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# ANALYSIS METHODOLOGY

In other to understand and make a significant conclusion on which variation of fuel sample to be chosen

A common approach to figure out a reliable fuel variation method would be to analyze the responses gotten during each test. we can use a statistical technique which can compare these nine treatment samples and depict how different these samples are from one another. Such a technique, which compares the samples on the basis of their variance, is called ANOVA.

Analysis of variance (ANOVA) is a statistical technique that is used to check if the means of two or more groups are significantly different from each other. ANOVA checks the impact of one or more factors by comparing the variance of different samples.

We can use ANOVA to prove/disprove if all the fuel variation were equally effective or not.

The ANOVA is based on calculation of the F-statistic, which is the result when you divide the variance between groups by the variance within groups. If there are no differences among groups, those two values are equal, resulting in an F value of 1. If F is significantly different from 1, as determined by consulting an F table, you would conclude that the null hypothesis does not hold and that there is at least one group that differs from at least one other group.

Another measure to compare the samples is called a t-test. When we have only two samples, t-test and ANOVA give the same results. However, using a t-test would not be reliable in cases where there are more than 2 samples (like in our case). If we conduct multiple t-tests for comparing more than two samples, it will have a compounded effect on the error rate of the result.

Some common terminologies used in the technique, are mean and hypothesis.

Mean is a simple or arithmetic average of a range of values. There are two kinds of means that we use in ANOVA calculations, which are separate sample means (µi) and the grand mean (µm) The grand mean is the mean of sample means or the mean of all observations combined, irrespective of the sample.

Considering our case study, we can assume that there are 2 possible cases – either the fuel variation will have an effect on the responses or it won’t. These statements are called Hypothesis. A hypothesis is an educated guess about something in the world around us. It should be testable either by experiment or observation.

Just like any other kind of hypothesis that you might have studied in statistics, ANOVA also uses a Null hypothesis (H0) and an Alternate hypothesis (H1). The Null hypothesis in ANOVA is valid when all the sample means are equal, or they don’t have any significant difference. Thus, they can be considered as a part of a larger set of the population. On the other hand, the alternate hypothesis is valid when at least one of the sample means is different from the rest of the sample means. In mathematical form, they can be represented as:

H0: µ1 = µ2 = µ3 = … = µL

H1: µl ≠ µm

In other words, the null hypothesis states that all the sample means are equal or the factor did not have any significant effect on the results. Whereas, the alternate hypothesis states that at least one of the sample means is different from another. But we still can’t tell which one specifically. For that, we will use other methods that we will discuss later in this study.

# F-Statistic

The statistic which measures if the means of different samples are significantly different or not is called the F-Ratio. Lower the F-Ratio, more similar are the sample means. In that case, we cannot reject the null hypothesis.

This F-statistic calculated here is compared with the F-critical value for making a conclusion. if the value of the calculated F-statistic is more than the F-critical value (for a specific α/significance level), then we reject the null hypothesis and can say that the treatment had a significant effect.

ANOVA tells us that at least two groups are different from each other. But it won’t tell us which groups are different. If our test returns a significant f-statistic, we may need to run a post-hoc test to tell us exactly which groups have a difference in means.

Another measure for ANOVA alongside our f-statistic is the p-value. If the p-value is less than the alpha level selected, we reject the Null Hypothesis.

There are commonly two types of ANOVA tests for univariate analysis – One-Way ANOVA and Two-Way ANOVA. One-way ANOVA is used when we are interested in studying the effect of one independent variable (IDV)/factor on a population, whereas Two-way ANOVA is used for studying the effects of two factors on a population at the same time. For multivariate analysis, such a technique is called MANOVA or Multi-variate ANOVA.

# MANOVA

Here, we will be working on a specific case called two factor MANOVA. We can say that two IDV/factor (fuel variation and Speed level) will be affecting five dependent variables (Torque, Time, Fuel flow rate, specific fuel consumption and break thermal efficiency). Now this kind of a problem comes under a multivariate case and the technique we will use to solve it is known as MANOVA. The speed and torque and time taken to consume 8ml of fuel where the bases on which this study was conducted as show in Table 3.1 below.

Here we have two factors with 9 levels each, fuel variation (Ao-A4, B1-B4) and speed level (1000, 1200,1400, 1600, 2000, 2200, 2500, 3000, 3500). These factors are going to affect our five dependent variables, i.e., the specific energy consumption and break thermal efficiency. Denoting this information in terms of variables, we can say that we have L = 9 (9 different fuel treatment groups) and P = 5 (Torque, Time, Fuel flow rate, specific fuel consumption and break thermal efficiency values).

## Hypothesis

A MANOVA test a null hypothesis and an alternate hypothesis for this study are.:

The null hypothesis (H0): µ1 = µ2 = µ3 = … = µL (the means are equal for each group)

The alternative hypothesis (H1): µl ≠ µm (the means are not equal for each group)

To figure out if to reject the null hypothesis or not, basically the following two factors are considered:

1. If the F-value (F) is larger than the f-critical value (F-crit)
2. If the p-value is smaller than your chosen alpha level.

*Note: It’s important to note that we only need to conduct a post hoc test when the p-value for the ANOVA is statistically significant. If the p-value is not statistically significant, this indicates that the means for all of the groups are not different from each other, so there is no need to conduct a post hoc test to find out which groups are different from each other.*

However, this MANOVO doesn’t tell us which groups are different from each other. It simply tells us that not all of the group means are equal.

