"The Importance of Attribute Recognition in the Quality Analysis and Control Process at Multinational Automotive Parts Suppliers in North America"

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Background

- Educational
  - <u>Eastern Kentucky University</u>
    - Bachelor of Art
    - Master of Business Administration
    - Master of Science-Manufacturing Technology
    - Master of Science-Loss Prevention & Safety
  - <u>Indiana State University</u>
    - Doctor of Philosophy-Technology Management with emphasis in Manufacturing Systems (Dissertation Target-2007)

- Professional
  - Twenty four years in manufacturing with eighteen of these in senior executive positions in Japanese-American automotive factories in North America.
  - Most recently as General Manager of Production Planning for a parts supplier for Toyota Motor Manufacturing of North America

Why is study relevant?

- In 2003 Toyota Motor Corporation Surpassed Chrysler as the #3 producer of vehicles in North America. In 2007, they are expected to surpass General Motors as the #1 global supplier of automobiles.
- Since the late 1980's Toyota has opened or announced seven new automobile production facilities in North America with more additional facility announcements pending. Nissan opened new facilities in Mississippi, Honda & Hyundai in Alabama.
- German producers Mercedes & BMW operate manufacturing facilities in Alabama and South Carolina respectively
- With these assembly plants has come additional significant development in supplier networks generally locating close to the manufacturing sites.
- Global collaborative engineering and development activity has now become the norm
- Design and development activity is no longer geographically constrained thus creating new dimensions and new challenges that have not been encountered in traditional manufacturing settings (i.e.: language, location, style)

