Gage R&R Study - ANOVA Method

**\* NOTE \* There are no operator values, or they are all the same. The operator factor will be  
omitted from the analysis.**

Gage R&R for Pat Score

|  |  |
| --- | --- |
| Gage name: | Washer |
| Date of study: | 06/23/2022 |
| Reported by: | AIS Technologies Group |
| Tolerance: | 0.8 - 1 |
| Misc: |  |

One-Way ANOVA Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | DF | SS | MS | F | P |
| Part No | 9 | 0.0052179 | 0.0005798 | 110.013 | 0.000 |
| Repeatability | 20 | 0.0001054 | 0.0000053 |  |  |
| Total | 29 | 0.0053233 |  |  |  |

*α to remove interaction term = 0.05*

Gage R&R

Variance Components

|  |  |  |
| --- | --- | --- |
| Source | VarComp | %Contribution (of VarComp) |
| Total Gage R&R | 0.0000053 | 2.68 |
| Repeatability | 0.0000053 | 2.68 |
| Part-To-Part | 0.0001915 | 97.32 |
| Total Variation | 0.0001968 | 100.00 |

Process tolerance = 0.2

Gage Evaluation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source | StdDev (SD) | Study Var (6 × SD) | %Study Var (%SV) | %Tolerance (SV/Toler) |
| Total Gage R&R | 0.0022956 | 0.0137739 | 16.37 | 6.89 |
| Repeatability | 0.0022956 | 0.0137739 | 16.37 | 6.89 |
| Part-To-Part | 0.0138383 | 0.0830300 | 98.65 | 41.52 |
| Total Variation | 0.0140275 | 0.0841647 | 100.00 | 42.08 |

Number of Distinct Categories = 8

Probabilities of Misclassification

Joint Probability

|  |  |
| --- | --- |
| Description | Probability |
| A randomly selected part is bad but accepted | 0.002 |
| A randomly selected part is good but rejected | 0.003 |

Conditional Probability

|  |  |
| --- | --- |
| Description | Probability |
| A part from a group of bad products is accepted | 0.135 |
| A part from a group of good products is rejected | 0.003 |

Gage R&R for Pat Score

Gage R&R Study - ANOVA Method

**\* NOTE \* There are no operator values, or they are all the same. The operator factor will be  
omitted from the analysis.**

Gage R&R for Pat Angle

|  |  |
| --- | --- |
| Gage name: | Washer |
| Date of study: | 06/23/2022 |
| Reported by: | AIS Technologies Group |
| Tolerance: | 0.8 - 1 |
| Misc: |  |

One-Way ANOVA Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | DF | SS | MS | F | P |
| Part No | 9 | 65.9097 | 7.32330 | 203289 | 0.000 |
| Repeatability | 20 | 0.0007 | 0.00004 |  |  |
| Total | 29 | 65.9104 |  |  |  |

*α to remove interaction term = 0.05*

Gage R&R

Variance Components

|  |  |  |
| --- | --- | --- |
| Source | VarComp | %Contribution (of VarComp) |
| Total Gage R&R | 0.00004 | 0.00 |
| Repeatability | 0.00004 | 0.00 |
| Part-To-Part | 2.44109 | 100.00 |
| Total Variation | 2.44112 | 100.00 |

Process tolerance = 30

Gage Evaluation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source | StdDev (SD) | Study Var (6 × SD) | %Study Var (%SV) | %Tolerance (SV/Toler) |
| Total Gage R&R | 0.00600 | 0.03601 | 0.38 | 0.12 |
| Repeatability | 0.00600 | 0.03601 | 0.38 | 0.12 |
| Part-To-Part | 1.56240 | 9.37439 | 100.00 | 31.25 |
| Total Variation | 1.56241 | 9.37446 | 100.00 | 31.25 |

Number of Distinct Categories = 367

Probabilities of Misclassification

Joint Probability

|  |  |
| --- | --- |
| Description | Probability |
| A randomly selected part is bad but accepted | 0.000 |
| A randomly selected part is good but rejected | 0.000 |

Conditional Probability

|  |  |
| --- | --- |
| Description | Probability |
| A part from a group of bad products is accepted | \* |
| A part from a group of good products is rejected | 0.000 |

*Probability of part within spec limits = 1.*

Gage R&R for Pat Angle

Gage R&R Study - ANOVA Method

**\* NOTE \* There are no operator values, or they are all the same. The operator factor will be  
omitted from the analysis.**

Gage R&R for Pat Scale

|  |  |
| --- | --- |
| Gage name: | Washer |
| Date of study: | 06/23/2022 |
| Reported by: | AIS Technologies Group |
| Tolerance: | 0.8 - 1 |
| Misc: |  |

One-Way ANOVA Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | DF | SS | MS | F | P |
| Part No | 9 | 0.0001561 | 0.0000173 | 1740.21 | 0.000 |
| Repeatability | 20 | 0.0000002 | 0.0000000 |  |  |
| Total | 29 | 0.0001563 |  |  |  |

*α to remove interaction term = 0.05*

Gage R&R

Variance Components

|  |  |  |
| --- | --- | --- |
| Source | VarComp | %Contribution (of VarComp) |
| Total Gage R&R | 0.0000000 | 0.17 |
| Repeatability | 0.0000000 | 0.17 |
| Part-To-Part | 0.0000058 | 99.83 |
| Total Variation | 0.0000058 | 100.00 |

Process tolerance = 20

Gage Evaluation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source | StdDev (SD) | Study Var (6 × SD) | %Study Var (%SV) | %Tolerance (SV/Toler) |
| Total Gage R&R | 0.0000998 | 0.0005989 | 4.15 | 0.00 |
| Repeatability | 0.0000998 | 0.0005989 | 4.15 | 0.00 |
| Part-To-Part | 0.0024034 | 0.0144205 | 99.91 | 0.07 |
| Total Variation | 0.0024055 | 0.0144329 | 100.00 | 0.07 |

Number of Distinct Categories = 33

Probabilities of Misclassification

Joint Probability

|  |  |
| --- | --- |
| Description | Probability |
| A randomly selected part is bad but accepted | 0.000 |
| A randomly selected part is good but rejected | 0.000 |

Conditional Probability

|  |  |
| --- | --- |
| Description | Probability |
| A part from a group of bad products is accepted | \* |
| A part from a group of good products is rejected | 0.000 |

*Probability of part within spec limits = 1.*

Gage R&R for Pat Scale