Table Dataset for the analysis

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Speed level | Fuels variation | Torque (Nm) | Brake Power (kW) | Time for 8ml (s) | Fuel Mass Flow Rate (Kg/hr) | Specific Fuel Consumption (g/kWh) | Brake Thermal Efficiency (%) |
| 1000(rpm) | Ao | 3.7 | 0.3875 | 87 | 0.2450 | 632.1473 | 12.9429 |
| 1000(rpm) | B1 | 3.6 | 0.3770 | 88 | 0.2585 | 685.7242 | 13.0595 |
| 1000(rpm) | B2 | 3.72 | 0.3896 | 89 | 0.2556 | 656.1478 | 13.6482 |
| 1000(rpm) | B3 | 3.72 | 0.3896 | 89 | 0.2556 | 656.1478 | 13.6482 |
| 1000(rpm) | B4 | 3.8 | 0.3980 | 91 | 0.2500 | 628.2170 | 14.2550 |
| 1000(rpm) | A1 | 3.7 | 0.3875 | 89 | 0.2556 | 659.6946 | 13.5748 |
| 1000(rpm) | A2 | 3.6 | 0.3770 | 90 | 0.2528 | 670.4859 | 13.3563 |
| 1000(rpm) | A3 | 3.65 | 0.3823 | 90.5 | 0.2514 | 657.6476 | 13.6171 |
| 1000(rpm) | A4 | 3.72 | 0.3896 | 91 | 0.2500 | 641.7270 | 13.9549 |
| 1200(rpm) | Ao | 4 | 0.5027 | 77 | 0.2768 | 550.5634 | 14.8608 |
| 1200(rpm) | B1 | 4 | 0.5027 | 79 | 0.2880 | 572.8835 | 15.6318 |
| 1200(rpm) | B2 | 3.95 | 0.4964 | 80 | 0.2844 | 572.8835 | 15.6318 |
| 1200(rpm) | B3 | 4.1 | 0.5153 | 80 | 0.2844 | 551.9244 | 16.2255 |
| 1200(rpm) | B4 | 4.2 | 0.5279 | 82 | 0.2775 | 525.6422 | 17.0367 |
| 1200(rpm) | A1 | 3.95 | 0.4964 | 80 | 0.2844 | 572.8835 | 15.6318 |
| 1200(rpm) | A2 | 4 | 0.5027 | 81 | 0.2809 | 558.7382 | 16.0276 |
| 1200(rpm) | A3 | 4 | 0.5027 | 81.5 | 0.2792 | 555.3104 | 16.1265 |
| 1200(rpm) | A4 | 4.1 | 0.5153 | 82 | 0.2775 | 538.4628 | 16.6311 |
| 1400(rpm) | Ao | 4.2 | 0.6158 | 62.2 | 0.3426 | 556.3801 | 14.7054 |
| 1400(rpm) | B1 | 4.2 | 0.6158 | 64.2 | 0.3320 | 539.0474 | 16.6131 |
| 1400(rpm) | B2 | 4.15 | 0.6085 | 65.2 | 0.3490 | 573.4703 | 15.6158 |
| 1400(rpm) | B3 | 4.3 | 0.6305 | 65.2 | 0.3490 | 553.4655 | 16.1803 |
| 1400(rpm) | B4 | 4.4 | 0.6452 | 67.2 | 0.3386 | 524.7889 | 17.0644 |
| 1400(rpm) | A1 | 3.95 | 0.5792 | 63.2 | 0.3600 | 621.5734 | 14.4073 |
| 1400(rpm) | A2 | 4 | 0.5865 | 64.2 | 0.3544 | 604.2430 | 14.8206 |
| 1400(rpm) | A3 | 4.15 | 0.6085 | 64.7 | 0.3517 | 577.9021 | 15.4961 |
| 1400(rpm) | A4 | 4.25 | 0.6232 | 65.2 | 0.3490 | 559.9769 | 15.9921 |
| 1600(rpm) | Ao | 4.8 | 0.8044 | 59.2 | 0.3600 | 447.5652 | 18.2807 |
| 1600(rpm) | B1 | 4.7 | 0.7876 | 61.2 | 0.3718 | 472.0254 | 18.9719 |
| 1600(rpm) | B2 | 4.7 | 0.7876 | 62.2 | 0.3658 | 464.4366 | 19.2819 |
| 1600(rpm) | B3 | 4.9 | 0.8211 | 62.2 | 0.3658 | 445.4800 | 20.1024 |
| 1600(rpm) | B4 | 5 | 0.8379 | 64.2 | 0.3544 | 422.9701 | 21.1722 |
| 1600(rpm) | A1 | 4.8 | 0.8044 | 60.2 | 0.3779 | 469.8692 | 19.0590 |
| 1600(rpm) | A2 | 4.75 | 0.7960 | 61.2 | 0.3718 | 467.0567 | 19.1737 |
| 1600(rpm) | A3 | 4.8 | 0.8044 | 61.7 | 0.3688 | 458.4461 | 19.5339 |
| 1600(rpm) | A4 | 4.9 | 0.8211 | 62.2 | 0.3658 | 445.4800 | 20.1024 |
| 1800(rpm) | Ao | 4.8 | 0.9049 | 54.2 | 0.3932 | 434.5365 | 18.8288 |
| 1800(rpm) | B1 | 4.8 | 0.9049 | 56.2 | 0.4048 | 447.3883 | 20.0167 |
| 1800(rpm) | B2 | 4.9 | 0.9237 | 57.2 | 0.3978 | 430.5960 | 20.7973 |
| 1800(rpm) | B3 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 1800(rpm) | B4 | 5.1 | 0.9615 | 59.2 | 0.3843 | 399.7332 | 22.4030 |
| 1800(rpm) | A1 | 4.75 | 0.8955 | 55.2 | 0.4122 | 460.2878 | 19.4557 |
| 1800(rpm) | A2 | 4.8 | 0.9049 | 56.2 | 0.4048 | 447.3883 | 20.0167 |
| 1800(rpm) | A3 | 4.8 | 0.9049 | 56.7 | 0.4013 | 443.4430 | 20.1948 |
| 1800(rpm) | A4 | 4.9 | 0.9237 | 57.2 | 0.3978 | 430.5960 | 20.7973 |
| 2200(rpm) | Ao | 5.6 | 1.2903 | 47.2 | 0.4515 | 349.9343 | 23.3810 |
| 2200(rpm) | B1 | 5.6 | 1.2903 | 49.2 | 0.4624 | 358.3924 | 24.9872 |
| 2200(rpm) | B2 | 5.7 | 1.3134 | 50.2 | 0.4532 | 345.0908 | 25.9503 |
| 2200(rpm) | B3 | 5.65 | 1.3018 | 50.2 | 0.4532 | 348.1447 | 25.7227 |
| 2200(rpm) | B4 | 5.8 | 1.3364 | 52.2 | 0.4359 | 326.1471 | 27.4576 |
| 2200(rpm) | A1 | 5.5 | 1.2673 | 48.2 | 0.4720 | 372.4794 | 24.0422 |
| 2200(rpm) | A2 | 5.5 | 1.2673 | 49.2 | 0.4624 | 364.9087 | 24.5410 |
| 2200(rpm) | A3 | 5.6 | 1.2903 | 49.7 | 0.4578 | 354.7869 | 25.2411 |
| 2200(rpm) | A4 | 5.75 | 1.3249 | 50.2 | 0.4532 | 342.0900 | 26.1780 |
| 2500(rpm) | Ao | 6 | 1.5710 | 45 | 0.4736 | 301.4640 | 27.1403 |
| 2500(rpm) | B1 | 6.1 | 1.5972 | 47 | 0.4841 | 303.0868 | 29.5467 |
| 2500(rpm) | B2 | 6.1 | 1.5972 | 48 | 0.4740 | 296.7724 | 30.1754 |
| 2500(rpm) | B3 | 6.2 | 1.6234 | 48 | 0.4740 | 291.9858 | 30.6701 |
| 2500(rpm) | B4 | 6.2 | 1.6234 | 50 | 0.4550 | 280.3064 | 31.9480 |
| 2500(rpm) | A1 | 6 | 1.5710 | 46 | 0.4946 | 314.8369 | 28.4440 |
| 2500(rpm) | A2 | 6 | 1.5710 | 47 | 0.4841 | 308.1382 | 29.0624 |
| 2500(rpm) | A3 | 5.95 | 1.5579 | 47.5 | 0.4790 | 307.4568 | 29.1268 |
| 2500(rpm) | A4 | 5.9 | 1.5448 | 48 | 0.4740 | 306.8325 | 29.1860 |
| 3000(rpm) | Ao | 6.6 | 2.0737 | 42 | 0.5074 | 244.6948 | 33.4368 |
| 3000(rpm) | B1 | 6.7 | 2.1051 | 44 | 0.5171 | 245.6326 | 36.4578 |
| 3000(rpm) | B2 | 6.72 | 2.1114 | 45 | 0.5056 | 239.4592 | 37.3977 |
| 3000(rpm) | B3 | 6.7 | 2.1051 | 45 | 0.5056 | 240.1741 | 37.2864 |
| 3000(rpm) | B4 | 6.8 | 2.1366 | 47 | 0.4841 | 226.5722 | 39.5248 |
| 3000(rpm) | A1 | 6.7 | 2.1051 | 45 | 0.5056 | 240.1741 | 37.2864 |
| 3000(rpm) | A2 | 6.7 | 2.1051 | 46 | 0.4946 | 234.9529 | 38.1150 |
| 3000(rpm) | A3 | 6.75 | 2.1209 | 46.5 | 0.4893 | 230.7048 | 38.8168 |
| 3000(rpm) | A4 | 6.8 | 2.1366 | 47 | 0.4841 | 226.5722 | 39.5248 |
| 3500(rpm) | Ao | 6 | 2.1994 | 37 | 0.5760 | 261.8896 | 31.2415 |
| 3500(rpm) | B1 | 6.05 | 2.2177 | 39 | 0.5812 | 262.0561 | 34.1729 |
| 3500(rpm) | B2 | 5.8 | 2.1261 | 40 | 0.5688 | 267.5338 | 33.4732 |
| 3500(rpm) | B3 | 6.2 | 2.2727 | 40 | 0.5688 | 250.2735 | 35.7817 |
| 3500(rpm) | B4 | 6.21 | 2.2764 | 42 | 0.5417 | 237.9719 | 37.6314 |
| 3500(rpm) | A1 | 6.4 | 2.3460 | 40 | 0.5688 | 242.4525 | 36.9360 |
| 3500(rpm) | A2 | 6.43 | 2.3570 | 41 | 0.5549 | 235.4354 | 38.0369 |
| 3500(rpm) | A3 | 6.5 | 2.3827 | 41.5 | 0.5482 | 230.0939 | 38.9199 |
| 3500(rpm) | A4 | 6.5 | 2.3827 | 42 | 0.5417 | 227.3547 | 39.3888 |
| 1000(rpm) | Ao | 3.9 | 0.4085 | 87 | 0.2450 | 599.7295 | 13.6425 |
| 1000(rpm) | B1 | 3.8 | 0.3980 | 88 | 0.2585 | 649.6335 | 13.7850 |
| 1000(rpm) | B2 | 3.92 | 0.4106 | 89 | 0.2556 | 622.6709 | 14.3820 |
| 1000(rpm) | B3 | 3.92 | 0.4106 | 89 | 0.2556 | 622.6709 | 14.3820 |
| 1000(rpm) | B4 | 4 | 0.4189 | 91 | 0.2500 | 596.8061 | 15.0052 |
| 1000(rpm) | A1 | 3.9 | 0.4085 | 89 | 0.2556 | 625.8641 | 14.3086 |
| 1000(rpm) | A2 | 3.8 | 0.3980 | 90 | 0.2528 | 635.1972 | 14.0983 |
| 1000(rpm) | A3 | 3.85 | 0.4032 | 90.5 | 0.2514 | 623.4840 | 14.3632 |
| 1000(rpm) | A4 | 3.92 | 0.4106 | 91 | 0.2500 | 608.9858 | 14.7051 |
| 1200(rpm) | Ao | 4.2 | 0.5279 | 77 | 0.2768 | 524.3461 | 15.6039 |
| 1200(rpm) | B1 | 4.2 | 0.5279 | 79 | 0.2880 | 545.6033 | 16.4134 |
| 1200(rpm) | B2 | 4.15 | 0.5216 | 80 | 0.2844 | 545.2747 | 16.4233 |
| 1200(rpm) | B3 | 4.3 | 0.5404 | 80 | 0.2844 | 526.2535 | 17.0169 |
| 1200(rpm) | B4 | 4.4 | 0.5530 | 82 | 0.2775 | 501.7494 | 17.8480 |
| 1200(rpm) | A1 | 4.15 | 0.5216 | 80 | 0.2844 | 545.2747 | 16.4233 |
| 1200(rpm) | A2 | 4.2 | 0.5279 | 81 | 0.2809 | 532.1317 | 16.8290 |
| 1200(rpm) | A3 | 4.2 | 0.5279 | 81.5 | 0.2792 | 528.8670 | 16.9328 |
| 1200(rpm) | A4 | 4.3 | 0.5404 | 82 | 0.2775 | 513.4180 | 17.4424 |
| 1400(rpm) | Ao | 4.4 | 0.6452 | 62.2 | 0.3426 | 531.0901 | 15.4057 |
| 1400(rpm) | B1 | 4.4 | 0.6452 | 64.2 | 0.3320 | 514.5452 | 17.4042 |
| 1400(rpm) | B2 | 4.35 | 0.6378 | 65.2 | 0.3490 | 547.1038 | 16.3684 |
| 1400(rpm) | B3 | 4.5 | 0.6598 | 65.2 | 0.3490 | 528.8670 | 16.9328 |
| 1400(rpm) | B4 | 4.6 | 0.6745 | 67.2 | 0.3386 | 501.9720 | 17.8401 |
| 1400(rpm) | A1 | 4.15 | 0.6085 | 63.2 | 0.3600 | 591.6181 | 15.1368 |
| 1400(rpm) | A2 | 4.2 | 0.6158 | 64.2 | 0.3544 | 575.4695 | 15.5616 |
| 1400(rpm) | A3 | 4.35 | 0.6378 | 64.7 | 0.3517 | 551.3318 | 16.2429 |
| 1400(rpm) | A4 | 4.45 | 0.6525 | 65.2 | 0.3490 | 534.8094 | 16.7447 |
| 1600(rpm) | Ao | 5 | 0.8379 | 59.2 | 0.3600 | 429.6626 | 19.0424 |
| 1600(rpm) | B1 | 4.9 | 0.8211 | 61.2 | 0.3718 | 452.7591 | 19.7792 |
| 1600(rpm) | B2 | 4.9 | 0.8211 | 62.2 | 0.3658 | 445.4800 | 20.1024 |
| 1600(rpm) | B3 | 5.1 | 0.8546 | 62.2 | 0.3658 | 428.0102 | 20.9229 |
| 1600(rpm) | B4 | 5.2 | 0.8714 | 64.2 | 0.3544 | 406.7020 | 22.0191 |
| 1600(rpm) | A1 | 5 | 0.8379 | 60.2 | 0.3779 | 451.0744 | 19.8531 |