General Japanese Automotive Parts Development Structure

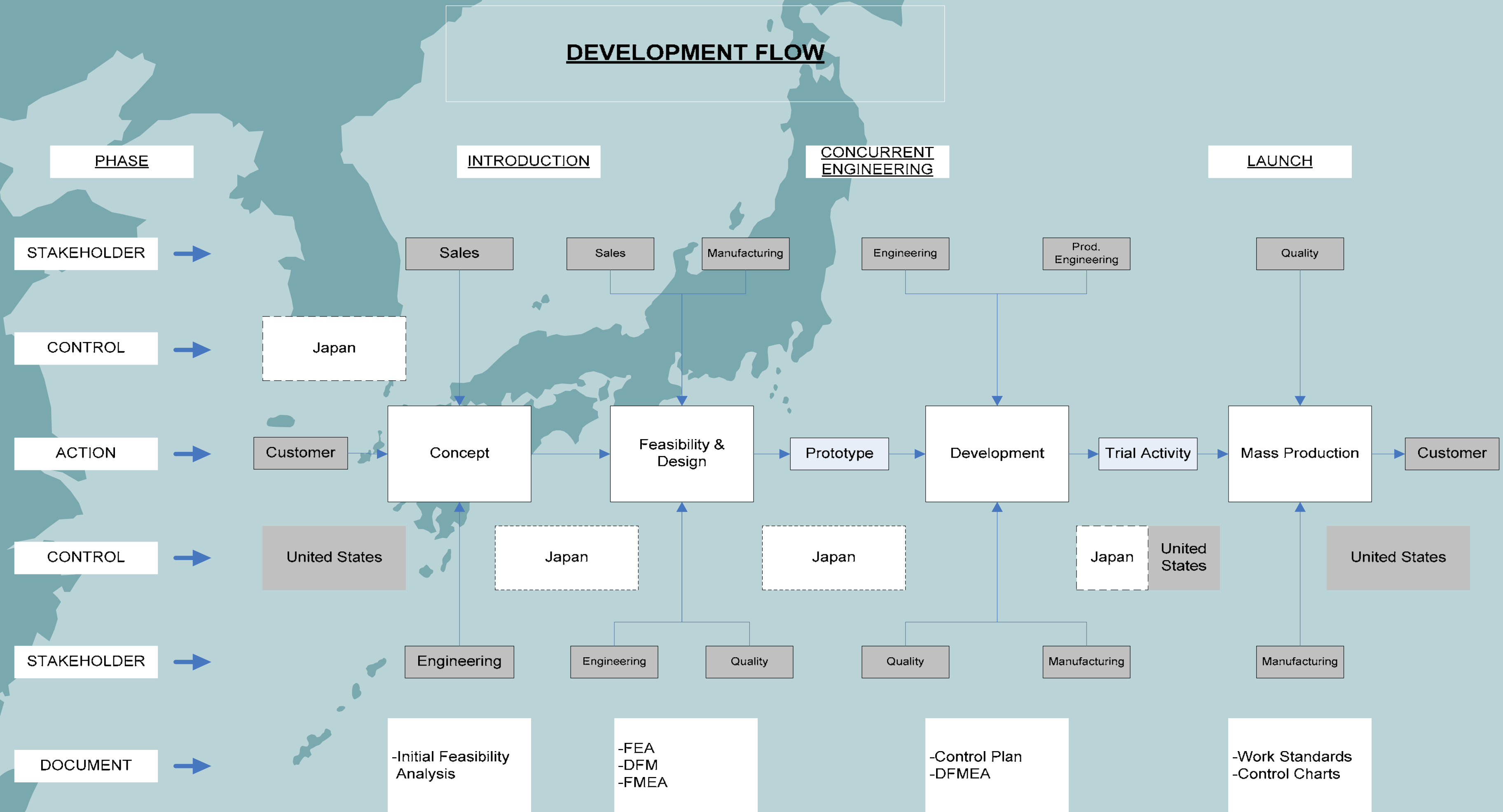

FIGURE (A)

Japanese Parts Development

- Substantial investment in R&D facilities in Japan
- Original Equipment Manufacturing (OEM) design facilities located in Japan
- Substantial early development activity occurring in Japan
- Generally local facilities not involved in preliminary design phases indicating a weaknesses in the global concurrent engineering process

Attempts at Global Standardization of Quality & Development

- ISO-9000
  - Interpretation of the standards
  - Rigor of certification varies
- QS-9000
  - Only applicable to the North American traditional automotive producers
  - Not generally recognized by Japanese OEM producers
- TS-16949
  - The next attempt and global standardization of quality standards
    - Will it address issues of interpretation?

Case Study

Japanese-American Supplier of Welded & Assembled Components in the Midwest

- Facility has operated in North America in excess of five years
- Facility is a wholly owned subsidiary of an eighty year old automotive supplier in Japan
- Facility top management is characterized by Japanese expatriates with subordinate local staff
- All engineering and development activity coordinated between Japanese parent and expatriated technical staff

Manufacturing Process

Manufacturing Process

Material →	Zinc Coated Carbon Steel	Zinc Coated Carbon Steel	Zinc Coated Carbon Steel/ Copper Welding Tip	Zinc Coated Carbon Steel/ Copper Welding Tip
Process →	Primary Metal Blanking	Component Metal Forming	Initial Component Resistance Welding	Final Assembly Resistance Welding
Machine →	450 Ton Blanking Press	1500/2500 Ton Blanking Press	10,450-11,550 Amp Resistance Welding Guns	10,450-11,550 Amp Resistance Welding Machine

Figure (B)

