

Seminář – Studium metodiky Six Sigma - Praha 15.03.2007



ZVVZ a.s.

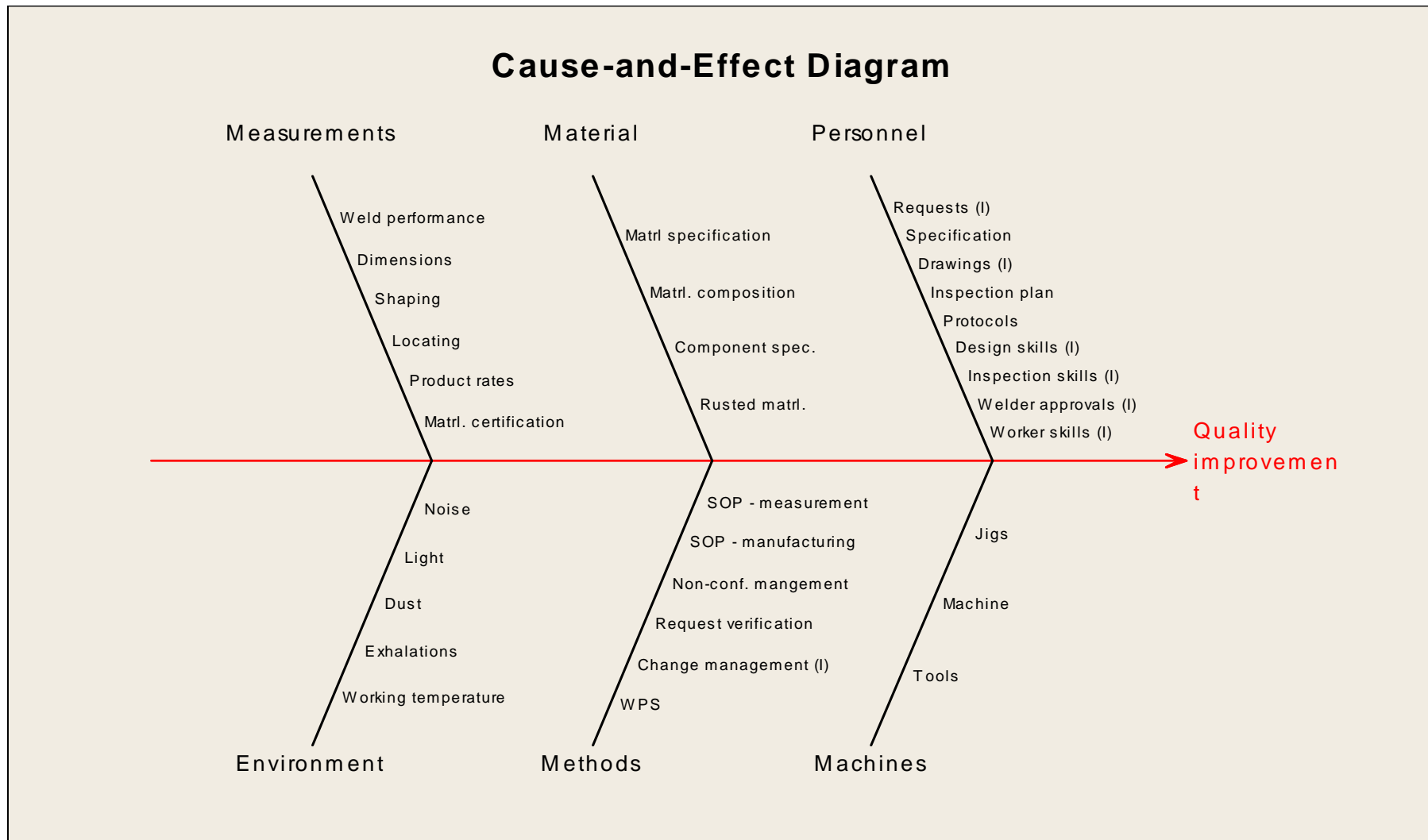
Dodavatel zařízení pro ekologii

- Ing Vít Tibitzanži

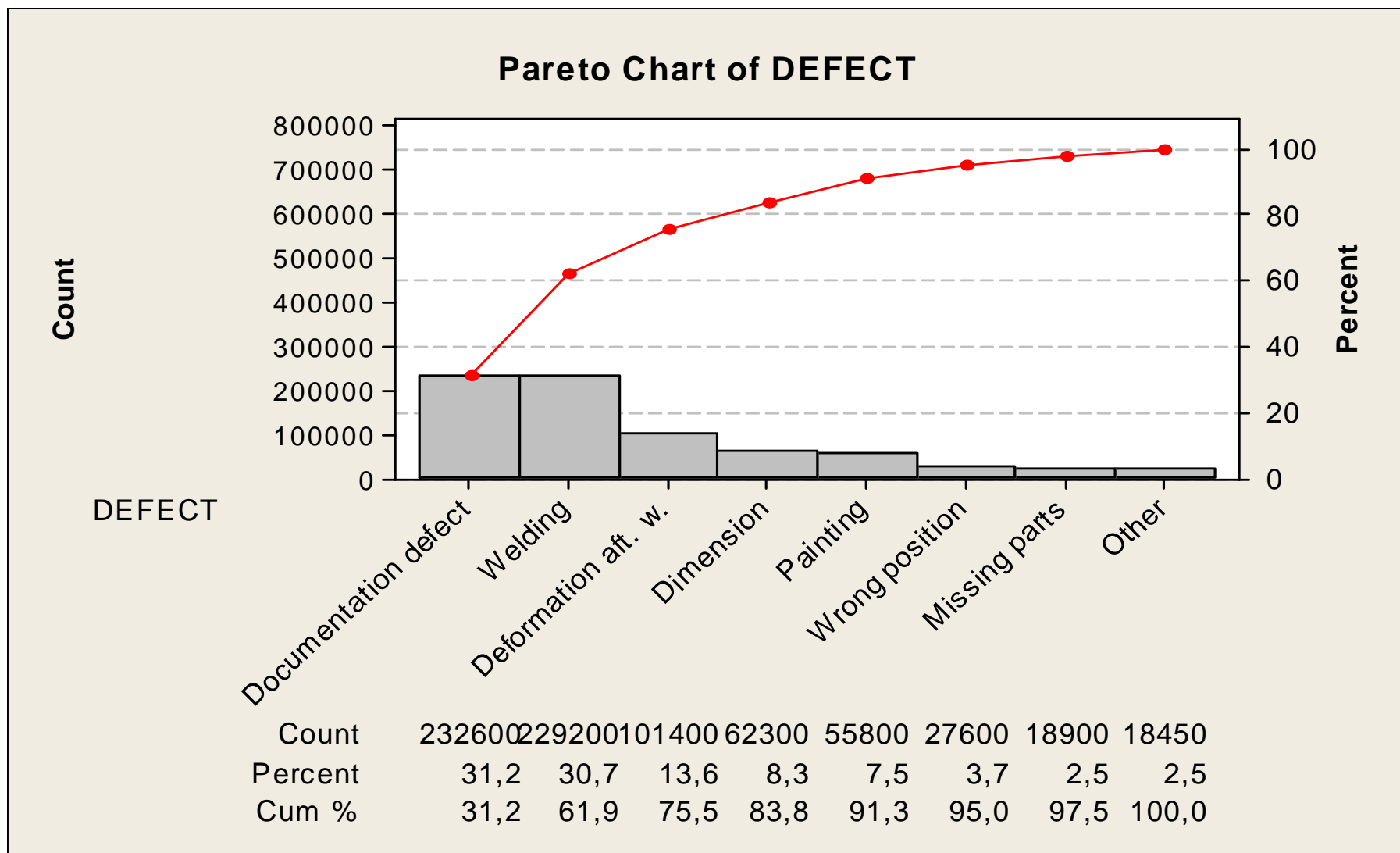
- **Obsah :**

1. Definování - Diagram příčin a efektů
 - Paretova analýza
 - Základní statistické veličiny
2. Analýza
 - Korelace
 - Regrese
 - Měřicí metody (R&R)
 - Multi –Vari
 - Testování hypotéz
3. Zlepšování - DOE
 - Anova
4. Kontrola a údržba – 5 s

Diagram příčin a efektů

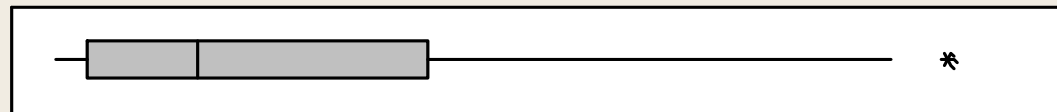