| 1600(rpm) | A2 | 4.95 | 0.8295 | 61.2 | 0.3718 | 448.1858 | 19.9811 |
| 1600(rpm) | A3 | 5 | 0.8379 | 61.7 | 0.3688 | 440.1082 | 20.3478 |
| 1600(rpm) | A4 | 5.1 | 0.8546 | 62.2 | 0.3658 | 428.0102 | 20.9229 |
| 1800(rpm) | Ao | 5 | 0.9426 | 54.2 | 0.3932 | 417.1550 | 19.6134 |
| 1800(rpm) | B1 | 5 | 0.9426 | 56.2 | 0.4048 | 429.4927 | 20.8507 |
| 1800(rpm) | B2 | 5.1 | 0.9615 | 57.2 | 0.3978 | 413.7099 | 21.6461 |
| 1800(rpm) | B3 | 5.2 | 0.9803 | 57.2 | 0.3978 | 405.7540 | 22.0706 |
| 1800(rpm) | B4 | 5.3 | 0.9992 | 59.2 | 0.3843 | 384.6490 | 23.2815 |
| 1800(rpm) | A1 | 4.95 | 0.9332 | 55.2 | 0.4122 | 441.6903 | 20.2749 |
| 1800(rpm) | A2 | 5 | 0.9426 | 56.2 | 0.4048 | 429.4927 | 20.8507 |
| 1800(rpm) | A3 | 5 | 0.9426 | 56.7 | 0.4013 | 425.7053 | 21.0362 |
| 1800(rpm) | A4 | 5.1 | 0.9615 | 57.2 | 0.3978 | 413.7099 | 21.6461 |
| 2200(rpm) | Ao | 5.8 | 1.3364 | 47.2 | 0.4515 | 337.8676 | 24.2160 |
| 2200(rpm) | B1 | 5.8 | 1.3364 | 49.2 | 0.4624 | 346.0341 | 25.8796 |
| 2200(rpm) | B2 | 5.9 | 1.3594 | 50.2 | 0.4532 | 333.3928 | 26.8609 |
| 2200(rpm) | B3 | 5.85 | 1.3479 | 50.2 | 0.4532 | 336.2423 | 26.6332 |
| 2200(rpm) | B4 | 6 | 1.3825 | 52.2 | 0.4359 | 315.2755 | 28.4044 |
| 2200(rpm) | A1 | 5.7 | 1.3134 | 48.2 | 0.4720 | 359.4099 | 24.9165 |
| 2200(rpm) | A2 | 5.7 | 1.3134 | 49.2 | 0.4624 | 352.1049 | 25.4334 |
| 2200(rpm) | A3 | 5.8 | 1.3364 | 49.7 | 0.4578 | 342.5529 | 26.1426 |
| 2200(rpm) | A4 | 5.95 | 1.3710 | 50.2 | 0.4532 | 330.5912 | 27.0885 |
| 2500(rpm) | Ao | 6.2 | 1.6234 | 45 | 0.4736 | 291.7394 | 28.0450 |
| 2500(rpm) | B1 | 6.3 | 1.6496 | 47 | 0.4841 | 293.4649 | 30.5155 |
| 2500(rpm) | B2 | 6.3 | 1.6496 | 48 | 0.4740 | 287.3511 | 31.1647 |
| 2500(rpm) | B3 | 6.4 | 1.6757 | 48 | 0.4740 | 282.8612 | 31.6594 |
| 2500(rpm) | B4 | 6.4 | 1.6757 | 50 | 0.4550 | 271.5468 | 32.9786 |
| 2500(rpm) | A1 | 6.2 | 1.6234 | 46 | 0.4946 | 304.6808 | 29.3921 |
| 2500(rpm) | A2 | 6.2 | 1.6234 | 47 | 0.4841 | 298.1983 | 30.0311 |
| 2500(rpm) | A3 | 6.15 | 1.6103 | 47.5 | 0.4790 | 297.4582 | 30.1058 |
| 2500(rpm) | A4 | 6.1 | 1.5972 | 48 | 0.4740 | 296.7724 | 30.1754 |
| 3000(rpm) | Ao | 6.8 | 2.1366 | 42 | 0.5074 | 237.4979 | 34.4501 |
| 3000(rpm) | B1 | 6.9 | 2.1680 | 44 | 0.5171 | 238.5128 | 37.5461 |
| 3000(rpm) | B2 | 6.92 | 2.1743 | 45 | 0.5056 | 232.5385 | 38.5107 |
| 3000(rpm) | B3 | 6.9 | 2.1680 | 45 | 0.5056 | 233.2125 | 38.3994 |
| 3000(rpm) | B4 | 7 | 2.1994 | 47 | 0.4841 | 220.0987 | 40.6873 |
| 3000(rpm) | A1 | 6.9 | 2.1680 | 45 | 0.5056 | 233.2125 | 38.3994 |
| 3000(rpm) | A2 | 6.9 | 2.1680 | 46 | 0.4946 | 228.1426 | 39.2527 |
| 3000(rpm) | A3 | 6.95 | 2.1837 | 46.5 | 0.4893 | 224.0658 | 39.9669 |
| 3000(rpm) | A4 | 7 | 2.1994 | 47 | 0.4841 | 220.0987 | 40.6873 |
| 3500(rpm) | Ao | 6.2 | 2.2727 | 37 | 0.5760 | 253.4416 | 32.2829 |
| 3500(rpm) | B1 | 6.25 | 2.2910 | 39 | 0.5812 | 253.6703 | 35.3026 |
| 3500(rpm) | B2 | 6 | 2.1994 | 40 | 0.5688 | 258.6160 | 34.6275 |
| 3500(rpm) | B3 | 6.4 | 2.3460 | 40 | 0.5688 | 242.4525 | 36.9360 |
| 3500(rpm) | B4 | 6.41 | 2.3497 | 42 | 0.5417 | 230.5469 | 38.8434 |
| 3500(rpm) | A1 | 6.6 | 2.4193 | 40 | 0.5688 | 235.1054 | 38.0902 |
| 3500(rpm) | A2 | 6.63 | 2.4303 | 41 | 0.5549 | 228.3333 | 39.2200 |
| 3500(rpm) | A3 | 6.7 | 2.4560 | 41.5 | 0.5482 | 223.2255 | 40.1174 |
| 3500(rpm) | A4 | 6.7 | 2.4560 | 42 | 0.5417 | 220.5680 | 40.6007 |
| 1000(rpm) | Ao | 3.7 | 0.3875 | 87 | 0.2450 | 632.1473 | 12.9429 |
| 1000(rpm) | B1 | 3.6 | 0.3770 | 88 | 0.2585 | 685.7242 | 13.0595 |
| 1000(rpm) | B2 | 3.72 | 0.3896 | 89 | 0.2556 | 656.1478 | 13.6482 |
| 1000(rpm) | B3 | 3.72 | 0.3896 | 89 | 0.2556 | 656.1478 | 13.6482 |
| 1000(rpm) | B4 | 3.8 | 0.3980 | 91 | 0.2500 | 628.2170 | 14.2550 |
| 1000(rpm) | A1 | 3.7 | 0.3875 | 89 | 0.2556 | 659.6946 | 13.5748 |
| 1000(rpm) | A2 | 3.6 | 0.3770 | 90 | 0.2528 | 670.4859 | 13.3563 |
| 1000(rpm) | A3 | 3.65 | 0.3823 | 90.5 | 0.2514 | 657.6476 | 13.6171 |
| 1000(rpm) | A4 | 3.72 | 0.3896 | 91 | 0.2500 | 641.7270 | 13.9549 |
| 1200(rpm) | Ao | 4 | 0.5027 | 77 | 0.2768 | 550.5634 | 14.8608 |
| 1200(rpm) | B1 | 4 | 0.5027 | 79 | 0.2880 | 572.8835 | 15.6318 |
| 1200(rpm) | B2 | 3.95 | 0.4964 | 80 | 0.2844 | 572.8835 | 15.6318 |
| 1200(rpm) | B3 | 4.1 | 0.5153 | 80 | 0.2844 | 551.9244 | 16.2255 |
| 1200(rpm) | B4 | 4.2 | 0.5279 | 82 | 0.2775 | 525.6422 | 17.0367 |
| 1200(rpm) | A1 | 3.95 | 0.4964 | 80 | 0.2844 | 572.8835 | 15.6318 |
| 1200(rpm) | A2 | 4 | 0.5027 | 81 | 0.2809 | 558.7382 | 16.0276 |
| 1200(rpm) | A3 | 4 | 0.5027 | 81.5 | 0.2792 | 555.3104 | 16.1265 |
| 1200(rpm) | A4 | 4.1 | 0.5153 | 82 | 0.2775 | 538.4628 | 16.6311 |
| 1400(rpm) | Ao | 4.2 | 0.6158 | 62.2 | 0.3426 | 556.3801 | 14.7054 |
| 1400(rpm) | B1 | 4.2 | 0.6158 | 64.2 | 0.3320 | 539.0474 | 16.6131 |
| 1400(rpm) | B2 | 4.15 | 0.6085 | 65.2 | 0.3490 | 573.4703 | 15.6158 |
| 1400(rpm) | B3 | 4.3 | 0.6305 | 65.2 | 0.3490 | 553.4655 | 16.1803 |
| 1400(rpm) | B4 | 4.4 | 0.6452 | 67.2 | 0.3386 | 524.7889 | 17.0644 |
| 1400(rpm) | A1 | 3.95 | 0.5792 | 63.2 | 0.3600 | 621.5734 | 14.4073 |
| 1400(rpm) | A2 | 4 | 0.5865 | 64.2 | 0.3544 | 604.2430 | 14.8206 |
| 1400(rpm) | A3 | 4.15 | 0.6085 | 64.7 | 0.3517 | 577.9021 | 15.4961 |
| 1400(rpm) | A4 | 4.25 | 0.6232 | 65.2 | 0.3490 | 559.9769 | 15.9921 |
| 1600(rpm) | Ao | 4.8 | 0.8044 | 59.2 | 0.3600 | 447.5652 | 18.2807 |
| 1600(rpm) | B1 | 4.7 | 0.7876 | 61.2 | 0.3718 | 472.0254 | 18.9719 |
| 1600(rpm) | B2 | 4.7 | 0.7876 | 62.2 | 0.3658 | 464.4366 | 19.2819 |
| 1600(rpm) | B3 | 4.9 | 0.8211 | 62.2 | 0.3658 | 445.4800 | 20.1024 |
| 1600(rpm) | B4 | 5 | 0.8379 | 64.2 | 0.3544 | 422.9701 | 21.1722 |
| 1600(rpm) | A1 | 4.8 | 0.8044 | 60.2 | 0.3779 | 469.8692 | 19.0590 |
| 1600(rpm) | A2 | 4.75 | 0.7960 | 61.2 | 0.3718 | 467.0567 | 19.1737 |
| 1600(rpm) | A3 | 4.8 | 0.8044 | 61.7 | 0.3688 | 458.4461 | 19.5339 |
| 1600(rpm) | A4 | 4.9 | 0.8211 | 62.2 | 0.3658 | 445.4800 | 20.1024 |
| 1800(rpm) | Ao | 4.8 | 0.9049 | 54.2 | 0.3932 | 434.5365 | 18.8288 |
| 1800(rpm) | B1 | 4.8 | 0.9049 | 56.2 | 0.4048 | 447.3883 | 20.0167 |
| 1800(rpm) | B2 | 4.9 | 0.9237 | 57.2 | 0.3978 | 430.5960 | 20.7973 |
| 1800(rpm) | B3 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 1800(rpm) | B4 | 5.1 | 0.9615 | 59.2 | 0.3843 | 399.7332 | 22.4030 |
| 1800(rpm) | A1 | 4.75 | 0.8955 | 55.2 | 0.4122 | 460.2878 | 19.4557 |
| 1800(rpm) | A2 | 4.8 | 0.9049 | 56.2 | 0.4048 | 447.3883 | 20.0167 |
| 1800(rpm) | A3 | 4.8 | 0.9049 | 56.7 | 0.4013 | 443.4430 | 20.1948 |
| 1800(rpm) | A4 | 4.9 | 0.9237 | 57.2 | 0.3978 | 430.5960 | 20.7973 |
| 2200(rpm) | Ao | 5.6 | 1.2903 | 47.2 | 0.4515 | 349.9343 | 23.3810 |
| 2200(rpm) | B1 | 5.6 | 1.2903 | 49.2 | 0.4624 | 358.3924 | 24.9872 |
| 2200(rpm) | B2 | 5.7 | 1.3134 | 50.2 | 0.4532 | 345.0908 | 25.9503 |
| 2200(rpm) | B3 | 5.65 | 1.3018 | 50.2 | 0.4532 | 348.1447 | 25.7227 |
| 2200(rpm) | B4 | 5.8 | 1.3364 | 52.2 | 0.4359 | 326.1471 | 27.4576 |
| 2200(rpm) | A1 | 5.5 | 1.2673 | 48.2 | 0.4720 | 372.4794 | 24.0422 |
| 2200(rpm) | A2 | 5.5 | 1.2673 | 49.2 | 0.4624 | 364.9087 | 24.5410 |
| 2200(rpm) | A3 | 5.6 | 1.2903 | 49.7 | 0.4578 | 354.7869 | 25.2411 |
| 2200(rpm) | A4 | 5.75 | 1.3249 | 50.2 | 0.4532 | 342.0900 | 26.1780 |
| 2500(rpm) | Ao | 6 | 1.5710 | 45 | 0.4736 | 301.4640 | 27.1403 |
| 2500(rpm) | B1 | 6.1 | 1.5972 | 47 | 0.4841 | 303.0868 | 29.5467 |
| 2500(rpm) | B2 | 6.1 | 1.5972 | 48 | 0.4740 | 296.7724 | 30.1754 |
| 2500(rpm) | B3 | 6.2 | 1.6234 | 48 | 0.4740 | 291.9858 | 30.6701 |
| 2500(rpm) | B4 | 6.2 | 1.6234 | 50 | 0.4550 | 280.3064 | 31.9480 |
| 2500(rpm) | A1 | 6 | 1.5710 | 46 | 0.4946 | 314.8369 | 28.4440 |
| 2500(rpm) | A2 | 6 | 1.5710 | 47 | 0.4841 | 308.1382 | 29.0624 |
| 2500(rpm) | A3 | 5.95 | 1.5579 | 47.5 | 0.4790 | 307.4568 | 29.1268 |
| 2500(rpm) | A4 | 5.9 | 1.5448 | 48 | 0.4740 | 306.8325 | 29.1860 |
| 3000(rpm) | Ao | 6.6 | 2.0737 | 42 | 0.5074 | 244.6948 | 33.4368 |
| 3000(rpm) | B1 | 6.7 | 2.1051 | 44 | 0.5171 | 245.6326 | 36.4578 |
| 3000(rpm) | B2 | 6.72 | 2.1114 | 45 | 0.5056 | 239.4592 | 37.3977 |
| 3000(rpm) | B3 | 6.7 | 2.1051 | 45 | 0.5056 | 240.1741 | 37.2864 |
| 3000(rpm) | B4 | 6.8 | 2.1366 | 47 | 0.4841 | 226.5722 | 39.5248 |
| 3000(rpm) | A1 | 6.7 | 2.1051 | 45 | 0.5056 | 240.1741 | 37.2864 |
| 3000(rpm) | A2 | 6.7 | 2.1051 | 46 | 0.4946 | 234.9529 | 38.1150 |