Welding Process

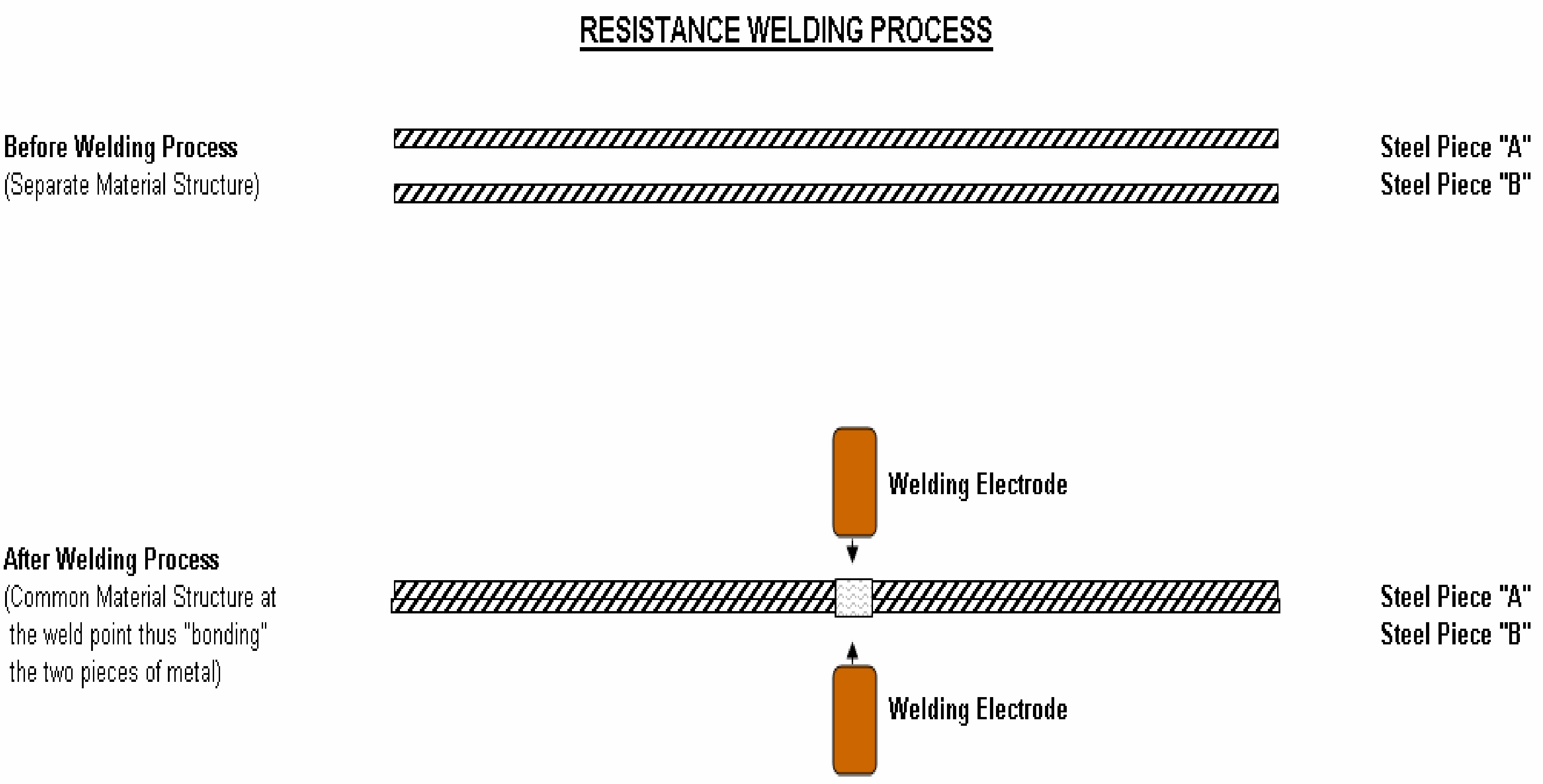

Figure (C)

Development Structure (DFMEA & PFMEA)

PRIMARY FAILURE EVALUATION ANALYSIS

Process	PRIMARY METAL BLANKING	METAL FORMING	INITIAL COMPONENT RESISTANCE WELDING	FINAL ASSEMBLY RESISTANCE WELDING
Area	**Material**	**Process**	**Process**	**Process**
FAILURE BASIS	Chemical Imbalance	Low spots in die	Improper Voltage	Improper Voltage
	Wrong Width & Size	Scrap build up in die	No Water Flow to Tip	No Water Flow to Tip
	Dimensional	Breakage of die	Welding Tip off center	Welding Tip off center
		Poor Machine settings	Holding fixture contaminated	Holding fixture contaminated
		Low points in the dies	Hold pressure	Hold pressure
		"Folding" of material	Cold Welds	Cold Welds
		Mis hits in die or double hits	Pin Holes	Pin Holes
		Folding	No Welds	No Welds
		Thinning		
		Splits		

Figure (D)

Development Structure (Control Plan)