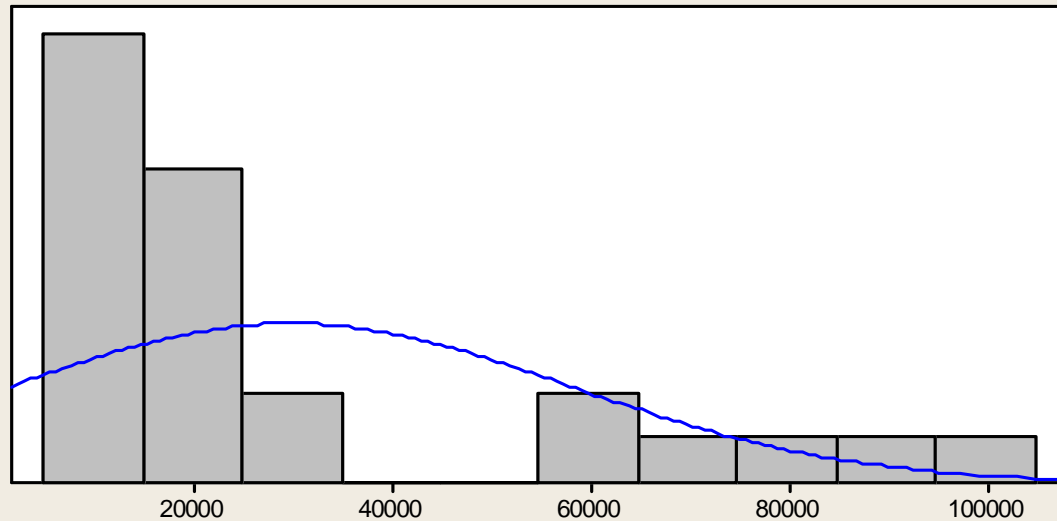


Paretova analýza

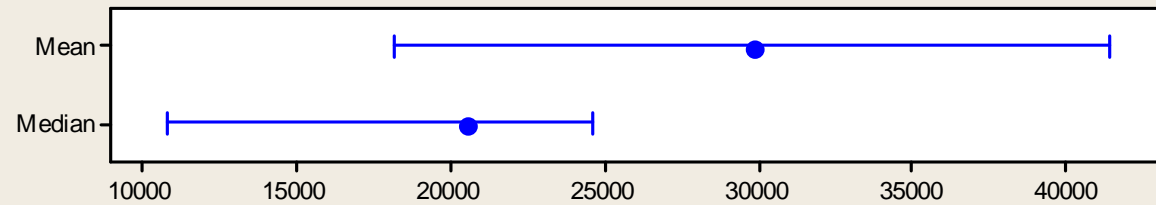


Základní statistické veličiny

Summary for Total cost



95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared	2,63
P-Value <	0,005

Mean	29850
StDev	28172
Variance	793656167
Skewness	1,34743
Kurtosis	0,43282
N	25

Minimum	6110
1st Quartile	9375
Median	20540
3rd Quartile	43750
Maximum	96330

95% Confidence Interval for Mean

18221	41479
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95% Confidence Interval for Median

