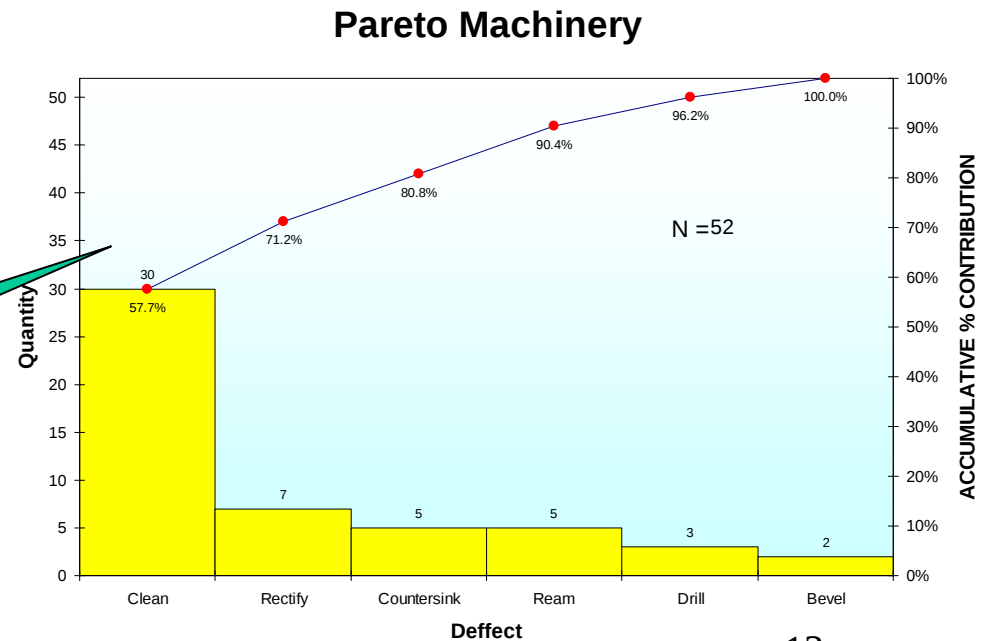
IDENTIFY THE PROBLEM

Paint Reworks



Pareto Chart for Paint Reworks Second Level

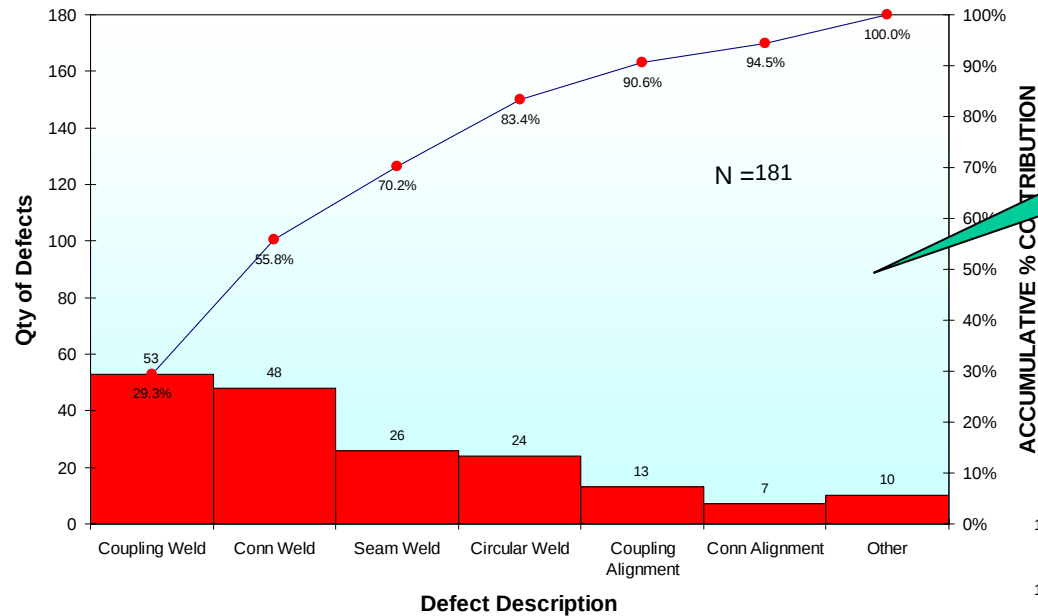
Pareto Chart for Machinery Second Level



IMPROVEMENT STORY - STEP 1

IDENTIFY THE PROBLEM

Pareto Shell Weld

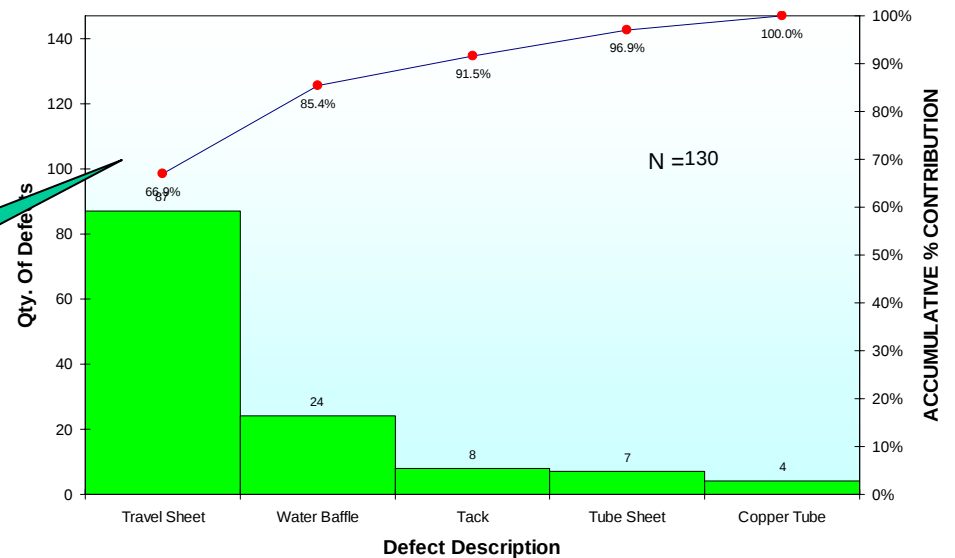


Pareto Chart for Shell Weld Defects Second Level

Name: Nestor Cenicerros
Date: Sep/05/00
Source: TDU's

Pareto Chart for Initial Assembly Second Level

Pareto Initial Assy.



Name: Nestor Cenicerros
Date: Sep/05/00
Source: TDU's

HISTORIA DE MEJORA - PASO 2

ANALIZAR LAS CAUSAS

HISTORIA DE MEJORA - PASO 3

GENERAR Y SELECCIONAR CONTRAMEDIDAS

HISTORIA DE MEJORA - PASO 4

IMPLEMENTAR/EVALUAR RESULTADOS

IMPROVEMENT STORY - STEP 5 STANDARDIZE AND REPLICATE IMPROVEMENTS

STEP CHECKLIST [Remove when step is completed]

The proven countermeasures / standards developed become a part of the daily work
A plan or control system [what, who, frequency] is in place to monitor ongoing performance
Opportunities to replicate the lessons learned and countermeasures have been factored into the action plan
Any remaining gaps in performance have been addressed or planned to be addressed
Lessons learned about the success and failure of the team / individual have been evaluated and/or acted upon
Revise flowchart and procedures
Communicate changes

Helpful Tools & Techniques [Remove when step is completed]

Flowchart
Policies / Procedures / Standards
Control System
Brainstorming
Pareto Analysis
Radar Chart