| 3000(rpm) | A3 | 6.75 | 2.1209 | 46.5 | 0.4893 | 230.7048 | 38.8168 |
| 3000(rpm) | A4 | 6.8 | 2.1366 | 47 | 0.4841 | 226.5722 | 39.5248 |
| 3500(rpm) | Ao | 6 | 2.1994 | 37 | 0.5760 | 261.8896 | 31.2415 |
| 3500(rpm) | B1 | 6.05 | 2.2177 | 39 | 0.5812 | 262.0561 | 34.1729 |
| 3500(rpm) | B2 | 5.8 | 2.1261 | 40 | 0.5688 | 267.5338 | 33.4732 |
| 3500(rpm) | B3 | 6.2 | 2.2727 | 40 | 0.5688 | 250.2735 | 35.7817 |
| 3500(rpm) | B4 | 6.21 | 2.2764 | 42 | 0.5417 | 237.9719 | 37.6314 |
| 3500(rpm) | A1 | 6.4 | 2.3460 | 40 | 0.5688 | 242.4525 | 36.9360 |
| 3500(rpm) | A2 | 6.43 | 2.3570 | 41 | 0.5549 | 235.4354 | 38.0369 |
| 3500(rpm) | A3 | 6.5 | 2.3827 | 41.5 | 0.5482 | 230.0939 | 38.9199 |
| 3500(rpm) | A4 | 6.5 | 2.3827 | 42 | 0.5417 | 227.3547 | 39.3888 |
| 1000(rpm) | Ao | 4 | 0.4189 | 87 | 0.2450 | 584.7363 | 13.9923 |
| 1000(rpm) | B1 | 3.9 | 0.4085 | 88 | 0.2585 | 632.9762 | 14.1478 |
| 1000(rpm) | B2 | 4.02 | 0.4210 | 89 | 0.2556 | 607.1816 | 14.7488 |
| 1000(rpm) | B3 | 4.02 | 0.4210 | 89 | 0.2556 | 607.1816 | 14.7488 |
| 1000(rpm) | B4 | 4.1 | 0.4294 | 91 | 0.2500 | 582.2499 | 15.3804 |
| 1000(rpm) | A1 | 4 | 0.4189 | 89 | 0.2556 | 610.2175 | 14.6755 |
| 1000(rpm) | A2 | 3.9 | 0.4085 | 90 | 0.2528 | 618.9101 | 14.4693 |
| 1000(rpm) | A3 | 3.95 | 0.4137 | 90.5 | 0.2514 | 607.6996 | 14.7363 |
| 1000(rpm) | A4 | 4.02 | 0.4210 | 91 | 0.2500 | 593.8369 | 15.0803 |
| 1200(rpm) | Ao | 4.3 | 0.5404 | 77 | 0.2768 | 512.1520 | 15.9754 |
| 1200(rpm) | B1 | 4.3 | 0.5404 | 79 | 0.2880 | 532.9149 | 16.8042 |
| 1200(rpm) | B2 | 4.25 | 0.5341 | 80 | 0.2844 | 532.4447 | 16.8191 |
| 1200(rpm) | B3 | 4.4 | 0.5530 | 80 | 0.2844 | 514.2932 | 17.4127 |
| 1200(rpm) | B4 | 4.5 | 0.5656 | 82 | 0.2775 | 490.5994 | 18.2536 |
| 1200(rpm) | A1 | 4.25 | 0.5341 | 80 | 0.2844 | 532.4447 | 16.8191 |
| 1200(rpm) | A2 | 4.3 | 0.5404 | 81 | 0.2809 | 519.7565 | 17.2297 |
| 1200(rpm) | A3 | 4.3 | 0.5404 | 81.5 | 0.2792 | 516.5678 | 17.3360 |
| 1200(rpm) | A4 | 4.4 | 0.5530 | 82 | 0.2775 | 501.7494 | 17.8480 |
| 1400(rpm) | Ao | 4.5 | 0.6598 | 62.2 | 0.3426 | 519.2881 | 15.7558 |
| 1400(rpm) | B1 | 4.5 | 0.6598 | 64.2 | 0.3320 | 503.1109 | 17.7997 |
| 1400(rpm) | B2 | 4.45 | 0.6525 | 65.2 | 0.3490 | 534.8094 | 16.7447 |
| 1400(rpm) | B3 | 4.6 | 0.6745 | 65.2 | 0.3490 | 517.3699 | 17.3091 |
| 1400(rpm) | B4 | 4.7 | 0.6891 | 67.2 | 0.3386 | 491.2918 | 18.2279 |
| 1400(rpm) | A1 | 4.25 | 0.6232 | 63.2 | 0.3600 | 577.6977 | 15.5016 |
| 1400(rpm) | A2 | 4.3 | 0.6305 | 64.2 | 0.3544 | 562.0865 | 15.9321 |
| 1400(rpm) | A3 | 4.45 | 0.6525 | 64.7 | 0.3517 | 538.9424 | 16.6163 |
| 1400(rpm) | A4 | 4.55 | 0.6672 | 65.2 | 0.3490 | 523.0553 | 17.1210 |
| 1600(rpm) | Ao | 5.1 | 0.8546 | 59.2 | 0.3600 | 421.2379 | 19.4233 |
| 1600(rpm) | B1 | 5 | 0.8379 | 61.2 | 0.3718 | 443.7039 | 20.1829 |
| 1600(rpm) | B2 | 5 | 0.8379 | 62.2 | 0.3658 | 436.5704 | 20.5127 |
| 1600(rpm) | B3 | 5.2 | 0.8714 | 62.2 | 0.3658 | 419.7792 | 21.3332 |
| 1600(rpm) | B4 | 5.3 | 0.8881 | 64.2 | 0.3544 | 399.0284 | 22.4426 |
| 1600(rpm) | A1 | 5.1 | 0.8546 | 60.2 | 0.3779 | 442.2298 | 20.2502 |
| 1600(rpm) | A2 | 5.05 | 0.8462 | 61.2 | 0.3718 | 439.3108 | 20.3847 |
| 1600(rpm) | A3 | 5.1 | 0.8546 | 61.7 | 0.3688 | 431.4787 | 20.7547 |
| 1600(rpm) | A4 | 5.2 | 0.8714 | 62.2 | 0.3658 | 419.7792 | 21.3332 |
| 1800(rpm) | Ao | 5.1 | 0.9615 | 54.2 | 0.3932 | 408.9755 | 20.0056 |
| 1800(rpm) | B1 | 5.1 | 0.9615 | 56.2 | 0.4048 | 421.0713 | 21.2677 |
| 1800(rpm) | B2 | 5.2 | 0.9803 | 57.2 | 0.3978 | 405.7540 | 22.0706 |
| 1800(rpm) | B3 | 5.3 | 0.9992 | 57.2 | 0.3978 | 398.0982 | 22.4950 |
| 1800(rpm) | B4 | 5.4 | 1.0180 | 59.2 | 0.3843 | 377.5258 | 23.7208 |
| 1800(rpm) | A1 | 5.05 | 0.9520 | 55.2 | 0.4122 | 432.9440 | 20.6845 |
| 1800(rpm) | A2 | 5.1 | 0.9615 | 56.2 | 0.4048 | 421.0713 | 21.2677 |
| 1800(rpm) | A3 | 5.1 | 0.9615 | 56.7 | 0.4013 | 417.3582 | 21.4569 |
| 1800(rpm) | A4 | 5.2 | 0.9803 | 57.2 | 0.3978 | 405.7540 | 22.0706 |
| 2200(rpm) | Ao | 5.9 | 1.3594 | 47.2 | 0.4515 | 332.1411 | 24.6336 |
| 2200(rpm) | B1 | 5.9 | 1.3594 | 49.2 | 0.4624 | 340.1691 | 26.3258 |
| 2200(rpm) | B2 | 6 | 1.3825 | 50.2 | 0.4532 | 327.8363 | 27.3161 |
| 2200(rpm) | B3 | 5.95 | 1.3710 | 50.2 | 0.4532 | 330.5912 | 27.0885 |
| 2200(rpm) | B4 | 6.1 | 1.4055 | 52.2 | 0.4359 | 310.1070 | 28.8778 |
| 2200(rpm) | A1 | 5.8 | 1.3364 | 48.2 | 0.4720 | 353.2132 | 25.3536 |
| 2200(rpm) | A2 | 5.8 | 1.3364 | 49.2 | 0.4624 | 346.0341 | 25.8796 |
| 2200(rpm) | A3 | 5.9 | 1.3594 | 49.7 | 0.4578 | 336.7469 | 26.5933 |
| 2200(rpm) | A4 | 6.05 | 1.3940 | 50.2 | 0.4532 | 325.1269 | 27.5438 |
| 2500(rpm) | Ao | 6.3 | 1.6496 | 45 | 0.4736 | 287.1086 | 28.4973 |
| 2500(rpm) | B1 | 6.4 | 1.6757 | 47 | 0.4841 | 288.8796 | 30.9999 |
| 2500(rpm) | B2 | 6.4 | 1.6757 | 48 | 0.4740 | 282.8612 | 31.6594 |
| 2500(rpm) | B3 | 6.5 | 1.7019 | 48 | 0.4740 | 278.5095 | 32.1541 |
| 2500(rpm) | B4 | 6.5 | 1.7019 | 50 | 0.4550 | 267.3691 | 33.4939 |
| 2500(rpm) | A1 | 6.3 | 1.6496 | 46 | 0.4946 | 299.8446 | 29.8662 |
| 2500(rpm) | A2 | 6.3 | 1.6496 | 47 | 0.4841 | 293.4649 | 30.5155 |
| 2500(rpm) | A3 | 6.25 | 1.6365 | 47.5 | 0.4790 | 292.6989 | 30.5954 |
| 2500(rpm) | A4 | 6.2 | 1.6234 | 48 | 0.4740 | 291.9858 | 30.6701 |
| 3000(rpm) | Ao | 6.9 | 2.1680 | 42 | 0.5074 | 234.0559 | 34.9567 |
| 3000(rpm) | B1 | 7 | 2.1994 | 44 | 0.5171 | 235.1054 | 38.0902 |
| 3000(rpm) | B2 | 7.02 | 2.2057 | 45 | 0.5056 | 229.2259 | 39.0672 |
| 3000(rpm) | B3 | 7 | 2.1994 | 45 | 0.5056 | 229.8809 | 38.9559 |
| 3000(rpm) | B4 | 7.1 | 2.2308 | 47 | 0.4841 | 216.9987 | 41.2686 |
| 3000(rpm) | A1 | 7 | 2.1994 | 45 | 0.5056 | 229.8809 | 38.9559 |
| 3000(rpm) | A2 | 7 | 2.1994 | 46 | 0.4946 | 224.8835 | 39.8216 |
| 3000(rpm) | A3 | 7.05 | 2.2151 | 46.5 | 0.4893 | 220.8876 | 40.5420 |
| 3000(rpm) | A4 | 7.1 | 2.2308 | 47 | 0.4841 | 216.9987 | 41.2686 |
| 3500(rpm) | Ao | 6.3 | 2.3094 | 37 | 0.5760 | 249.4187 | 32.8036 |
| 3500(rpm) | B1 | 6.35 | 2.3277 | 39 | 0.5812 | 249.6755 | 35.8675 |
| 3500(rpm) | B2 | 6.1 | 2.2361 | 40 | 0.5688 | 254.3764 | 35.2046 |
| 3500(rpm) | B3 | 6.5 | 2.3827 | 40 | 0.5688 | 238.7224 | 37.5131 |
| 3500(rpm) | B4 | 6.51 | 2.3863 | 42 | 0.5417 | 227.0055 | 39.4494 |
| 3500(rpm) | A1 | 6.7 | 2.4560 | 40 | 0.5688 | 231.5964 | 38.6674 |
| 3500(rpm) | A2 | 6.73 | 2.4670 | 41 | 0.5549 | 224.9405 | 39.8115 |
| 3500(rpm) | A3 | 6.8 | 2.4927 | 41.5 | 0.5482 | 219.9427 | 40.7162 |
| 3500(rpm) | A4 | 6.8 | 2.4927 | 42 | 0.5417 | 217.3244 | 41.2067 |
| 1000(rpm) | Ao | 3.6 | 0.3770 | 87 | 0.2450 | 649.7070 | 12.5931 |
| 1000(rpm) | B1 | 3.5 | 0.3666 | 88 | 0.2585 | 705.3163 | 12.6967 |
| 1000(rpm) | B2 | 3.62 | 0.3791 | 89 | 0.2556 | 674.2735 | 13.2813 |
| 1000(rpm) | B3 | 3.62 | 0.3791 | 89 | 0.2556 | 674.2735 | 13.2813 |
| 1000(rpm) | B4 | 3.7 | 0.3875 | 91 | 0.2500 | 645.1958 | 13.8799 |
| 1000(rpm) | A1 | 3.6 | 0.3770 | 89 | 0.2556 | 678.0194 | 13.2079 |
| 1000(rpm) | A2 | 3.5 | 0.3666 | 90 | 0.2528 | 689.6426 | 12.9853 |
| 1000(rpm) | A3 | 3.55 | 0.3718 | 90.5 | 0.2514 | 676.1728 | 13.2440 |
| 1000(rpm) | A4 | 3.62 | 0.3791 | 91 | 0.2500 | 659.4543 | 13.5797 |
| 1200(rpm) | Ao | 3.9 | 0.4902 | 77 | 0.2768 | 564.6804 | 14.4893 |
| 1200(rpm) | B1 | 3.9 | 0.4902 | 79 | 0.2880 | 587.5728 | 15.2410 |
| 1200(rpm) | B2 | 3.85 | 0.4839 | 80 | 0.2844 | 587.7636 | 15.2361 |
| 1200(rpm) | B3 | 4 | 0.5027 | 80 | 0.2844 | 565.7225 | 15.8297 |
| 1200(rpm) | B4 | 4.1 | 0.5153 | 82 | 0.2775 | 538.4628 | 16.6311 |
| 1200(rpm) | A1 | 3.85 | 0.4839 | 80 | 0.2844 | 587.7636 | 15.2361 |
| 1200(rpm) | A2 | 3.9 | 0.4902 | 81 | 0.2809 | 573.0649 | 15.6269 |
| 1200(rpm) | A3 | 3.9 | 0.4902 | 81.5 | 0.2792 | 569.5491 | 15.7234 |
| 1200(rpm) | A4 | 4 | 0.5027 | 82 | 0.2775 | 551.9244 | 16.2255 |
| 1400(rpm) | Ao | 4.1 | 0.6012 | 62.2 | 0.3426 | 569.9503 | 14.3553 |
| 1400(rpm) | B1 | 4.1 | 0.6012 | 64.2 | 0.3320 | 552.1949 | 16.2175 |
| 1400(rpm) | B2 | 4.05 | 0.5938 | 65.2 | 0.3490 | 587.6301 | 15.2396 |
| 1400(rpm) | B3 | 4.2 | 0.6158 | 65.2 | 0.3490 | 566.6433 | 15.8040 |
| 1400(rpm) | B4 | 4.3 | 0.6305 | 67.2 | 0.3386 | 536.9933 | 16.6766 |
| 1400(rpm) | A1 | 3.85 | 0.5645 | 63.2 | 0.3600 | 637.7182 | 14.0426 |
| 1400(rpm) | A2 | 3.9 | 0.5718 | 64.2 | 0.3544 | 619.7364 | 14.4501 |
| 1400(rpm) | A3 | 4.05 | 0.5938 | 64.7 | 0.3517 | 592.1712 | 15.1227 |