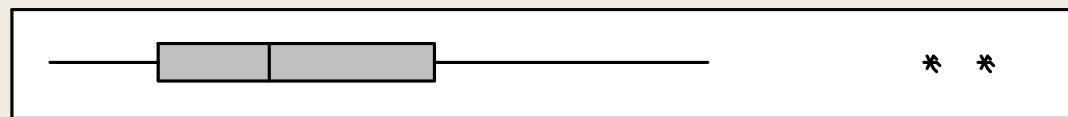
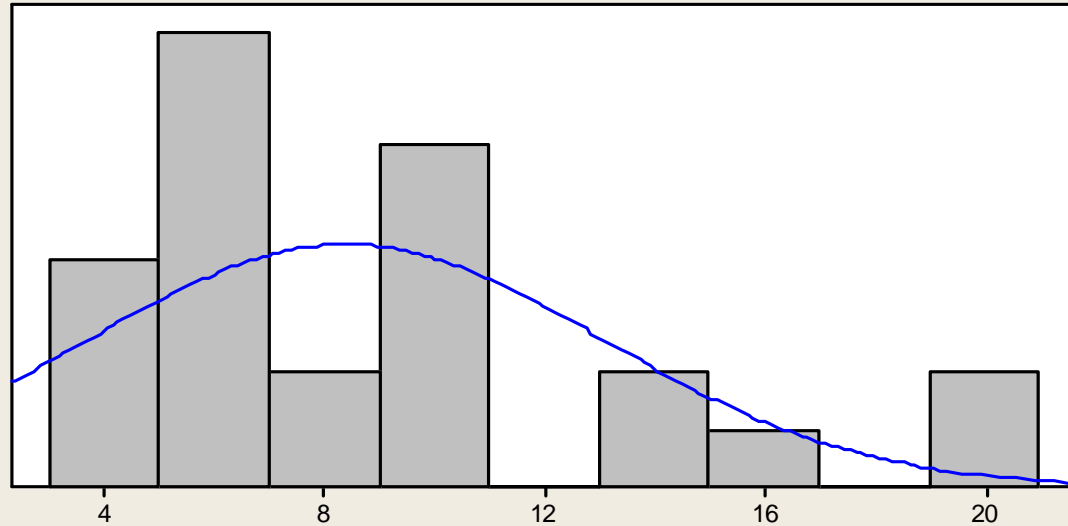
10834	24676
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95% Confidence Interval for StDev

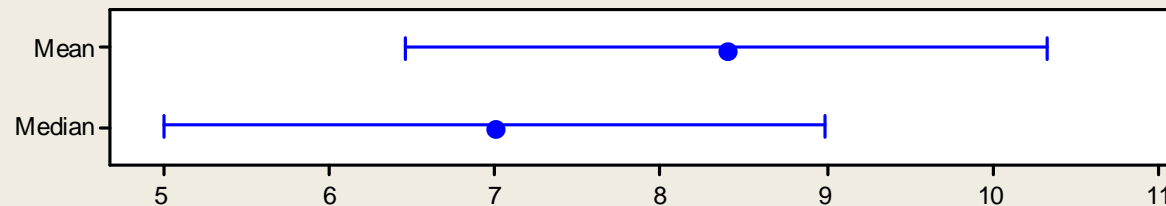
21997	39191
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Základní statistické veličiny

Summary for Total No



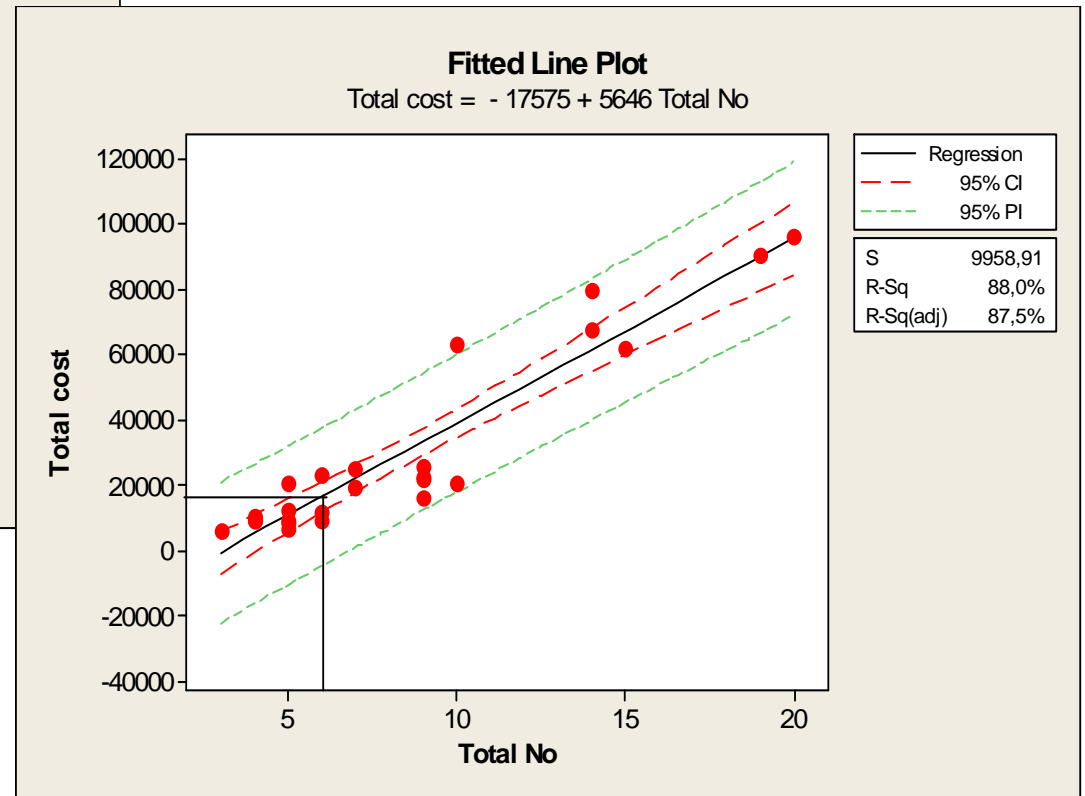
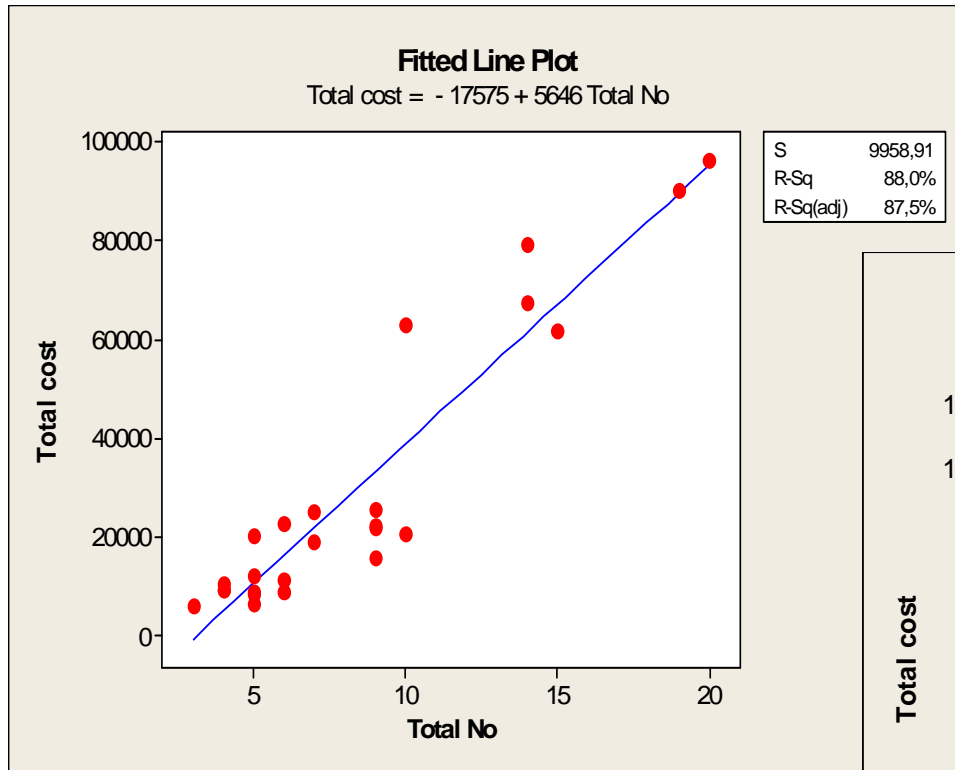
95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared	1,29
P-Value <	0,005
Mean	8,4000
StDev	4,6815
Variance	21,9167
Skewness	1,21087
Kurtosis	0,74793
N	25
Minimum	3,0000
1st Quartile	5,0000
Median	7,0000
3rd Quartile	10,0000
Maximum	20,0000
95% Confidence Interval for Mean	6,4676 10,3324
95% Confidence Interval for Median	5,0000 9,0000
95% Confidence Interval for StDev	3,6555 6,5127