CONTROL PLAN ANALYSIS

Process	PRIMARY METAL BLANKING	Control	METAL FORMING	Control	INITIAL COMPONENT RESISTANCE WELDING	Control	FINAL ASSEMBLY RESISTANCE WELDING	Control
Area	Material		Process		Process		Process	
FAILURE BASIS	Chemical Imbalance	Material Certification and Mill Analysis	Low spots in die	Inspection	Improper Voltage	Check Sheet Machine Setting	Improper Voltage	Check Sheet Machine Setting
	Wrong Width & Size	Inspection	Scrap build up in die	Inspection	No Water Flow to Tip	Check Sheet Machine Setting	No Water Flow to Tip	Check Sheet Machine Setting
	Dimensional	Inspection	Breakage of die	Inspection	Welding Tip off center	Check Sheet Standard	Welding Tip off center	Check Sheet Standard
			Poor Machine settings	Check Sheet	Holding fixture contaminated	Check Sheet Visual	Holding fixture contaminated	Check Sheet Visual
			Low points in the dies	Inspection	Hold pressure	Check Sheet Machine Setting	Hold pressure	Check Sheet Machine Setting
			"Folding" of material	Inspection	Cold Welds	Destructive Test Specification	Cold Welds	Destructive Test Specification
			Mis hits in die or double hits	Inspection	Pin Holes	Visual	Pin Holes	Visual
			Folding	Inspection	No Welds	Visual	No Welds	Visual
			Thinning	Inspection				
			Splits	Inspection				

Figure (E)