| 1400(rpm) | A4 | 4.15 | 0.6085 | 65.2 | 0.3490 | 573.4703 | 15.6158 |
| 1600(rpm) | Ao | 4.7 | 0.7876 | 59.2 | 0.3600 | 457.0879 | 17.8999 |
| 1600(rpm) | B1 | 4.6 | 0.7708 | 61.2 | 0.3718 | 482.2868 | 18.5683 |
| 1600(rpm) | B2 | 4.6 | 0.7708 | 62.2 | 0.3658 | 474.5330 | 18.8717 |
| 1600(rpm) | B3 | 4.8 | 0.8044 | 62.2 | 0.3658 | 454.7608 | 19.6922 |
| 1600(rpm) | B4 | 4.9 | 0.8211 | 64.2 | 0.3544 | 431.6021 | 20.7488 |
| 1600(rpm) | A1 | 4.7 | 0.7876 | 60.2 | 0.3779 | 479.8664 | 18.6619 |
| 1600(rpm) | A2 | 4.65 | 0.7792 | 61.2 | 0.3718 | 477.1010 | 18.7701 |
| 1600(rpm) | A3 | 4.7 | 0.7876 | 61.7 | 0.3688 | 468.2003 | 19.1269 |
| 1600(rpm) | A4 | 4.8 | 0.8044 | 62.2 | 0.3658 | 454.7608 | 19.6922 |
| 1800(rpm) | Ao | 4.7 | 0.8860 | 54.2 | 0.3932 | 443.7819 | 18.4366 |
| 1800(rpm) | B1 | 4.7 | 0.8860 | 56.2 | 0.4048 | 456.9072 | 19.5997 |
| 1800(rpm) | B2 | 4.8 | 0.9049 | 57.2 | 0.3978 | 439.5668 | 20.3728 |
| 1800(rpm) | B3 | 4.9 | 0.9237 | 57.2 | 0.3978 | 430.5960 | 20.7973 |
| 1800(rpm) | B4 | 5 | 0.9426 | 59.2 | 0.3843 | 407.7279 | 21.9637 |
| 1800(rpm) | A1 | 4.65 | 0.8766 | 55.2 | 0.4122 | 470.1865 | 19.0461 |
| 1800(rpm) | A2 | 4.7 | 0.8860 | 56.2 | 0.4048 | 456.9072 | 19.5997 |
| 1800(rpm) | A3 | 4.7 | 0.8860 | 56.7 | 0.4013 | 452.8780 | 19.7740 |
| 1800(rpm) | A4 | 4.8 | 0.9049 | 57.2 | 0.3978 | 439.5668 | 20.3728 |
| 2200(rpm) | Ao | 5.5 | 1.2673 | 47.2 | 0.4515 | 356.2968 | 22.9635 |
| 2200(rpm) | B1 | 5.5 | 1.2673 | 49.2 | 0.4624 | 364.9087 | 24.5410 |
| 2200(rpm) | B2 | 5.6 | 1.2903 | 50.2 | 0.4532 | 351.2532 | 25.4951 |
| 2200(rpm) | B3 | 5.55 | 1.2788 | 50.2 | 0.4532 | 354.4176 | 25.2674 |
| 2200(rpm) | B4 | 5.7 | 1.3134 | 52.2 | 0.4359 | 331.8689 | 26.9842 |
| 2200(rpm) | A1 | 5.4 | 1.2442 | 48.2 | 0.4720 | 379.3772 | 23.6051 |
| 2200(rpm) | A2 | 5.4 | 1.2442 | 49.2 | 0.4624 | 371.6662 | 24.0948 |
| 2200(rpm) | A3 | 5.5 | 1.2673 | 49.7 | 0.4578 | 361.2376 | 24.7904 |
| 2200(rpm) | A4 | 5.65 | 1.3018 | 50.2 | 0.4532 | 348.1447 | 25.7227 |
| 2500(rpm) | Ao | 5.9 | 1.5448 | 45 | 0.4736 | 306.5736 | 26.6879 |
| 2500(rpm) | B1 | 6 | 1.5710 | 47 | 0.4841 | 308.1382 | 29.0624 |
| 2500(rpm) | B2 | 6 | 1.5710 | 48 | 0.4740 | 301.7187 | 29.6807 |
| 2500(rpm) | B3 | 6.1 | 1.5972 | 48 | 0.4740 | 296.7724 | 30.1754 |
| 2500(rpm) | B4 | 6.1 | 1.5972 | 50 | 0.4550 | 284.9015 | 31.4327 |
| 2500(rpm) | A1 | 5.9 | 1.5448 | 46 | 0.4946 | 320.1731 | 27.9699 |
| 2500(rpm) | A2 | 5.9 | 1.5448 | 47 | 0.4841 | 313.3609 | 28.5780 |
| 2500(rpm) | A3 | 5.85 | 1.5317 | 47.5 | 0.4790 | 312.7124 | 28.6372 |
| 2500(rpm) | A4 | 5.8 | 1.5186 | 48 | 0.4740 | 312.1227 | 28.6914 |
| 3000(rpm) | Ao | 6.5 | 2.0423 | 42 | 0.5074 | 248.4594 | 32.9302 |
| 3000(rpm) | B1 | 6.6 | 2.0737 | 44 | 0.5171 | 249.3543 | 35.9137 |
| 3000(rpm) | B2 | 6.62 | 2.0800 | 45 | 0.5056 | 243.0765 | 36.8412 |
| 3000(rpm) | B3 | 6.6 | 2.0737 | 45 | 0.5056 | 243.8131 | 36.7299 |
| 3000(rpm) | B4 | 6.7 | 2.1051 | 47 | 0.4841 | 229.9539 | 38.9436 |
| 3000(rpm) | A1 | 6.6 | 2.0737 | 45 | 0.5056 | 243.8131 | 36.7299 |
| 3000(rpm) | A2 | 6.6 | 2.0737 | 46 | 0.4946 | 238.5128 | 37.5461 |
| 3000(rpm) | A3 | 6.65 | 2.0894 | 46.5 | 0.4893 | 234.1741 | 38.2417 |
| 3000(rpm) | A4 | 6.7 | 2.1051 | 47 | 0.4841 | 229.9539 | 38.9436 |
| 3500(rpm) | Ao | 5.9 | 2.1627 | 37 | 0.5760 | 266.3284 | 30.7208 |
| 3500(rpm) | B1 | 5.95 | 2.1811 | 39 | 0.5812 | 266.4604 | 33.6081 |
| 3500(rpm) | B2 | 5.7 | 2.0894 | 40 | 0.5688 | 272.2274 | 32.8961 |
| 3500(rpm) | B3 | 6.1 | 2.2361 | 40 | 0.5688 | 254.3764 | 35.2046 |
| 3500(rpm) | B4 | 6.11 | 2.2397 | 42 | 0.5417 | 241.8667 | 37.0254 |
| 3500(rpm) | A1 | 6.3 | 2.3094 | 40 | 0.5688 | 246.3009 | 36.3589 |
| 3500(rpm) | A2 | 6.33 | 2.3204 | 41 | 0.5549 | 239.1548 | 37.4453 |
| 3500(rpm) | A3 | 6.4 | 2.3460 | 41.5 | 0.5482 | 233.6891 | 38.3211 |
| 3500(rpm) | A4 | 6.4 | 2.3460 | 42 | 0.5417 | 230.9071 | 38.7828 |
| 1000(rpm) | Ao | 3.4 | 0.3561 | 87 | 0.2450 | 687.9250 | 11.8935 |
| 1000(rpm) | B1 | 3.3 | 0.3456 | 88 | 0.2585 | 748.0628 | 11.9712 |
| 1000(rpm) | B2 | 3.42 | 0.3582 | 89 | 0.2556 | 713.7047 | 12.5475 |
| 1000(rpm) | B3 | 3.42 | 0.3582 | 89 | 0.2556 | 713.7047 | 12.5475 |
| 1000(rpm) | B4 | 3.5 | 0.3666 | 91 | 0.2500 | 682.0641 | 13.1296 |
| 1000(rpm) | A1 | 3.4 | 0.3561 | 89 | 0.2556 | 717.9029 | 12.4741 |
| 1000(rpm) | A2 | 3.3 | 0.3456 | 90 | 0.2528 | 731.4392 | 12.2433 |
| 1000(rpm) | A3 | 3.35 | 0.3509 | 90.5 | 0.2514 | 716.5414 | 12.4978 |
| 1000(rpm) | A4 | 3.42 | 0.3582 | 91 | 0.2500 | 698.0189 | 12.8295 |
| 1200(rpm) | Ao | 3.7 | 0.4650 | 77 | 0.2768 | 595.2037 | 13.7463 |
| 1200(rpm) | B1 | 3.7 | 0.4650 | 79 | 0.2880 | 619.3335 | 14.4595 |
| 1200(rpm) | B2 | 3.65 | 0.4587 | 80 | 0.2844 | 619.9698 | 14.4446 |
| 1200(rpm) | B3 | 3.8 | 0.4776 | 80 | 0.2844 | 595.4973 | 15.0382 |
| 1200(rpm) | B4 | 3.9 | 0.4902 | 82 | 0.2775 | 566.0763 | 15.8198 |
| 1200(rpm) | A1 | 3.65 | 0.4587 | 80 | 0.2844 | 619.9698 | 14.4446 |
| 1200(rpm) | A2 | 3.7 | 0.4650 | 81 | 0.2809 | 604.0413 | 14.8255 |
| 1200(rpm) | A3 | 3.7 | 0.4650 | 81.5 | 0.2792 | 600.3356 | 14.9170 |
| 1200(rpm) | A4 | 3.8 | 0.4776 | 82 | 0.2775 | 580.9730 | 15.4142 |
| 1400(rpm) | Ao | 3.9 | 0.5718 | 62.2 | 0.3426 | 599.1785 | 13.6551 |
| 1400(rpm) | B1 | 3.9 | 0.5718 | 64.2 | 0.3320 | 580.5125 | 15.4264 |
| 1400(rpm) | B2 | 3.85 | 0.5645 | 65.2 | 0.3490 | 618.1563 | 14.4870 |
| 1400(rpm) | B3 | 4 | 0.5865 | 65.2 | 0.3490 | 594.9754 | 15.0514 |
| 1400(rpm) | B4 | 4.1 | 0.6012 | 67.2 | 0.3386 | 563.1881 | 15.9009 |
| 1400(rpm) | A1 | 3.65 | 0.5352 | 63.2 | 0.3600 | 672.6617 | 13.3131 |
| 1400(rpm) | A2 | 3.7 | 0.5425 | 64.2 | 0.3544 | 653.2356 | 13.7090 |
| 1400(rpm) | A3 | 3.85 | 0.5645 | 64.7 | 0.3517 | 622.9334 | 14.3759 |
| 1400(rpm) | A4 | 3.95 | 0.5792 | 65.2 | 0.3490 | 602.5068 | 14.8633 |
| 1600(rpm) | Ao | 4.5 | 0.7541 | 59.2 | 0.3600 | 477.4029 | 17.1382 |
| 1600(rpm) | B1 | 4.4 | 0.7373 | 61.2 | 0.3718 | 504.2090 | 17.7609 |
| 1600(rpm) | B2 | 4.4 | 0.7373 | 62.2 | 0.3658 | 496.1027 | 18.0511 |
| 1600(rpm) | B3 | 4.6 | 0.7708 | 62.2 | 0.3658 | 474.5330 | 18.8717 |
| 1600(rpm) | B4 | 4.7 | 0.7876 | 64.2 | 0.3544 | 449.9682 | 19.9019 |
| 1600(rpm) | A1 | 4.5 | 0.7541 | 60.2 | 0.3779 | 501.1938 | 17.8678 |
| 1600(rpm) | A2 | 4.45 | 0.7457 | 61.2 | 0.3718 | 498.5437 | 17.9628 |
| 1600(rpm) | A3 | 4.5 | 0.7541 | 61.7 | 0.3688 | 489.0092 | 18.3130 |
| 1600(rpm) | A4 | 4.6 | 0.7708 | 62.2 | 0.3658 | 474.5330 | 18.8717 |
| 1800(rpm) | Ao | 4.5 | 0.8483 | 54.2 | 0.3932 | 463.5056 | 17.6520 |
| 1800(rpm) | B1 | 4.5 | 0.8483 | 56.2 | 0.4048 | 477.2142 | 18.7656 |
| 1800(rpm) | B2 | 4.6 | 0.8672 | 57.2 | 0.3978 | 458.6784 | 19.5240 |
| 1800(rpm) | B3 | 4.7 | 0.8860 | 57.2 | 0.3978 | 448.9193 | 19.9484 |
| 1800(rpm) | B4 | 4.8 | 0.9049 | 59.2 | 0.3843 | 424.7166 | 21.0852 |
| 1800(rpm) | A1 | 4.45 | 0.8389 | 55.2 | 0.4122 | 491.3184 | 18.2269 |
| 1800(rpm) | A2 | 4.5 | 0.8483 | 56.2 | 0.4048 | 477.2142 | 18.7656 |
| 1800(rpm) | A3 | 4.5 | 0.8483 | 56.7 | 0.4013 | 473.0059 | 18.9326 |
| 1800(rpm) | A4 | 4.6 | 0.8672 | 57.2 | 0.3978 | 458.6784 | 19.5240 |
| 2200(rpm) | Ao | 5.3 | 1.2212 | 47.2 | 0.4515 | 369.7420 | 22.1285 |
| 2200(rpm) | B1 | 5.3 | 1.2212 | 49.2 | 0.4624 | 378.6788 | 23.6486 |
| 2200(rpm) | B2 | 5.4 | 1.2442 | 50.2 | 0.4532 | 364.2625 | 24.5845 |
| 2200(rpm) | B3 | 5.35 | 1.2327 | 50.2 | 0.4532 | 367.6668 | 24.3569 |
| 2200(rpm) | B4 | 5.5 | 1.2673 | 52.2 | 0.4359 | 343.9369 | 26.0374 |
| 2200(rpm) | A1 | 5.2 | 1.1981 | 48.2 | 0.4720 | 393.9686 | 22.7308 |
| 2200(rpm) | A2 | 5.2 | 1.1981 | 49.2 | 0.4624 | 385.9611 | 23.2024 |
| 2200(rpm) | A3 | 5.3 | 1.2212 | 49.7 | 0.4578 | 374.8692 | 23.8889 |
| 2200(rpm) | A4 | 5.45 | 1.2558 | 50.2 | 0.4532 | 360.9207 | 24.8122 |
| 2500(rpm) | Ao | 5.7 | 1.4925 | 45 | 0.4736 | 317.3306 | 25.7833 |
| 2500(rpm) | B1 | 5.8 | 1.5186 | 47 | 0.4841 | 318.7637 | 28.0936 |
| 2500(rpm) | B2 | 5.8 | 1.5186 | 48 | 0.4740 | 312.1227 | 28.6914 |
| 2500(rpm) | B3 | 5.9 | 1.5448 | 48 | 0.4740 | 306.8325 | 29.1860 |
| 2500(rpm) | B4 | 5.9 | 1.5448 | 50 | 0.4550 | 294.5592 | 30.4021 |
| 2500(rpm) | A1 | 5.7 | 1.4925 | 46 | 0.4946 | 331.4072 | 27.0218 |
| 2500(rpm) | A2 | 5.7 | 1.4925 | 47 | 0.4841 | 324.3560 | 27.6092 |
| 2500(rpm) | A3 | 5.65 | 1.4794 | 47.5 | 0.4790 | 323.7819 | 27.6582 |
| 2500(rpm) | A4 | 5.6 | 1.4663 | 48 | 0.4740 | 323.2700 | 27.7020 |