Korelace a regrese

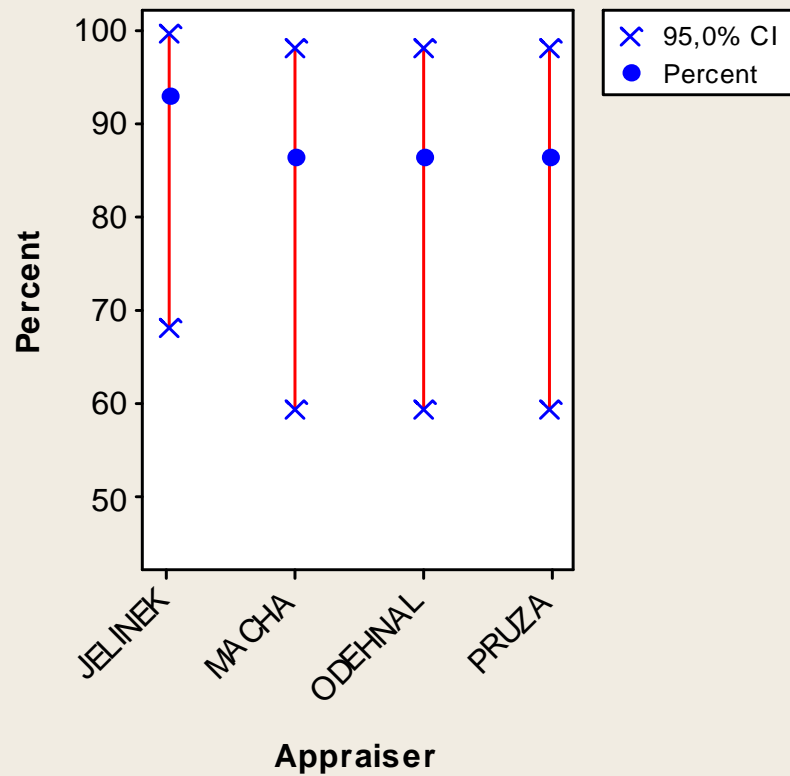


Měřicí metody R&R

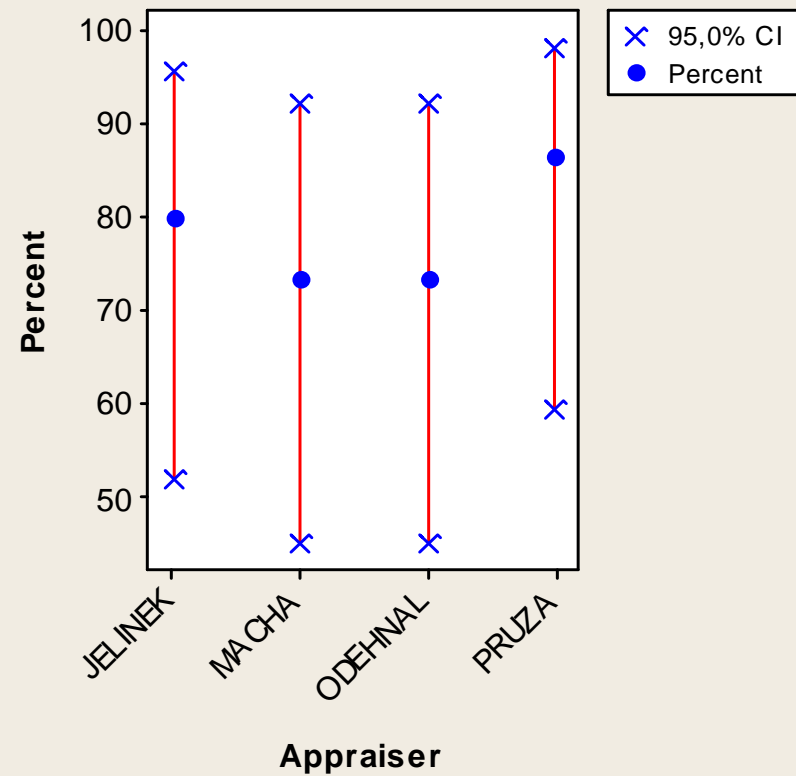
Assessment Agreement

Date of study: 8.3.2005
Reported by: Vit TIBITANZL
Name of product: Project - Non-conform. c
Misc: Evolution EN ISO 5817