Launch Performance Statistics

SOP Initial Lanuch Performance

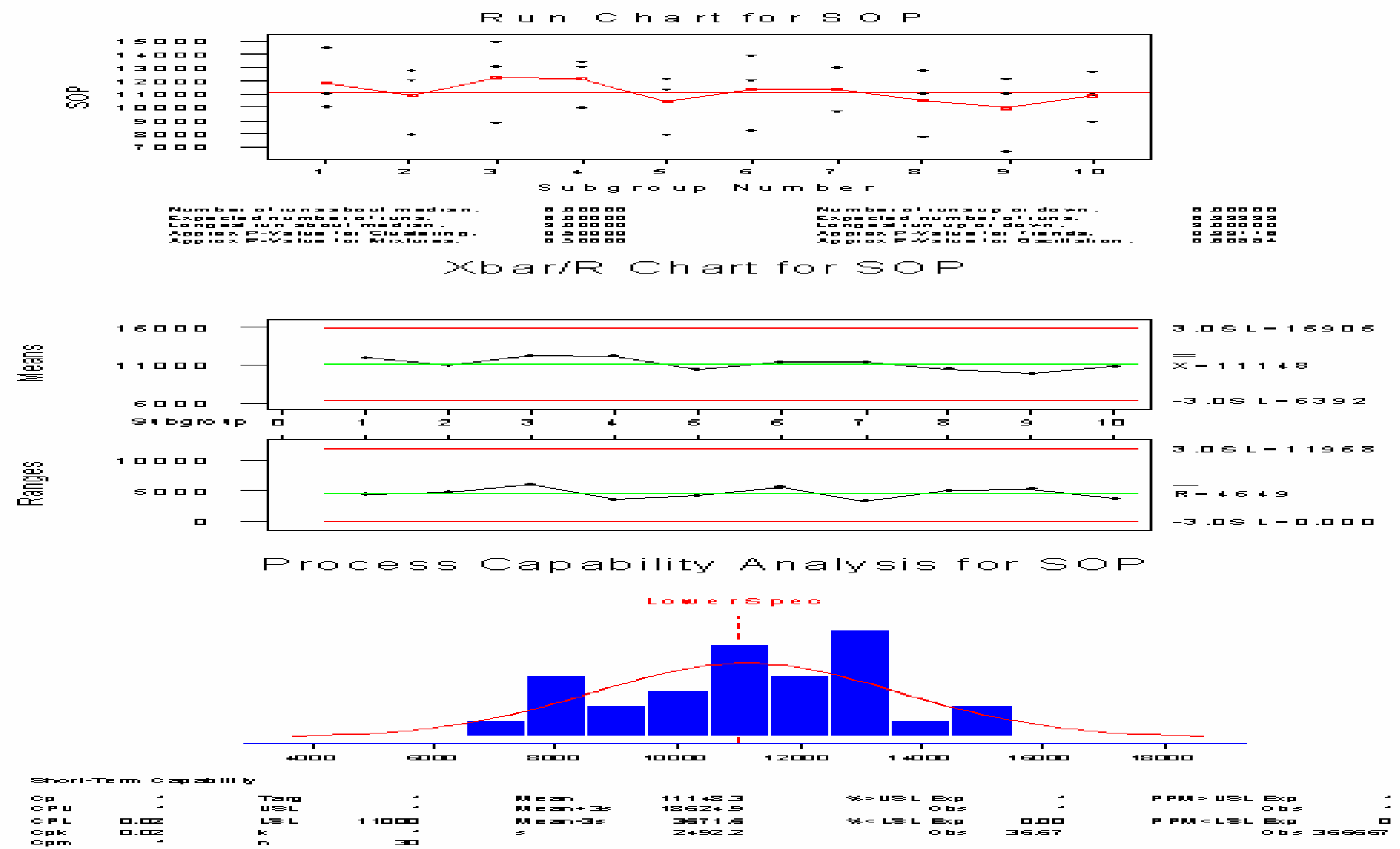

Figure (F)

Investigation

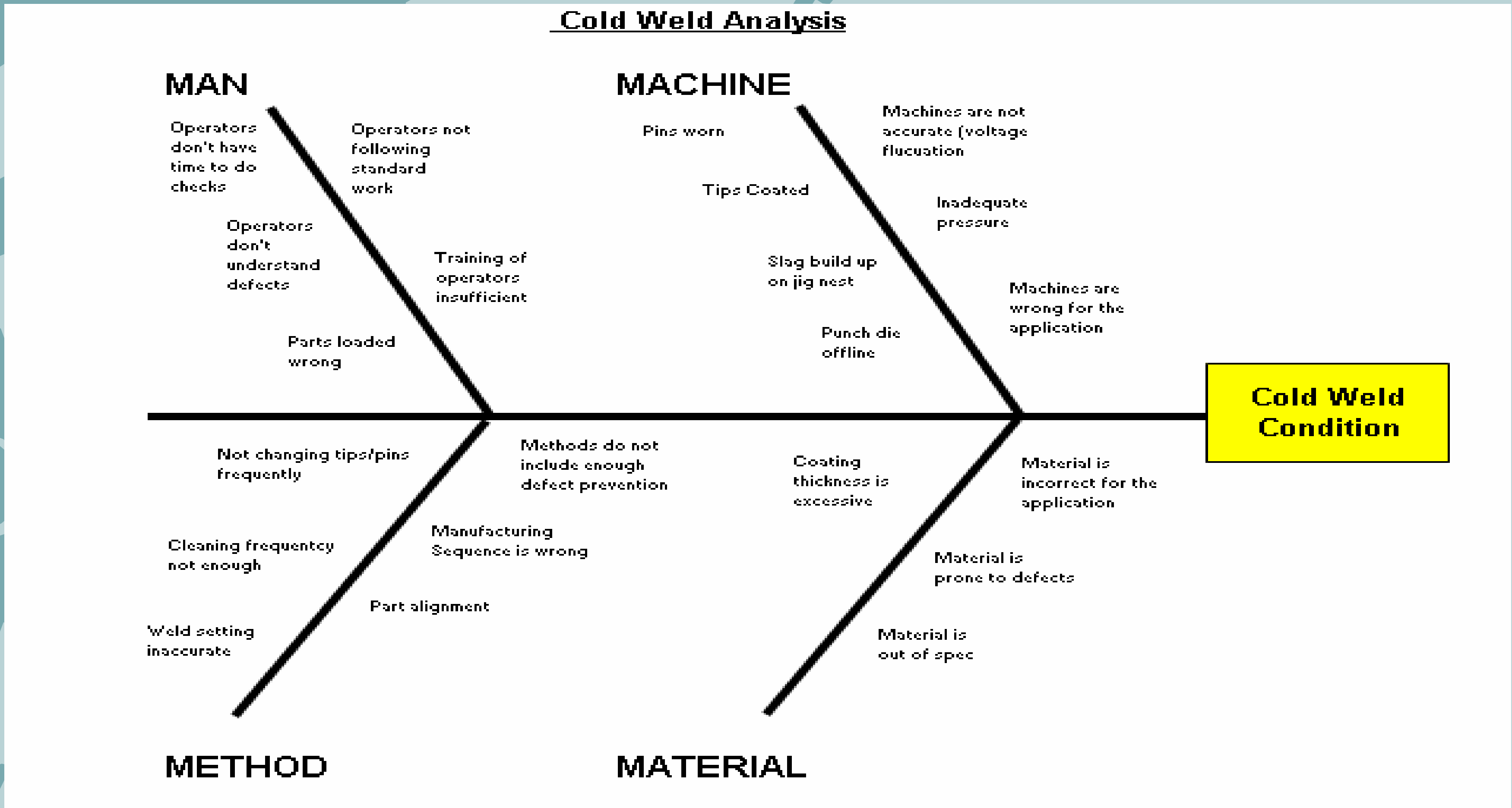

Figure (G)