| 3000(rpm) | Ao | 6.3 | 1.9795 | 42 | 0.5074 | 256.3470 | 31.9170 |
| 3000(rpm) | B1 | 6.4 | 2.0109 | 44 | 0.5171 | 257.1466 | 34.8254 |
| 3000(rpm) | B2 | 6.42 | 2.0172 | 45 | 0.5056 | 250.6489 | 35.7282 |
| 3000(rpm) | B3 | 6.4 | 2.0109 | 45 | 0.5056 | 251.4322 | 35.6169 |
| 3000(rpm) | B4 | 6.5 | 2.0423 | 47 | 0.4841 | 237.0294 | 37.7811 |
| 3000(rpm) | A1 | 6.4 | 2.0109 | 45 | 0.5056 | 251.4322 | 35.6169 |
| 3000(rpm) | A2 | 6.4 | 2.0109 | 46 | 0.4946 | 245.9663 | 36.4083 |
| 3000(rpm) | A3 | 6.45 | 2.0266 | 46.5 | 0.4893 | 241.4353 | 37.0916 |
| 3000(rpm) | A4 | 6.5 | 2.0423 | 47 | 0.4841 | 237.0294 | 37.7811 |
| 3500(rpm) | Ao | 5.7 | 2.0894 | 37 | 0.5760 | 275.6733 | 29.6794 |
| 3500(rpm) | B1 | 5.75 | 2.1078 | 39 | 0.5812 | 275.7286 | 32.4784 |
| 3500(rpm) | B2 | 5.5 | 2.0161 | 40 | 0.5688 | 282.1265 | 31.7419 |
| 3500(rpm) | B3 | 5.9 | 2.1627 | 40 | 0.5688 | 262.9993 | 34.0504 |
| 3500(rpm) | B4 | 5.91 | 2.1664 | 42 | 0.5417 | 250.0517 | 35.8135 |
| 3500(rpm) | A1 | 6.1 | 2.2361 | 40 | 0.5688 | 254.3764 | 35.2046 |
| 3500(rpm) | A2 | 6.13 | 2.2471 | 41 | 0.5549 | 246.9575 | 36.2622 |
| 3500(rpm) | A3 | 6.2 | 2.2727 | 41.5 | 0.5482 | 241.2275 | 37.1236 |
| 3500(rpm) | A4 | 6.2 | 2.2727 | 42 | 0.5417 | 238.3557 | 37.5708 |
| 1000(rpm) | Ao | 3.3 | 0.3456 | 87 | 0.2450 | 708.7712 | 11.5437 |
| 1000(rpm) | B1 | 3.2 | 0.3351 | 88 | 0.2585 | 771.4397 | 11.6085 |
| 1000(rpm) | B2 | 3.32 | 0.3477 | 89 | 0.2556 | 735.2018 | 12.1806 |
| 1000(rpm) | B3 | 3.32 | 0.3477 | 89 | 0.2556 | 735.2018 | 12.1806 |
| 1000(rpm) | B4 | 3.4 | 0.3561 | 91 | 0.2500 | 702.1248 | 12.7545 |
| 1000(rpm) | A1 | 3.3 | 0.3456 | 89 | 0.2556 | 739.6576 | 12.1073 |
| 1000(rpm) | A2 | 3.2 | 0.3351 | 90 | 0.2528 | 754.2966 | 11.8723 |
| 1000(rpm) | A3 | 3.25 | 0.3404 | 90.5 | 0.2514 | 738.5888 | 12.1248 |
| 1000(rpm) | A4 | 3.32 | 0.3477 | 91 | 0.2500 | 719.0435 | 12.4544 |
| 1200(rpm) | Ao | 3.6 | 0.4524 | 77 | 0.2768 | 611.7371 | 13.3747 |
| 1200(rpm) | B1 | 3.6 | 0.4524 | 79 | 0.2880 | 636.5372 | 14.0687 |
| 1200(rpm) | B2 | 3.55 | 0.4462 | 80 | 0.2844 | 637.4338 | 14.0489 |
| 1200(rpm) | B3 | 3.7 | 0.4650 | 80 | 0.2844 | 611.5919 | 14.6425 |
| 1200(rpm) | B4 | 3.8 | 0.4776 | 82 | 0.2775 | 580.9730 | 15.4142 |
| 1200(rpm) | A1 | 3.55 | 0.4462 | 80 | 0.2844 | 637.4338 | 14.0489 |
| 1200(rpm) | A2 | 3.6 | 0.4524 | 81 | 0.2809 | 620.8203 | 14.4248 |
| 1200(rpm) | A3 | 3.6 | 0.4524 | 81.5 | 0.2792 | 617.0116 | 14.5139 |
| 1200(rpm) | A4 | 3.7 | 0.4650 | 82 | 0.2775 | 596.6750 | 15.0085 |
| 1400(rpm) | Ao | 3.8 | 0.5572 | 62.2 | 0.3426 | 614.9464 | 13.3049 |
| 1400(rpm) | B1 | 3.8 | 0.5572 | 64.2 | 0.3320 | 595.7892 | 15.0309 |
| 1400(rpm) | B2 | 3.75 | 0.5499 | 65.2 | 0.3490 | 634.6405 | 14.1107 |
| 1400(rpm) | B3 | 3.9 | 0.5718 | 65.2 | 0.3490 | 610.2312 | 14.6751 |
| 1400(rpm) | B4 | 4 | 0.5865 | 67.2 | 0.3386 | 577.2678 | 15.5131 |
| 1400(rpm) | A1 | 3.55 | 0.5205 | 63.2 | 0.3600 | 691.6099 | 12.9484 |
| 1400(rpm) | A2 | 3.6 | 0.5279 | 64.2 | 0.3544 | 671.3811 | 13.3385 |
| 1400(rpm) | A3 | 3.75 | 0.5499 | 64.7 | 0.3517 | 639.5449 | 14.0025 |
| 1400(rpm) | A4 | 3.85 | 0.5645 | 65.2 | 0.3490 | 618.1563 | 14.4870 |
| 1600(rpm) | Ao | 4.4 | 0.7373 | 59.2 | 0.3600 | 488.2530 | 16.7573 |
| 1600(rpm) | B1 | 4.3 | 0.7206 | 61.2 | 0.3718 | 515.9348 | 17.3573 |
| 1600(rpm) | B2 | 4.3 | 0.7206 | 62.2 | 0.3658 | 507.6400 | 17.6409 |
| 1600(rpm) | B3 | 4.5 | 0.7541 | 62.2 | 0.3658 | 485.0782 | 18.4614 |
| 1600(rpm) | B4 | 4.6 | 0.7708 | 64.2 | 0.3544 | 459.7501 | 19.4785 |
| 1600(rpm) | A1 | 4.4 | 0.7373 | 60.2 | 0.3779 | 512.5845 | 17.4707 |
| 1600(rpm) | A2 | 4.35 | 0.7289 | 61.2 | 0.3718 | 510.0045 | 17.5591 |
| 1600(rpm) | A3 | 4.4 | 0.7373 | 61.7 | 0.3688 | 500.1230 | 17.9060 |
| 1600(rpm) | A4 | 4.5 | 0.7541 | 62.2 | 0.3658 | 485.0782 | 18.4614 |
| 1800(rpm) | Ao | 4.4 | 0.8295 | 54.2 | 0.3932 | 474.0398 | 17.2598 |
| 1800(rpm) | B1 | 4.4 | 0.8295 | 56.2 | 0.4048 | 488.0599 | 18.3486 |
| 1800(rpm) | B2 | 4.5 | 0.8483 | 57.2 | 0.3978 | 468.8713 | 19.0995 |
| 1800(rpm) | B3 | 4.6 | 0.8672 | 57.2 | 0.3978 | 458.6784 | 19.5240 |
| 1800(rpm) | B4 | 4.7 | 0.8860 | 59.2 | 0.3843 | 433.7531 | 20.6459 |
| 1800(rpm) | A1 | 4.35 | 0.8201 | 55.2 | 0.4122 | 502.6131 | 17.8173 |
| 1800(rpm) | A2 | 4.4 | 0.8295 | 56.2 | 0.4048 | 488.0599 | 18.3486 |
| 1800(rpm) | A3 | 4.4 | 0.8295 | 56.7 | 0.4013 | 483.7561 | 18.5119 |
| 1800(rpm) | A4 | 4.5 | 0.8483 | 57.2 | 0.3978 | 468.8713 | 19.0995 |
| 2200(rpm) | Ao | 5.2 | 1.1981 | 47.2 | 0.4515 | 376.8524 | 21.7109 |
| 2200(rpm) | B1 | 5.2 | 1.1981 | 49.2 | 0.4624 | 385.9611 | 23.2024 |
| 2200(rpm) | B2 | 5.3 | 1.2212 | 50.2 | 0.4532 | 371.1354 | 24.1293 |
| 2200(rpm) | B3 | 5.25 | 1.2097 | 50.2 | 0.4532 | 374.6700 | 23.9016 |
| 2200(rpm) | B4 | 5.4 | 1.2442 | 52.2 | 0.4359 | 350.3061 | 25.5640 |
| 2200(rpm) | A1 | 5.1 | 1.1751 | 48.2 | 0.4720 | 401.6935 | 22.2937 |
| 2200(rpm) | A2 | 5.1 | 1.1751 | 49.2 | 0.4624 | 393.5290 | 22.7562 |
| 2200(rpm) | A3 | 5.2 | 1.1981 | 49.7 | 0.4578 | 382.0782 | 23.4382 |
| 2200(rpm) | A4 | 5.35 | 1.2327 | 50.2 | 0.4532 | 367.6668 | 24.3569 |
| 2500(rpm) | Ao | 5.6 | 1.4663 | 45 | 0.4736 | 322.9972 | 25.3309 |
| 2500(rpm) | B1 | 5.7 | 1.4925 | 47 | 0.4841 | 324.3560 | 27.6092 |
| 2500(rpm) | B2 | 5.7 | 1.4925 | 48 | 0.4740 | 317.5986 | 28.1967 |
| 2500(rpm) | B3 | 5.8 | 1.5186 | 48 | 0.4740 | 312.1227 | 28.6914 |
| 2500(rpm) | B4 | 5.8 | 1.5186 | 50 | 0.4550 | 299.6378 | 29.8868 |
| 2500(rpm) | A1 | 5.6 | 1.4663 | 46 | 0.4946 | 337.3252 | 26.5477 |
| 2500(rpm) | A2 | 5.6 | 1.4663 | 47 | 0.4841 | 330.1481 | 27.1249 |
| 2500(rpm) | A3 | 5.55 | 1.4532 | 47.5 | 0.4790 | 329.6158 | 27.1687 |
| 2500(rpm) | A4 | 5.5 | 1.4401 | 48 | 0.4740 | 329.1476 | 27.2073 |
| 3000(rpm) | Ao | 6.2 | 1.9480 | 42 | 0.5074 | 260.4816 | 31.4104 |
| 3000(rpm) | B1 | 6.3 | 1.9795 | 44 | 0.5171 | 261.2283 | 34.2812 |
| 3000(rpm) | B2 | 6.32 | 1.9857 | 45 | 0.5056 | 254.6149 | 35.1716 |
| 3000(rpm) | B3 | 6.3 | 1.9795 | 45 | 0.5056 | 255.4232 | 35.0603 |
| 3000(rpm) | B4 | 6.4 | 2.0109 | 47 | 0.4841 | 240.7330 | 37.1998 |
| 3000(rpm) | A1 | 6.3 | 1.9795 | 45 | 0.5056 | 255.4232 | 35.0603 |
| 3000(rpm) | A2 | 6.3 | 1.9795 | 46 | 0.4946 | 249.8705 | 35.8395 |
| 3000(rpm) | A3 | 6.35 | 1.9952 | 46.5 | 0.4893 | 245.2374 | 36.5165 |
| 3000(rpm) | A4 | 6.4 | 2.0109 | 47 | 0.4841 | 240.7330 | 37.1998 |
| 3500(rpm) | Ao | 5.6 | 2.0528 | 37 | 0.5760 | 280.5960 | 29.1587 |
| 3500(rpm) | B1 | 5.65 | 2.0711 | 39 | 0.5812 | 280.6087 | 31.9136 |
| 3500(rpm) | B2 | 5.4 | 1.9795 | 40 | 0.5688 | 287.3511 | 31.1647 |
| 3500(rpm) | B3 | 5.8 | 2.1261 | 40 | 0.5688 | 267.5338 | 33.4732 |
| 3500(rpm) | B4 | 5.81 | 2.1298 | 42 | 0.5417 | 254.3555 | 35.2075 |
| 3500(rpm) | A1 | 6 | 2.1994 | 40 | 0.5688 | 258.6160 | 34.6275 |
| 3500(rpm) | A2 | 6.03 | 2.2104 | 41 | 0.5549 | 251.0530 | 35.6706 |
| 3500(rpm) | A3 | 6.1 | 2.2361 | 41.5 | 0.5482 | 245.1821 | 36.5248 |
| 3500(rpm) | A4 | 6.1 | 2.2361 | 42 | 0.5417 | 242.2632 | 36.9649 |
| 1000(rpm) | Ao | 3.8 | 0.3980 | 87 | 0.2450 | 615.5119 | 13.2927 |
| 1000(rpm) | B1 | 3.7 | 0.3875 | 88 | 0.2585 | 667.1911 | 13.4223 |
| 1000(rpm) | B2 | 3.82 | 0.4001 | 89 | 0.2556 | 638.9712 | 14.0151 |
| 1000(rpm) | B3 | 3.82 | 0.4001 | 89 | 0.2556 | 638.9712 | 14.0151 |
| 1000(rpm) | B4 | 3.9 | 0.4085 | 91 | 0.2500 | 612.1088 | 14.6301 |
| 1000(rpm) | A1 | 3.8 | 0.3980 | 89 | 0.2556 | 642.3342 | 13.9417 |
| 1000(rpm) | A2 | 3.7 | 0.3875 | 90 | 0.2528 | 652.3646 | 13.7273 |
| 1000(rpm) | A3 | 3.75 | 0.3928 | 90.5 | 0.2514 | 640.1103 | 13.9901 |
| 1000(rpm) | A4 | 3.82 | 0.4001 | 91 | 0.2500 | 624.9279 | 14.3300 |
| 1200(rpm) | Ao | 4.1 | 0.5153 | 77 | 0.2768 | 537.1350 | 15.2323 |
| 1200(rpm) | B1 | 4.1 | 0.5153 | 79 | 0.2880 | 558.9107 | 16.0226 |
| 1200(rpm) | B2 | 4.05 | 0.5090 | 80 | 0.2844 | 558.7382 | 16.0276 |
| 1200(rpm) | B3 | 4.2 | 0.5279 | 80 | 0.2844 | 538.7833 | 16.6212 |
| 1200(rpm) | B4 | 4.3 | 0.5404 | 82 | 0.2775 | 513.4180 | 17.4424 |
| 1200(rpm) | A1 | 4.05 | 0.5090 | 80 | 0.2844 | 558.7382 | 16.0276 |
| 1200(rpm) | A2 | 4.1 | 0.5153 | 81 | 0.2809 | 545.1105 | 16.4283 |
| 1200(rpm) | A3 | 4.1 | 0.5153 | 81.5 | 0.2792 | 541.7662 | 16.5297 |
| 1200(rpm) | A4 | 4.2 | 0.5279 | 82 | 0.2775 | 525.6422 | 17.0367 |
| 1400(rpm) | Ao | 4.3 | 0.6305 | 62.2 | 0.3426 | 543.4410 | 15.0556 |