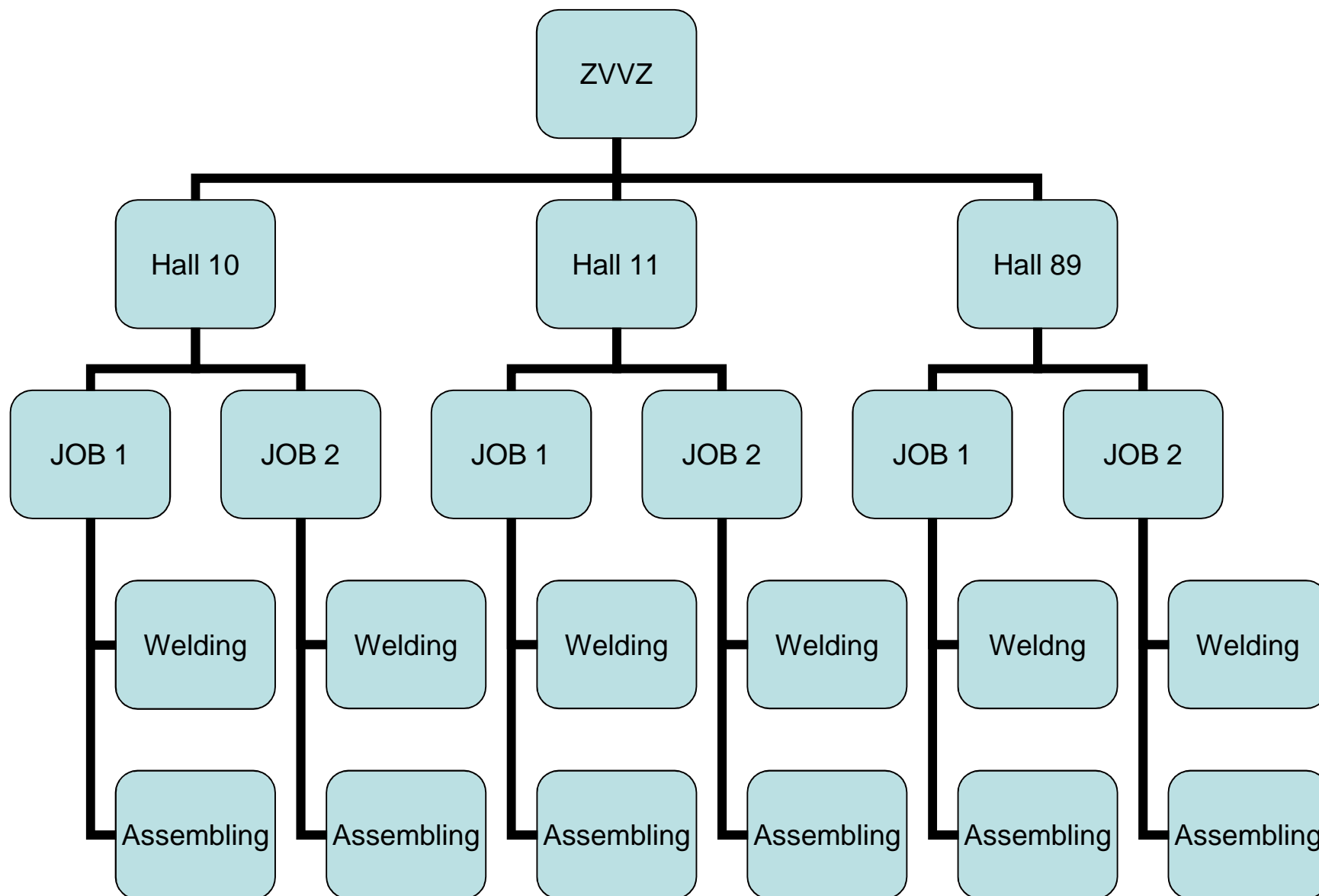
Within Appraisers



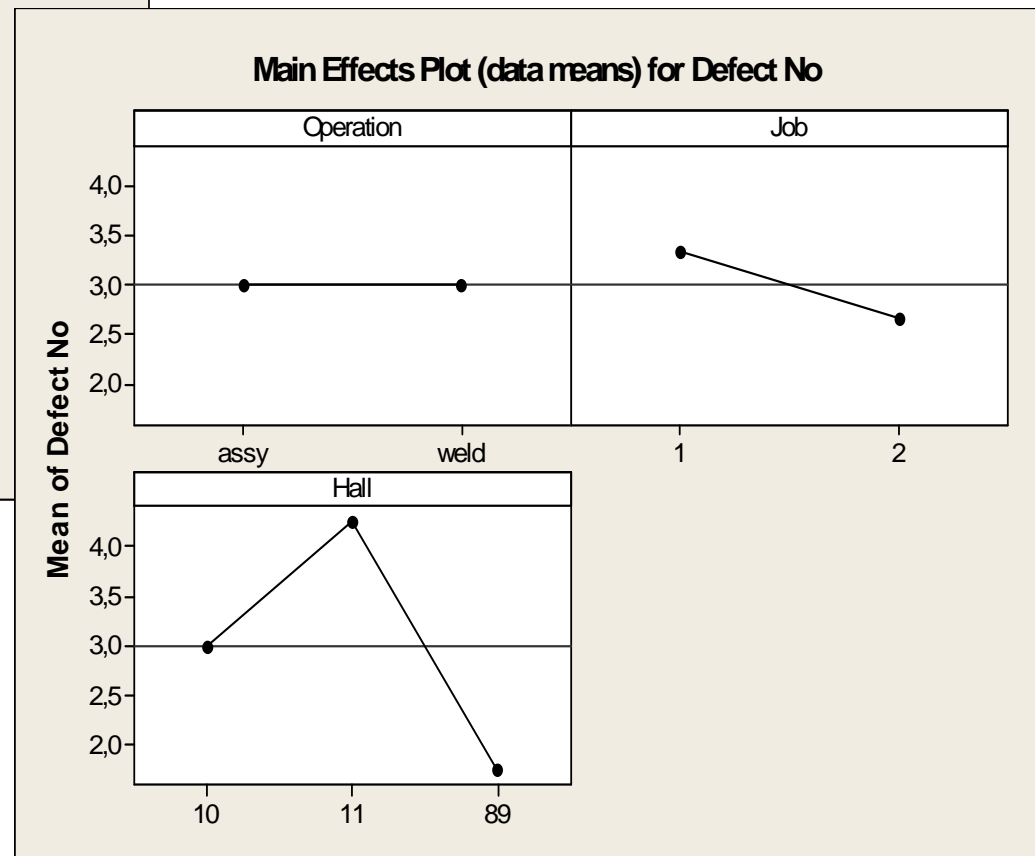
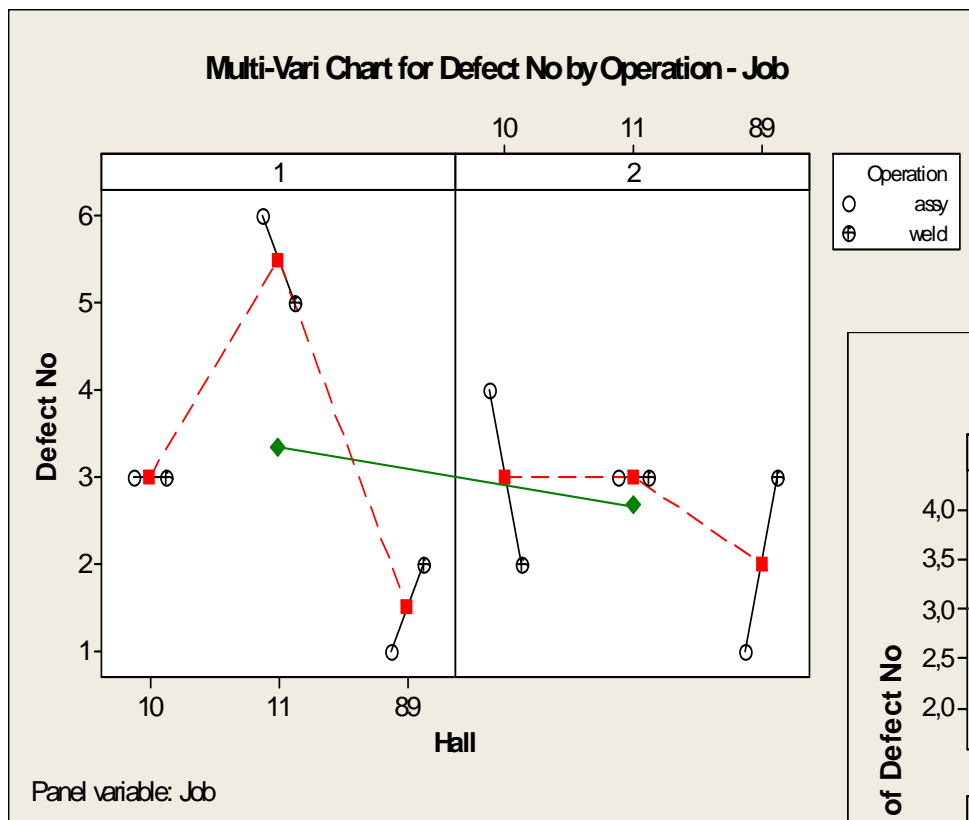
Appraiser vs Standard