Key Variables Analysis

Current & Pressure Analysis

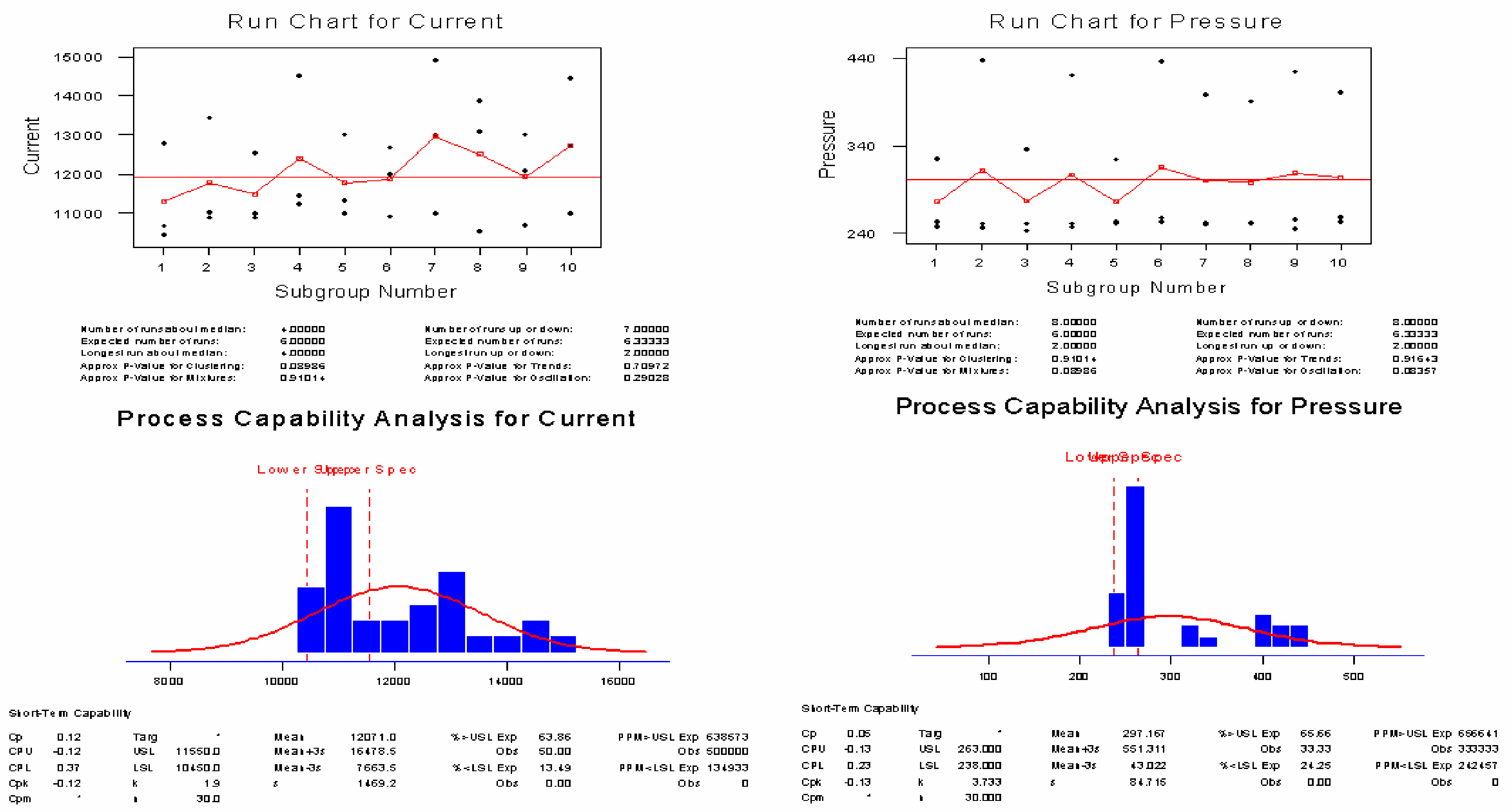

Figure (H)

