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Indication of RoHS compliance Approval markings (UL, CE, etc.) where applicable See NCR part label examples on the following slide 135 Part Label Example 136 PPAP Summary The Production Part Approval Process is an extensive approval process for new or changed designs or Processes Are Very Formalized, so it inevitably causes some administrative work Later changes to the product or process to be expensive and time-consuming! 137 APPENDICE - CAPABILITY 138 Process Capability Tool Selection MapProcess Capability can be determined for all types of data. However, selecting the correct method is critical. 139 Index of Ability Examples (Using Minitab)Capability - Normal Capability - Normal Capability - Non-Normal Distribution Identification Central Limit Theorem Box - Cox Transformation 140 Normal Capability SampleActivity Using the Data in a Minitab File Capability Example.MTW determines the ability of the PO process in terms of time is required to process the PO's. Time to process one individual PO Use the file capability Example.MTW 141 Normal Ability ExampleQ What capability analysis applies? Is the data attribute or variable? Is the data normal? Applies subgrouping? Yes??? A normal 142 Normal Capability Analysis in MinitabOpen the worksheet Ability Example.MTW. Select Stat &gt; Quality Tools &gt; Capability Analysis &gt; Normal. In the [Single column] field, click. Double-click [Time to process] in the column on the left. In the [Subgroup Size] field, click. Depending on subgroup information either: a. Enter 1 if the subgroup size is 1. B. Double-click Indiv Dates\_1 in the column on the left. C. Since the subgroup size is constant (n =5), the number 5 can be typed in the subgroup size field. Use the file capability Sample MTW 143 Normal Capability Analysis in MinitabType 20 in Lower Spec. Type 40 in Upper Spec. Select [Options] button. Add target value (if applicable). Under Display selected parts per million or Percentages Ability Metrics or Benchmark Z Add title if desired. Click [OK]. 144 Normal Capability Analysis ResultsSample Means Voice of the Client Voice of the Process StDev (Inside): Represents short-term data. StDev (Overall): Represents long-term data, includes shifting and drives between subgroups. 145 Normal Capability Analysis ResultsExp Within Performance: Based on StDev (Inside) and represents short-term process capability. Capability indexes: Based on short-term data. Exp Overall Performance: Based on StDev (Overall) and represents long-term process capability. Capability indexes: Based on long-term data. Observed Performance: Represents the sample data. Non-normal capability - Distribution IdentificationExercise Using the Data (Time\_2) in a Minitab file Example.MTW determines the ability of the PO process in terms of time required to process the POOs. Time to process one individual PO Use the file capability example. MTW 147 Non-normal capability - Distribution Identification Which capability analysis applies? Is the data attribute or variable? Is the data normal? Are the reasons for non-normality understood? Can the data be described by another distribution? No a ??? Non-normal Try Individual Distribution Identification 148 Individual Distribution Identification in MinitabOpen the worksheet Capability Example.MTW. Select Stat &gt; quality tools &gt;.an individual distribution identification. In the [Single column] field, click. Double-Time\_2 in the column on the left. Select [Use all distributions]. Click [OK]. Use the file capability example. MTW 149 Individual Distribution Identification in Minitab 150 Using Individual Distribution IdentificationOpen the worksheet Capability Example.MTW. Select Stat &gt; Quality Tools &gt; Capability Analysis &gt; Nonnormal. In the [Single column] field, click. Double-Time\_2 in the column on the left. Select [Match data with distribution]. Using drop-down menu select [3-parameter Weibull]. Type 20 in [Lower Spec]. Type 40 in [Upper Spec]. Use the file capability example. MTW 151 Using individual distribution identificationSelect [Options] button. Add target value (if applicable). Under Display select Capability Metrics Benchmark Z Add title if desired. Click [OK]. 