Multi - Vari



Multi - Vari



Testování hypotéz

•Step 1 - Practical problem : Does the particular hall detect more or less number of defects depending on the defect source ?

•Step 2 - H₀ - Defect source NOT dependent on manufacturing hall

• - H_a - Defect source is dependent on manufacturing hall

•Step 3-4 - Chi-square test and an alpha of 0.05

•Step 5-6 - Sampling plan: Data of each hall - 14 for hall 89, 26 for hall 11, 21 for hall 10

•Step 7-8 - Chi-square test - results

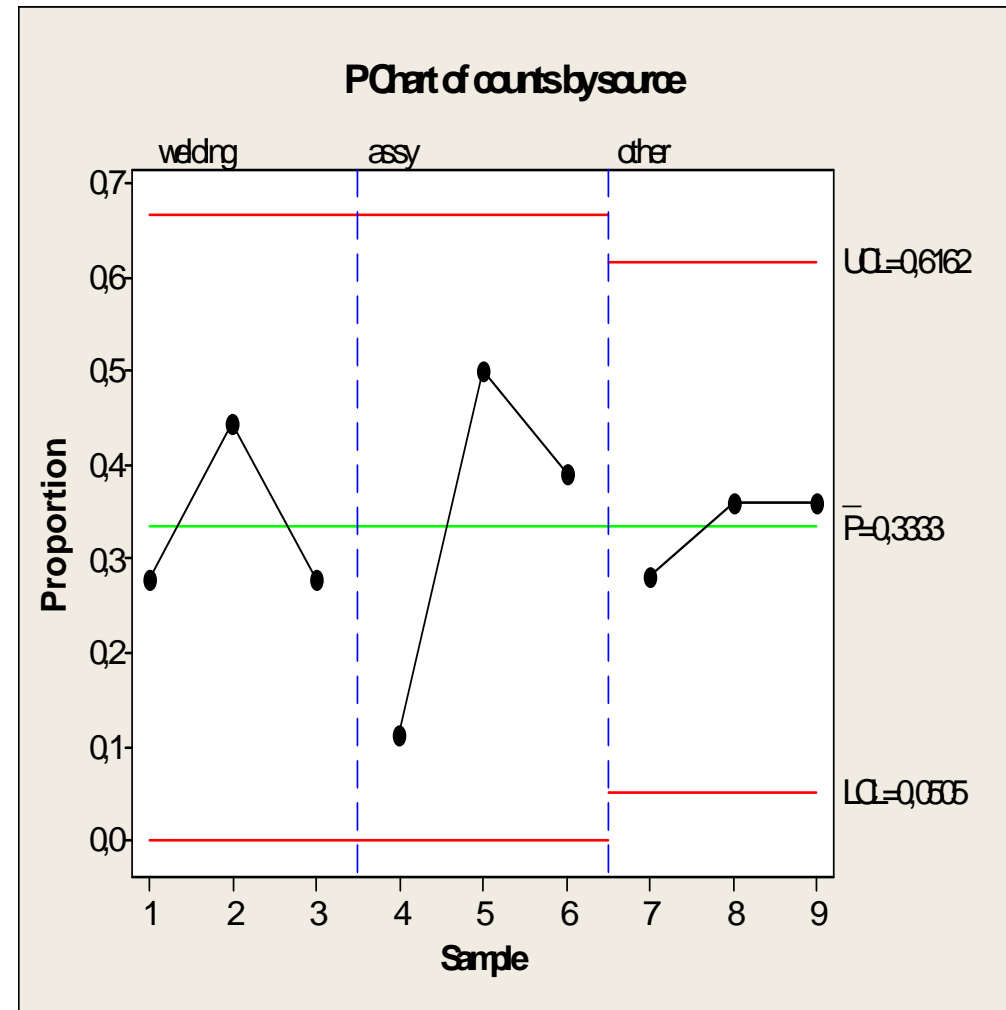
•Step 9 - Chi-square crit - 9,49

• Chi-square calc - 2,414

• P-value - 0,66

• Fail to reject H₀ hypothesis

•Step 10 - Conclusion : The source of defect are NOT dependent on manufacturing hall