Post Improvement Analysis

Post Improvement Analysis

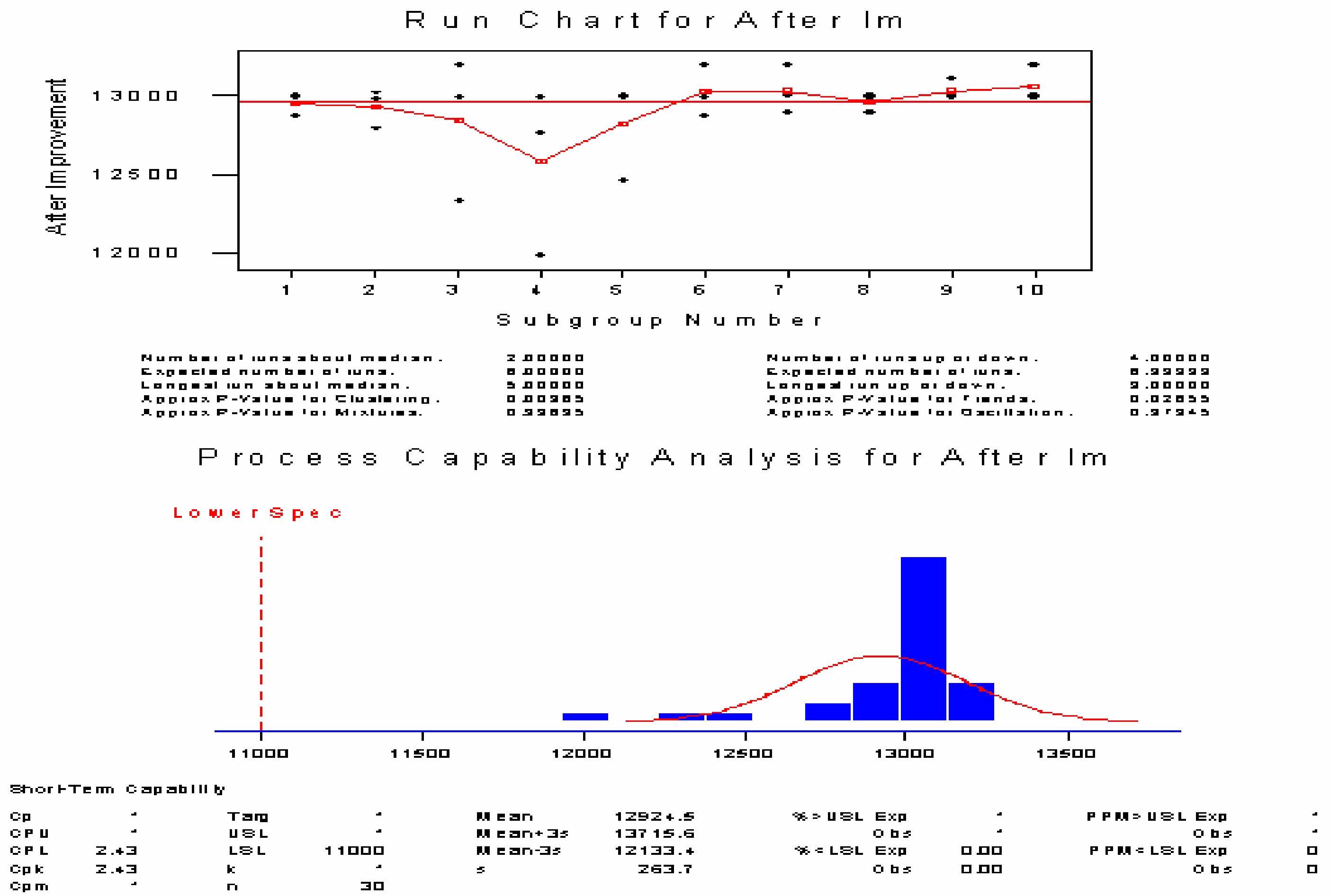

Figure (I)