| 1400(rpm) | B1 | 4.3 | 0.6305 | 64.2 | 0.3320 | 526.5114 | 17.0086 |
| 1400(rpm) | B2 | 4.25 | 0.6232 | 65.2 | 0.3490 | 559.9769 | 15.9921 |
| 1400(rpm) | B3 | 4.4 | 0.6452 | 65.2 | 0.3490 | 540.8868 | 16.5566 |
| 1400(rpm) | B4 | 4.5 | 0.6598 | 67.2 | 0.3386 | 513.1270 | 17.4523 |
| 1400(rpm) | A1 | 4.05 | 0.5938 | 63.2 | 0.3600 | 606.2259 | 14.7721 |
| 1400(rpm) | A2 | 4.1 | 0.6012 | 64.2 | 0.3544 | 589.5053 | 15.1911 |
| 1400(rpm) | A3 | 4.25 | 0.6232 | 64.7 | 0.3517 | 564.3044 | 15.8695 |
| 1400(rpm) | A4 | 4.35 | 0.6378 | 65.2 | 0.3490 | 547.1038 | 16.3684 |
| 1600(rpm) | Ao | 4.9 | 0.8211 | 59.2 | 0.3600 | 438.4313 | 18.6616 |
| 1600(rpm) | B1 | 4.8 | 0.8044 | 61.2 | 0.3718 | 462.1916 | 19.3756 |
| 1600(rpm) | B2 | 4.8 | 0.8044 | 62.2 | 0.3658 | 454.7608 | 19.6922 |
| 1600(rpm) | B3 | 5 | 0.8379 | 62.2 | 0.3658 | 436.5704 | 20.5127 |
| 1600(rpm) | B4 | 5.1 | 0.8546 | 64.2 | 0.3544 | 414.6765 | 21.5957 |
| 1600(rpm) | A1 | 4.9 | 0.8211 | 60.2 | 0.3779 | 460.2800 | 19.4560 |
| 1600(rpm) | A2 | 4.85 | 0.8127 | 61.2 | 0.3718 | 457.4267 | 19.5774 |
| 1600(rpm) | A3 | 4.9 | 0.8211 | 61.7 | 0.3688 | 449.0900 | 19.9408 |
| 1600(rpm) | A4 | 5 | 0.8379 | 62.2 | 0.3658 | 436.5704 | 20.5127 |
| 1800(rpm) | Ao | 4.9 | 0.9237 | 54.2 | 0.3932 | 425.6684 | 19.2211 |
| 1800(rpm) | B1 | 4.9 | 0.9237 | 56.2 | 0.4048 | 438.2579 | 20.4337 |
| 1800(rpm) | B2 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 1800(rpm) | B3 | 5.1 | 0.9615 | 57.2 | 0.3978 | 413.7099 | 21.6461 |
| 1800(rpm) | B4 | 5.2 | 0.9803 | 59.2 | 0.3843 | 392.0461 | 22.8423 |
| 1800(rpm) | A1 | 4.85 | 0.9143 | 55.2 | 0.4122 | 450.7973 | 19.8653 |
| 1800(rpm) | A2 | 4.9 | 0.9237 | 56.2 | 0.4048 | 438.2579 | 20.4337 |
| 1800(rpm) | A3 | 4.9 | 0.9237 | 56.7 | 0.4013 | 434.3932 | 20.6155 |
| 1800(rpm) | A4 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 2200(rpm) | Ao | 5.7 | 1.3134 | 47.2 | 0.4515 | 343.7952 | 23.7985 |
| 2200(rpm) | B1 | 5.7 | 1.3134 | 49.2 | 0.4624 | 352.1049 | 25.4334 |
| 2200(rpm) | B2 | 5.8 | 1.3364 | 50.2 | 0.4532 | 339.1410 | 26.4056 |
| 2200(rpm) | B3 | 5.75 | 1.3249 | 50.2 | 0.4532 | 342.0900 | 26.1780 |
| 2200(rpm) | B4 | 5.9 | 1.3594 | 52.2 | 0.4359 | 320.6191 | 27.9310 |
| 2200(rpm) | A1 | 5.6 | 1.2903 | 48.2 | 0.4720 | 365.8280 | 24.4793 |
| 2200(rpm) | A2 | 5.6 | 1.2903 | 49.2 | 0.4624 | 358.3924 | 24.9872 |
| 2200(rpm) | A3 | 5.7 | 1.3134 | 49.7 | 0.4578 | 348.5626 | 25.6919 |
| 2200(rpm) | A4 | 5.85 | 1.3479 | 50.2 | 0.4532 | 336.2423 | 26.6332 |
| 2500(rpm) | Ao | 6.1 | 1.5972 | 45 | 0.4736 | 296.5220 | 27.5926 |
| 2500(rpm) | B1 | 6.2 | 1.6234 | 47 | 0.4841 | 298.1983 | 30.0311 |
| 2500(rpm) | B2 | 6.2 | 1.6234 | 48 | 0.4740 | 291.9858 | 30.6701 |
| 2500(rpm) | B3 | 6.3 | 1.6496 | 48 | 0.4740 | 287.3511 | 31.1647 |
| 2500(rpm) | B4 | 6.3 | 1.6496 | 50 | 0.4550 | 275.8571 | 32.4633 |
| 2500(rpm) | A1 | 6.1 | 1.5972 | 46 | 0.4946 | 309.6756 | 28.9181 |
| 2500(rpm) | A2 | 6.1 | 1.5972 | 47 | 0.4841 | 303.0868 | 29.5467 |
| 2500(rpm) | A3 | 6.05 | 1.5841 | 47.5 | 0.4790 | 302.3748 | 29.6163 |
| 2500(rpm) | A4 | 6 | 1.5710 | 48 | 0.4740 | 301.7187 | 29.6807 |
| 3000(rpm) | Ao | 6.7 | 2.1051 | 42 | 0.5074 | 241.0427 | 33.9434 |
| 3000(rpm) | B1 | 6.8 | 2.1366 | 44 | 0.5171 | 242.0203 | 37.0020 |
| 3000(rpm) | B2 | 6.82 | 2.1428 | 45 | 0.5056 | 235.9481 | 37.9542 |
| 3000(rpm) | B3 | 6.8 | 2.1366 | 45 | 0.5056 | 236.6421 | 37.8429 |
| 3000(rpm) | B4 | 6.9 | 2.1680 | 47 | 0.4841 | 223.2885 | 40.1061 |
| 3000(rpm) | A1 | 6.8 | 2.1366 | 45 | 0.5056 | 236.6421 | 37.8429 |
| 3000(rpm) | A2 | 6.8 | 2.1366 | 46 | 0.4946 | 231.4977 | 38.6839 |
| 3000(rpm) | A3 | 6.85 | 2.1523 | 46.5 | 0.4893 | 227.3369 | 39.3919 |
| 3000(rpm) | A4 | 6.9 | 2.1680 | 47 | 0.4841 | 223.2885 | 40.1061 |
| 3500(rpm) | Ao | 6.1 | 2.2361 | 37 | 0.5760 | 257.5963 | 31.7622 |
| 3500(rpm) | B1 | 6.15 | 2.2544 | 39 | 0.5812 | 257.7950 | 34.7378 |
| 3500(rpm) | B2 | 5.9 | 2.1627 | 40 | 0.5688 | 262.9993 | 34.0504 |
| 3500(rpm) | B3 | 6.3 | 2.3094 | 40 | 0.5688 | 246.3009 | 36.3589 |
| 3500(rpm) | B4 | 6.31 | 2.3130 | 42 | 0.5417 | 234.2006 | 38.2374 |
| 3500(rpm) | A1 | 6.5 | 2.3827 | 40 | 0.5688 | 238.7224 | 37.5131 |
| 3500(rpm) | A2 | 6.53 | 2.3937 | 41 | 0.5549 | 231.8300 | 38.6284 |
| 3500(rpm) | A3 | 6.6 | 2.4193 | 41.5 | 0.5482 | 226.6077 | 39.5186 |
| 3500(rpm) | A4 | 6.6 | 2.4193 | 42 | 0.5417 | 223.9099 | 39.9948 |
| 1000(rpm) | Ao | 3.8 | 0.3980 | 87 | 0.2450 | 615.5119 | 13.2927 |
| 1000(rpm) | B1 | 3.7 | 0.3875 | 88 | 0.2585 | 667.1911 | 13.4223 |
| 1000(rpm) | B2 | 3.82 | 0.4001 | 89 | 0.2556 | 638.9712 | 14.0151 |
| 1000(rpm) | B3 | 3.82 | 0.4001 | 89 | 0.2556 | 638.9712 | 14.0151 |
| 1000(rpm) | B4 | 3.9 | 0.4085 | 91 | 0.2500 | 612.1088 | 14.6301 |
| 1000(rpm) | A1 | 3.8 | 0.3980 | 89 | 0.2556 | 642.3342 | 13.9417 |
| 1000(rpm) | A2 | 3.7 | 0.3875 | 90 | 0.2528 | 652.3646 | 13.7273 |
| 1000(rpm) | A3 | 3.75 | 0.3928 | 90.5 | 0.2514 | 640.1103 | 13.9901 |
| 1000(rpm) | A4 | 3.82 | 0.4001 | 91 | 0.2500 | 624.9279 | 14.3300 |
| 1200(rpm) | Ao | 4.1 | 0.5153 | 77 | 0.2768 | 537.1350 | 15.2323 |
| 1200(rpm) | B1 | 4.1 | 0.5153 | 79 | 0.2880 | 558.9107 | 16.0226 |
| 1200(rpm) | B2 | 4.05 | 0.5090 | 80 | 0.2844 | 558.7382 | 16.0276 |
| 1200(rpm) | B3 | 4.2 | 0.5279 | 80 | 0.2844 | 538.7833 | 16.6212 |
| 1200(rpm) | B4 | 4.3 | 0.5404 | 82 | 0.2775 | 513.4180 | 17.4424 |
| 1200(rpm) | A1 | 4.05 | 0.5090 | 80 | 0.2844 | 558.7382 | 16.0276 |
| 1200(rpm) | A2 | 4.1 | 0.5153 | 81 | 0.2809 | 545.1105 | 16.4283 |
| 1200(rpm) | A3 | 4.1 | 0.5153 | 81.5 | 0.2792 | 541.7662 | 16.5297 |
| 1200(rpm) | A4 | 4.2 | 0.5279 | 82 | 0.2775 | 525.6422 | 17.0367 |
| 1400(rpm) | Ao | 4.3 | 0.6305 | 62.2 | 0.3426 | 543.4410 | 15.0556 |
| 1400(rpm) | B1 | 4.3 | 0.6305 | 64.2 | 0.3320 | 526.5114 | 17.0086 |
| 1400(rpm) | B2 | 4.25 | 0.6232 | 65.2 | 0.3490 | 559.9769 | 15.9921 |
| 1400(rpm) | B3 | 4.4 | 0.6452 | 65.2 | 0.3490 | 540.8868 | 16.5566 |
| 1400(rpm) | B4 | 4.5 | 0.6598 | 67.2 | 0.3386 | 513.1270 | 17.4523 |
| 1400(rpm) | A1 | 4.05 | 0.5938 | 63.2 | 0.3600 | 606.2259 | 14.7721 |
| 1400(rpm) | A2 | 4.1 | 0.6012 | 64.2 | 0.3544 | 589.5053 | 15.1911 |
| 1400(rpm) | A3 | 4.25 | 0.6232 | 64.7 | 0.3517 | 564.3044 | 15.8695 |
| 1400(rpm) | A4 | 4.35 | 0.6378 | 65.2 | 0.3490 | 547.1038 | 16.3684 |
| 1600(rpm) | Ao | 4.9 | 0.8211 | 59.2 | 0.3600 | 438.4313 | 18.6616 |
| 1600(rpm) | B1 | 4.8 | 0.8044 | 61.2 | 0.3718 | 462.1916 | 19.3756 |
| 1600(rpm) | B2 | 4.8 | 0.8044 | 62.2 | 0.3658 | 454.7608 | 19.6922 |
| 1600(rpm) | B3 | 5 | 0.8379 | 62.2 | 0.3658 | 436.5704 | 20.5127 |
| 1600(rpm) | B4 | 5.1 | 0.8546 | 64.2 | 0.3544 | 414.6765 | 21.5957 |
| 1600(rpm) | A1 | 4.9 | 0.8211 | 60.2 | 0.3779 | 460.2800 | 19.4560 |
| 1600(rpm) | A2 | 4.85 | 0.8127 | 61.2 | 0.3718 | 457.4267 | 19.5774 |
| 1600(rpm) | A3 | 4.9 | 0.8211 | 61.7 | 0.3688 | 449.0900 | 19.9408 |
| 1600(rpm) | A4 | 5 | 0.8379 | 62.2 | 0.3658 | 436.5704 | 20.5127 |
| 1800(rpm) | Ao | 4.9 | 0.9237 | 54.2 | 0.3932 | 425.6684 | 19.2211 |
| 1800(rpm) | B1 | 4.9 | 0.9237 | 56.2 | 0.4048 | 438.2579 | 20.4337 |
| 1800(rpm) | B2 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 1800(rpm) | B3 | 5.1 | 0.9615 | 57.2 | 0.3978 | 413.7099 | 21.6461 |
| 1800(rpm) | B4 | 5.2 | 0.9803 | 59.2 | 0.3843 | 392.0461 | 22.8423 |
| 1800(rpm) | A1 | 4.85 | 0.9143 | 55.2 | 0.4122 | 450.7973 | 19.8653 |
| 1800(rpm) | A2 | 4.9 | 0.9237 | 56.2 | 0.4048 | 438.2579 | 20.4337 |
| 1800(rpm) | A3 | 4.9 | 0.9237 | 56.7 | 0.4013 | 434.3932 | 20.6155 |
| 1800(rpm) | A4 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 2200(rpm) | Ao | 5.7 | 1.3134 | 47.2 | 0.4515 | 343.7952 | 23.7985 |
| 2200(rpm) | B1 | 5.7 | 1.3134 | 49.2 | 0.4624 | 352.1049 | 25.4334 |
| 2200(rpm) | B2 | 5.8 | 1.3364 | 50.2 | 0.4532 | 339.1410 | 26.4056 |
| 2200(rpm) | B3 | 5.75 | 1.3249 | 50.2 | 0.4532 | 342.0900 | 26.1780 |
| 2200(rpm) | B4 | 5.9 | 1.3594 | 52.2 | 0.4359 | 320.6191 | 27.9310 |
| 2200(rpm) | A1 | 5.6 | 1.2903 | 48.2 | 0.4720 | 365.8280 | 24.4793 |
| 2200(rpm) | A2 | 5.6 | 1.2903 | 49.2 | 0.4624 | 358.3924 | 24.9872 |
| 2200(rpm) | A3 | 5.7 | 1.3134 | 49.7 | 0.4578 | 348.5626 | 25.6919 |
| 2200(rpm) | A4 | 5.85 | 1.3479 | 50.2 | 0.4532 | 336.2423 | 26.6332 |
| 2500(rpm) | Ao | 6.1 | 1.5972 | 45 | 0.4736 | 296.5220 | 27.5926 |