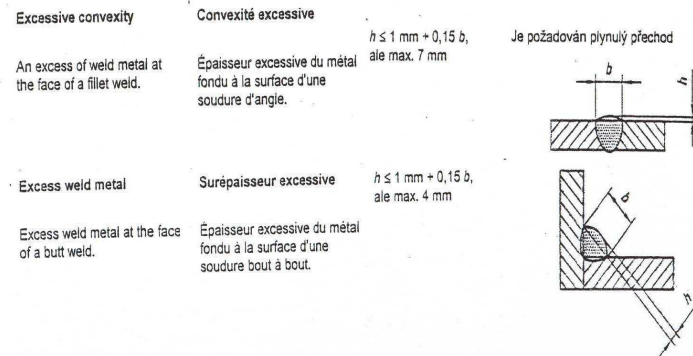
DOE

Weld requests according to the EN ISO 5817

- Excessive convexity
- Excess weld metal

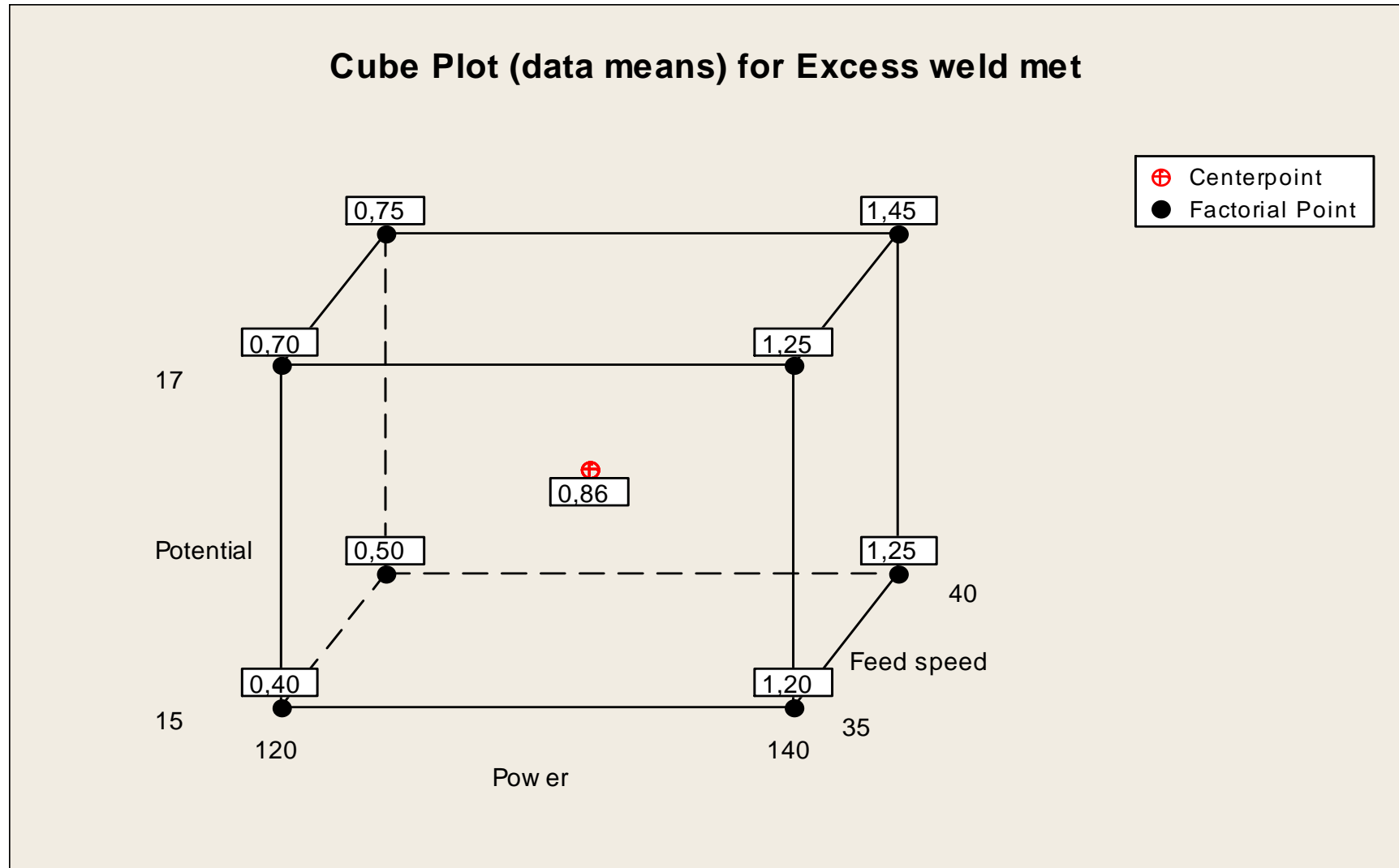
Megtec dryer :

- sheet thickness = 3 mm
- $b = 4$ mm
- $h < 1 + 0,15 b = 1 + 0,6$
- LSL = 0 ; USL = 1,6 mm