"True" Root Cause

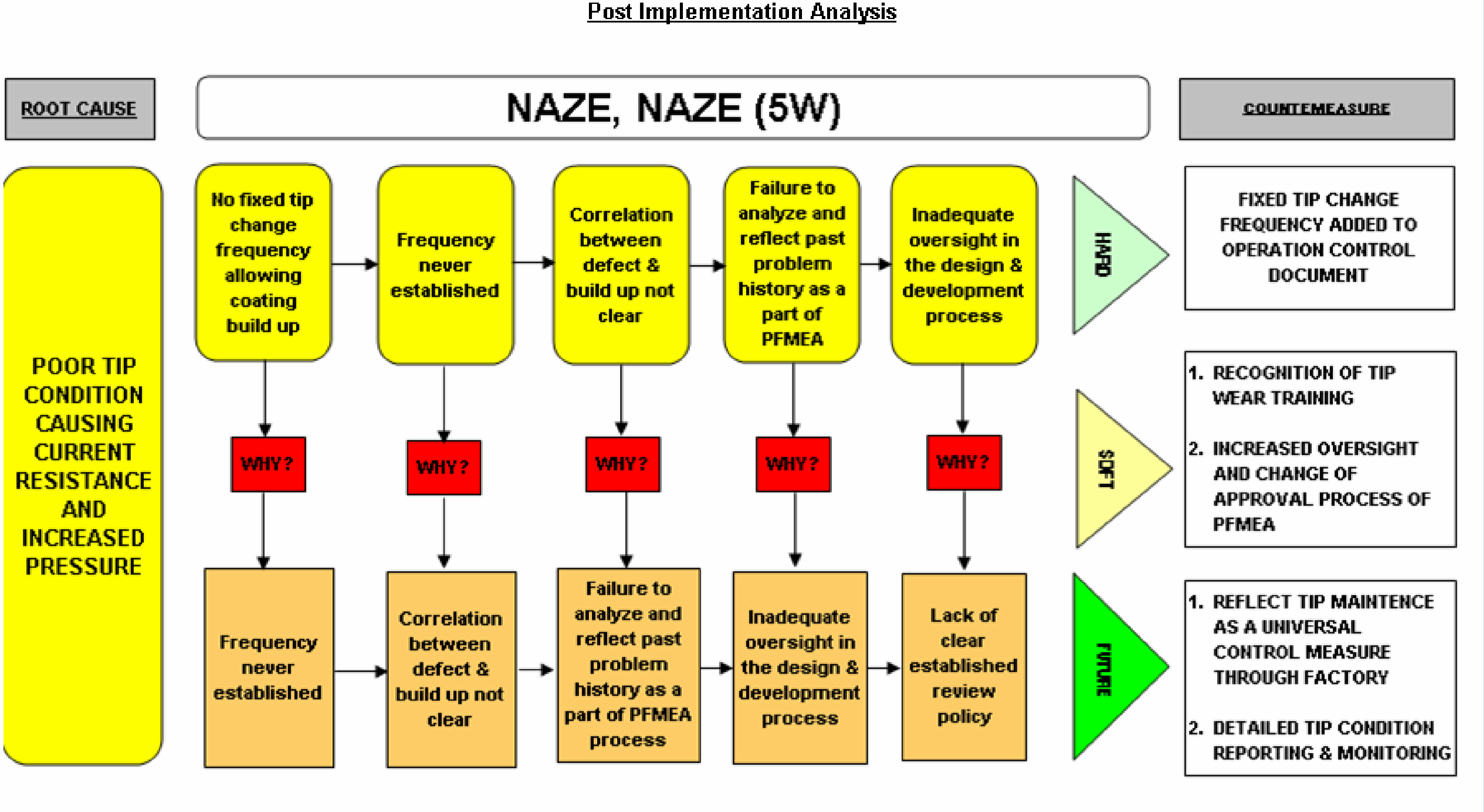

Figure (J)

Conclusion

Japanese Design & Development

-Variables Identification
Failure Potentials

FAILURE
POTENTIAL

North American Production

-Attribute Failure Contribution

Questions?