152 Using Individual Distribution IdentificationOverall Capability: Benchmark Z or Capability Indices - based on long-term data Example Means Voice of the Client Voice of the Process Exp Overall Performance: Represents long-term process capability observed performance: Represents the sample data 153 Non-normal capability - Central Limit Statement Activity Using the Data (Time\_3 and Time 3 sub) in a Minitab file Capability Example.MTW determines the ability of the PO process in terms of time is required to determine the PO's. 2019 to process one individual PO Average time to process five POOs a day Use the file capability Sample. MTW 154 Non-normal capability - Central limit theoreseq What capability analysis applies? Is the data attribute or variable? Is the data normal? Are the reasons for non-normality understood? Can the data be described by another distribution? Can the data be subgrouped? Is the subgrouped data normal? No No No No a ??? Non-normal Try subgrouping the data 155 Use the file capability Example. MTWUsing Central Limit Theorem Sub-Grouping Caution! Check subgroup data files that Time\_3 for normalcy. If the data is not normal, this method cannot be used! Open the worksheet capability Example.MTW. Select Stat &gt; Quality Tools &gt; Capability Analysis &gt; Normal. In the [Single column] field, click. Double Time\_3 click in the column Left. In the [Subgroup Size] field - Double-click Indiv Dates\_3 in the column on the left. Type 20 in [Lower Spec]. Type 40 in [Upper [Upper Important! The subgroups should make logical sense, as by day, by shift, by the machine. - Use the file capability example. MTW 156 Using Central Limit Theorem Sub-GroupingSelect [Options] button. Add target value (if applicable). Under Display selected parts per million or Percentages Ability Metrics or Benchmark Z Add title if desired. Click [OK]. 157 Using Central Limit Theorem Sub-GroupingSample Means Voice of the Client Voice of the Process StDev (Inside): Represents short-term data StDev (Overall): Represents long-term data, includes shift and drives between subgroups 158 Using Central Limit Theorem Sub-GroupingExp Inside: Performance: Based on StDev (Inside) and represents short-term process capability Exp Overall: Performance: Based on StDev (Overall) and represents long-term process capability. Capability indexes: Based on long-term data. Observed Performance: Represents the sample data. 159 Non-normal capability - Box-Cox Transformation Activity Using the Data (Time\_4) in a Minitab file Capability Example.MTW determines the ability of the PO process in terms of time is required to process the PO's. Time to process one individual PO 160 Non-normal capability - Box-Cox TransformationQ What capability analysis applies? Is the data attribute or variable? Is the data normal? Are the reasons for non-normality understood? Can the data be described by another distribution? Can the data be subgrouped? Can data be changed? No no no no a ??? Non-normal Try Box-Cox transform 161 Box-Cox TransformationOpen the worksheet Capability Example.MTW Select Stat &gt; Control Charts &gt; Box-Cox Transformation Select [All Observations... in one column] of drop-down menu Click in Large Box Double click [Time\_4] in the column on the left Click in the [Subgroup Size] field - enter 1 Select [Options] radio button Select [Optimal Lambda] Enter column for Stored Data Click [OK] 162 Box-Cox Transformation ResultsTransformed Data Lambda Values Q Is the Transformed Normal Data? 163 Using Box-Cox TransformationOpen the worksheet Capability Example.MTW Select Stat &gt; Quality Tools &gt; Capability Analysis &gt; Normal Click in the [Single Column] field Double click Time\_4 in the column on the left Use the original data, not the transformed data. Click in the [Subgroup Size] field - enter 1 (the data is already sub-grouped) Type 20 in Lower Spec Type 40 in Upper Spec Carefully! Check transformed data for normalcy. If the data is not normal, this method cannot be used! Use the file capability example. MTW 164 Using Box-Cox TransformationSelect [Box-Cox] radio button Select [Box-Cox power transformation] Select [Use Optional lambda] Click OK Select [Options] radio button Add target value (if applicable) Under Display selected parts per or percentages of capability metrics or Benchmark Z Add title if desired Click [OK] 165 Transformed Voice of the Client Client Sample data transformed voice from the client transformed example data transformed voice of the process 166 Using Box-Cox TransformationExp Inside Performance: Based on StDev (Inside) and represents short-term process capability. Capability indexes: Based on Short-Term Data Exp Overall Performance: Based on StDev (Overall) and represents long-term process capability. Capability indexes: Based on long-term data. Observed Performance: Represents the sample data data

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