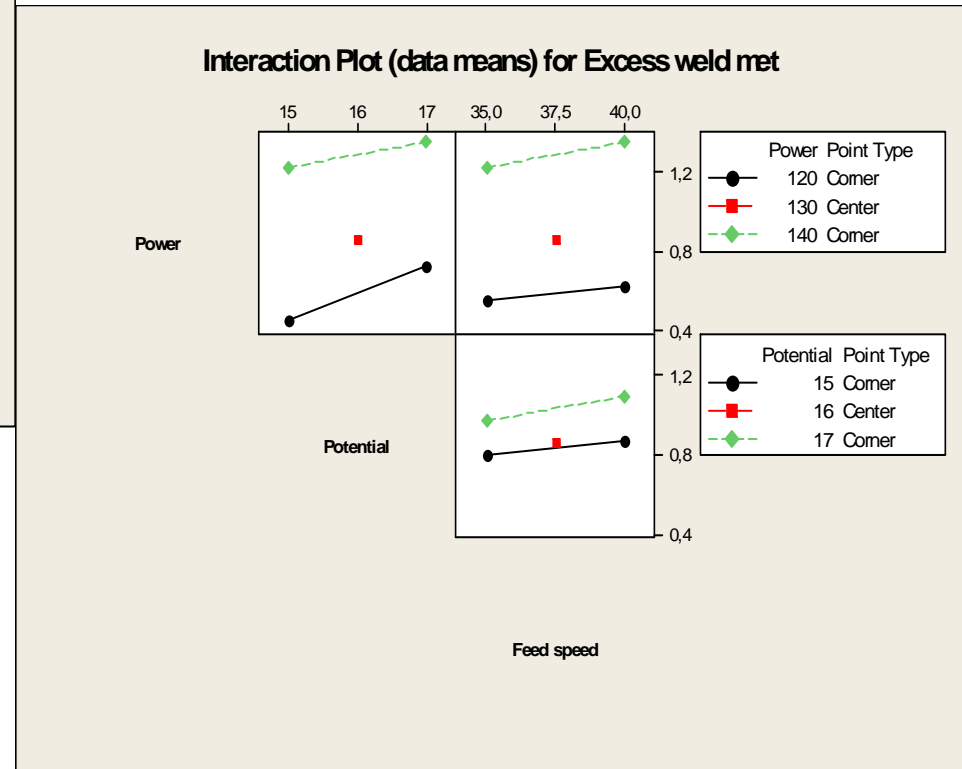
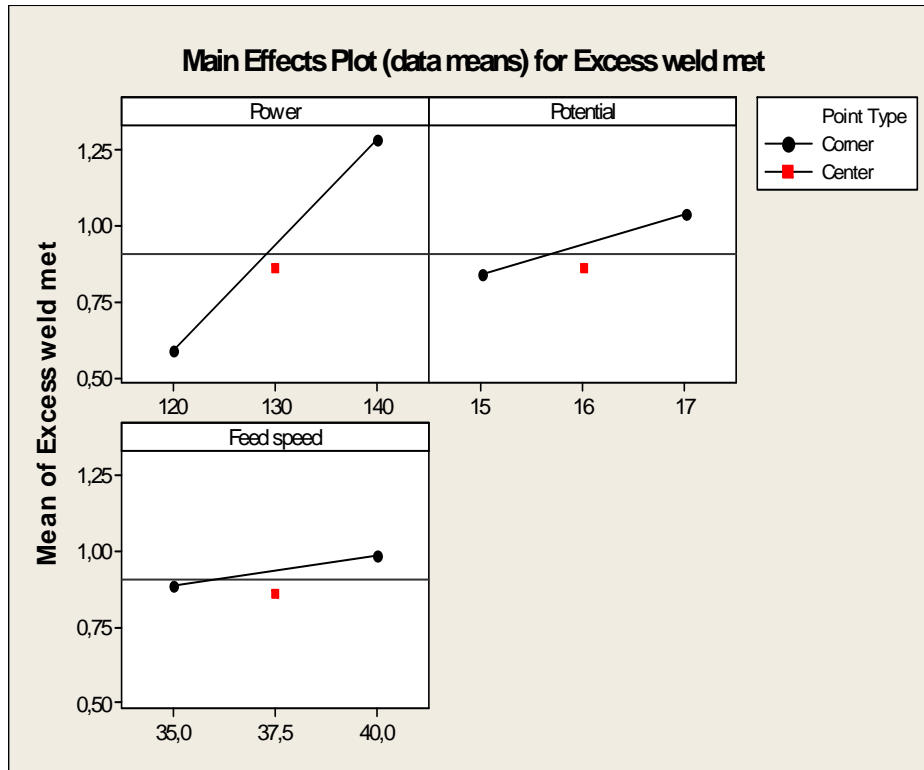


- Power (Current –A-) = 120, 130, 140
- Potential (Votage –V-) = 15, 16, 17
- Feeding Speed (cm / min) = 35, 37.5, 40
- Response = Excess weld metal / Excessive convexity (mm)
- Target = 0,7 – 0.8 mm
- Used method : Centerpoints 23 Factorial experiment

DOE



DOE



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 Anova

1. To apply the factors according DOE results
2. To specify the mesure points
 - Beginning of weld - point # 1
 - Mid of weld - point # 2
 - End of weld - point # 3
3. To perform 8 measurements in each measure point
4. To receive the responses
5. To settle the hypothesis : $H_0: \mu_1 = \mu_2 = \mu_3$

One-way ANOVA: Excessive convexity_1 versus Measure point

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-
-

Source	DF	SS	MS	F	P
Measure point	2	0,04021	0,02010	3,39	0,053
Error	21	0,12469	0,00594		
Total	23	0,16490			

- S = 0,07706 R-Sq = 24,38% R-Sq(adj) = 17,18%

- Individual 95% CIs For Mean Based on

-
-
-
-
-
-
-
-
-

Level	N	Mean	StDev
1	8	0,82500	0,08452
2	8	0,72500	0,07559
3	8	0,76875	0,07039

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 (-----*-----)
 (-----*-----)
 (-----*-----)
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 0,720 0,780 0,840 0,900

Kontrola a údržba

5 S

Drawings, list of changes, drawing tree - výkresy, kusovníky, strom výkresů

Sort / rozříd'

- review all drawings / *reviduj všechny výkresy*
- remove old versions / *odstraň staré verze*
- remove dualities / *odstraň podvojnosti*
- mark the last version / *označ poslední verzi*

Store / uskladni - uchovej

- order the drawings into drawing tree / *uspořádej výkresy do stromu výkresů*
- mark the last version of each tree level / *označ poslední verzi každé úrovně stromu*

Shine / osvětli

- verify the drawing tree / *ověř strom výkresů*
- make the new version for the drawing change / *připrav novou verzi stromu pro změny*

Standardize / uspořádej

- based on change of basic drawing make the new version of the tree / *na základě změny základních výkresů udělej novou verzi stromu*
- make the SOP for drawing treatment and change management / *vytvoř postup pro nakládání s výkresy a řízení změn*

Sustain the 5S Habit / udržuj zvyk 5s

- keep the drawing tree live and check it periodically / *udržuj strom živý a pravidelně jej kontroluj*