| 2500(rpm) | B1 | 6.2 | 1.6234 | 47 | 0.4841 | 298.1983 | 30.0311 |
| 2500(rpm) | B2 | 6.2 | 1.6234 | 48 | 0.4740 | 291.9858 | 30.6701 |
| 2500(rpm) | B3 | 6.3 | 1.6496 | 48 | 0.4740 | 287.3511 | 31.1647 |
| 2500(rpm) | B4 | 6.3 | 1.6496 | 50 | 0.4550 | 275.8571 | 32.4633 |
| 2500(rpm) | A1 | 6.1 | 1.5972 | 46 | 0.4946 | 309.6756 | 28.9181 |
| 2500(rpm) | A2 | 6.1 | 1.5972 | 47 | 0.4841 | 303.0868 | 29.5467 |
| 2500(rpm) | A3 | 6.05 | 1.5841 | 47.5 | 0.4790 | 302.3748 | 29.6163 |
| 2500(rpm) | A4 | 6 | 1.5710 | 48 | 0.4740 | 301.7187 | 29.6807 |
| 3000(rpm) | Ao | 6.7 | 2.1051 | 42 | 0.5074 | 241.0427 | 33.9434 |
| 3000(rpm) | B1 | 6.8 | 2.1366 | 44 | 0.5171 | 242.0203 | 37.0020 |
| 3000(rpm) | B2 | 6.82 | 2.1428 | 45 | 0.5056 | 235.9481 | 37.9542 |
| 3000(rpm) | B3 | 6.8 | 2.1366 | 45 | 0.5056 | 236.6421 | 37.8429 |
| 3000(rpm) | B4 | 6.9 | 2.1680 | 47 | 0.4841 | 223.2885 | 40.1061 |
| 3000(rpm) | A1 | 6.8 | 2.1366 | 45 | 0.5056 | 236.6421 | 37.8429 |
| 3000(rpm) | A2 | 6.8 | 2.1366 | 46 | 0.4946 | 231.4977 | 38.6839 |
| 3000(rpm) | A3 | 6.85 | 2.1523 | 46.5 | 0.4893 | 227.3369 | 39.3919 |
| 3000(rpm) | A4 | 6.9 | 2.1680 | 47 | 0.4841 | 223.2885 | 40.1061 |
| 3500(rpm) | Ao | 6.1 | 2.2361 | 37 | 0.5760 | 257.5963 | 31.7622 |
| 3500(rpm) | B1 | 6.15 | 2.2544 | 39 | 0.5812 | 257.7950 | 34.7378 |
| 3500(rpm) | B2 | 5.9 | 2.1627 | 40 | 0.5688 | 262.9993 | 34.0504 |
| 3500(rpm) | B3 | 6.3 | 2.3094 | 40 | 0.5688 | 246.3009 | 36.3589 |
| 3500(rpm) | B4 | 6.31 | 2.3130 | 42 | 0.5417 | 234.2006 | 38.2374 |
| 3500(rpm) | A1 | 6.5 | 2.3827 | 40 | 0.5688 | 238.7224 | 37.5131 |
| 3500(rpm) | A2 | 6.53 | 2.3937 | 41 | 0.5549 | 231.8300 | 38.6284 |
| 3500(rpm) | A3 | 6.6 | 2.4193 | 41.5 | 0.5482 | 226.6077 | 39.5186 |
| 3500(rpm) | A4 | 6.6 | 2.4193 | 42 | 0.5417 | 223.9099 | 39.9948 |
| 1000(rpm) | Ao | 3.8 | 0.3980 | 87 | 0.2450 | 615.5119 | 13.2927 |
| 1000(rpm) | B1 | 3.7 | 0.3875 | 88 | 0.2585 | 667.1911 | 13.4223 |
| 1000(rpm) | B2 | 3.82 | 0.4001 | 89 | 0.2556 | 638.9712 | 14.0151 |
| 1000(rpm) | B3 | 3.82 | 0.4001 | 89 | 0.2556 | 638.9712 | 14.0151 |
| 1000(rpm) | B4 | 3.9 | 0.4085 | 91 | 0.2500 | 612.1088 | 14.6301 |
| 1000(rpm) | A1 | 3.8 | 0.3980 | 89 | 0.2556 | 642.3342 | 13.9417 |
| 1000(rpm) | A2 | 3.7 | 0.3875 | 90 | 0.2528 | 652.3646 | 13.7273 |
| 1000(rpm) | A3 | 3.75 | 0.3928 | 90.5 | 0.2514 | 640.1103 | 13.9901 |
| 1000(rpm) | A4 | 3.82 | 0.4001 | 91 | 0.2500 | 624.9279 | 14.3300 |
| 1200(rpm) | Ao | 4.1 | 0.5153 | 77 | 0.2768 | 537.1350 | 15.2323 |
| 1200(rpm) | B1 | 4.1 | 0.5153 | 79 | 0.2880 | 558.9107 | 16.0226 |
| 1200(rpm) | B2 | 4.05 | 0.5090 | 80 | 0.2844 | 558.7382 | 16.0276 |
| 1200(rpm) | B3 | 4.2 | 0.5279 | 80 | 0.2844 | 538.7833 | 16.6212 |
| 1200(rpm) | B4 | 4.3 | 0.5404 | 82 | 0.2775 | 513.4180 | 17.4424 |
| 1200(rpm) | A1 | 4.05 | 0.5090 | 80 | 0.2844 | 558.7382 | 16.0276 |
| 1200(rpm) | A2 | 4.1 | 0.5153 | 81 | 0.2809 | 545.1105 | 16.4283 |
| 1200(rpm) | A3 | 4.1 | 0.5153 | 81.5 | 0.2792 | 541.7662 | 16.5297 |
| 1200(rpm) | A4 | 4.2 | 0.5279 | 82 | 0.2775 | 525.6422 | 17.0367 |
| 1400(rpm) | Ao | 4.3 | 0.6305 | 62.2 | 0.3426 | 543.4410 | 15.0556 |
| 1400(rpm) | B1 | 4.3 | 0.6305 | 64.2 | 0.3320 | 526.5114 | 17.0086 |
| 1400(rpm) | B2 | 4.25 | 0.6232 | 65.2 | 0.3490 | 559.9769 | 15.9921 |
| 1400(rpm) | B3 | 4.4 | 0.6452 | 65.2 | 0.3490 | 540.8868 | 16.5566 |
| 1400(rpm) | B4 | 4.5 | 0.6598 | 67.2 | 0.3386 | 513.1270 | 17.4523 |
| 1400(rpm) | A1 | 4.05 | 0.5938 | 63.2 | 0.3600 | 606.2259 | 14.7721 |
| 1400(rpm) | A2 | 4.1 | 0.6012 | 64.2 | 0.3544 | 589.5053 | 15.1911 |
| 1400(rpm) | A3 | 4.25 | 0.6232 | 64.7 | 0.3517 | 564.3044 | 15.8695 |
| 1400(rpm) | A4 | 4.35 | 0.6378 | 65.2 | 0.3490 | 547.1038 | 16.3684 |
| 1600(rpm) | Ao | 4.9 | 0.8211 | 59.2 | 0.3600 | 438.4313 | 18.6616 |
| 1600(rpm) | B1 | 4.8 | 0.8044 | 61.2 | 0.3718 | 462.1916 | 19.3756 |
| 1600(rpm) | B2 | 4.8 | 0.8044 | 62.2 | 0.3658 | 454.7608 | 19.6922 |
| 1600(rpm) | B3 | 5 | 0.8379 | 62.2 | 0.3658 | 436.5704 | 20.5127 |
| 1600(rpm) | B4 | 5.1 | 0.8546 | 64.2 | 0.3544 | 414.6765 | 21.5957 |
| 1600(rpm) | A1 | 4.9 | 0.8211 | 60.2 | 0.3779 | 460.2800 | 19.4560 |
| 1600(rpm) | A2 | 4.85 | 0.8127 | 61.2 | 0.3718 | 457.4267 | 19.5774 |
| 1600(rpm) | A3 | 4.9 | 0.8211 | 61.7 | 0.3688 | 449.0900 | 19.9408 |
| 1600(rpm) | A4 | 5 | 0.8379 | 62.2 | 0.3658 | 436.5704 | 20.5127 |
| 1800(rpm) | Ao | 4.9 | 0.9237 | 54.2 | 0.3932 | 425.6684 | 19.2211 |
| 1800(rpm) | B1 | 4.9 | 0.9237 | 56.2 | 0.4048 | 438.2579 | 20.4337 |
| 1800(rpm) | B2 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 1800(rpm) | B3 | 5.1 | 0.9615 | 57.2 | 0.3978 | 413.7099 | 21.6461 |
| 1800(rpm) | B4 | 5.2 | 0.9803 | 59.2 | 0.3843 | 392.0461 | 22.8423 |
| 1800(rpm) | A1 | 4.85 | 0.9143 | 55.2 | 0.4122 | 450.7973 | 19.8653 |
| 1800(rpm) | A2 | 4.9 | 0.9237 | 56.2 | 0.4048 | 438.2579 | 20.4337 |
| 1800(rpm) | A3 | 4.9 | 0.9237 | 56.7 | 0.4013 | 434.3932 | 20.6155 |
| 1800(rpm) | A4 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 2200(rpm) | Ao | 5.7 | 1.3134 | 47.2 | 0.4515 | 343.7952 | 23.7985 |
| 2200(rpm) | B1 | 5.7 | 1.3134 | 49.2 | 0.4624 | 352.1049 | 25.4334 |
| 2200(rpm) | B2 | 5.8 | 1.3364 | 50.2 | 0.4532 | 339.1410 | 26.4056 |
| 2200(rpm) | B3 | 5.75 | 1.3249 | 50.2 | 0.4532 | 342.0900 | 26.1780 |
| 2200(rpm) | B4 | 5.9 | 1.3594 | 52.2 | 0.4359 | 320.6191 | 27.9310 |
| 2200(rpm) | A1 | 5.6 | 1.2903 | 48.2 | 0.4720 | 365.8280 | 24.4793 |
| 2200(rpm) | A2 | 5.6 | 1.2903 | 49.2 | 0.4624 | 358.3924 | 24.9872 |
| 2200(rpm) | A3 | 5.7 | 1.3134 | 49.7 | 0.4578 | 348.5626 | 25.6919 |
| 2200(rpm) | A4 | 5.85 | 1.3479 | 50.2 | 0.4532 | 336.2423 | 26.6332 |
| 2500(rpm) | Ao | 6.1 | 1.5972 | 45 | 0.4736 | 296.5220 | 27.5926 |
| 2500(rpm) | B1 | 6.2 | 1.6234 | 47 | 0.4841 | 298.1983 | 30.0311 |
| 2500(rpm) | B2 | 6.2 | 1.6234 | 48 | 0.4740 | 291.9858 | 30.6701 |
| 2500(rpm) | B3 | 6.3 | 1.6496 | 48 | 0.4740 | 287.3511 | 31.1647 |
| 2500(rpm) | B4 | 6.3 | 1.6496 | 50 | 0.4550 | 275.8571 | 32.4633 |
| 2500(rpm) | A1 | 6.1 | 1.5972 | 46 | 0.4946 | 309.6756 | 28.9181 |
| 2500(rpm) | A2 | 6.1 | 1.5972 | 47 | 0.4841 | 303.0868 | 29.5467 |
| 2500(rpm) | A3 | 6.05 | 1.5841 | 47.5 | 0.4790 | 302.3748 | 29.6163 |
| 2500(rpm) | A4 | 6 | 1.5710 | 48 | 0.4740 | 301.7187 | 29.6807 |
| 3000(rpm) | Ao | 6.7 | 2.1051 | 42 | 0.5074 | 241.0427 | 33.9434 |
| 3000(rpm) | B1 | 6.8 | 2.1366 | 44 | 0.5171 | 242.0203 | 37.0020 |
| 3000(rpm) | B2 | 6.82 | 2.1428 | 45 | 0.5056 | 235.9481 | 37.9542 |
| 3000(rpm) | B3 | 6.8 | 2.1366 | 45 | 0.5056 | 236.6421 | 37.8429 |
| 3000(rpm) | B4 | 6.9 | 2.1680 | 47 | 0.4841 | 223.2885 | 40.1061 |
| 3000(rpm) | A1 | 6.8 | 2.1366 | 45 | 0.5056 | 236.6421 | 37.8429 |
| 3000(rpm) | A2 | 6.8 | 2.1366 | 46 | 0.4946 | 231.4977 | 38.6839 |
| 3000(rpm) | A3 | 6.85 | 2.1523 | 46.5 | 0.4893 | 227.3369 | 39.3919 |
| 3000(rpm) | A4 | 6.9 | 2.1680 | 47 | 0.4841 | 223.2885 | 40.1061 |
| 3500(rpm) | Ao | 6.1 | 2.2361 | 37 | 0.5760 | 257.5963 | 31.7622 |
| 3500(rpm) | B1 | 6.15 | 2.2544 | 39 | 0.5812 | 257.7950 | 34.7378 |
| 3500(rpm) | B2 | 5.9 | 2.1627 | 40 | 0.5688 | 262.9993 | 34.0504 |
| 3500(rpm) | B3 | 6.3 | 2.3094 | 40 | 0.5688 | 246.3009 | 36.3589 |
| 3500(rpm) | B4 | 6.31 | 2.3130 | 42 | 0.5417 | 234.2006 | 38.2374 |
| 3500(rpm) | A1 | 6.5 | 2.3827 | 40 | 0.5688 | 238.7224 | 37.5131 |
| 3500(rpm) | A2 | 6.53 | 2.3937 | 41 | 0.5549 | 231.8300 | 38.6284 |
| 3500(rpm) | A3 | 6.6 | 2.4193 | 41.5 | 0.5482 | 226.6077 | 39.5186 |
| 3500(rpm) | A4 | 6.6 | 2.4193 | 42 | 0.5417 | 223.9099 | 39.9948 |
| 1000(rpm) | Ao | 3.7 | 0.3875 | 87 | 0.2450 | 632.1473 | 12.9429 |
| 1000(rpm) | B1 | 3.6 | 0.3770 | 88 | 0.2585 | 685.7242 | 13.0595 |
| 1000(rpm) | B2 | 3.72 | 0.3896 | 89 | 0.2556 | 656.1478 | 13.6482 |
| 1000(rpm) | B3 | 3.72 | 0.3896 | 89 | 0.2556 | 656.1478 | 13.6482 |
| 1000(rpm) | B4 | 3.8 | 0.3980 | 91 | 0.2500 | 628.2170 | 14.2550 |
| 1000(rpm) | A1 | 3.7 | 0.3875 | 89 | 0.2556 | 659.6946 | 13.5748 |
| 1000(rpm) | A2 | 3.6 | 0.3770 | 90 | 0.2528 | 670.4859 | 13.3563 |
| 1000(rpm) | A3 | 3.65 | 0.3823 | 90.5 | 0.2514 | 657.6476 | 13.6171 |
| 1000(rpm) | A4 | 3.72 | 0.3896 | 91 | 0.2500 | 641.7270 | 13.9549 |
| 1200(rpm) | Ao | 4 | 0.5027 | 77 | 0.2768 | 550.5634 | 14.8608 |
| 1200(rpm) | B1 | 4 | 0.5027 | 79 | 0.2880 | 572.8835 | 15.6318 |
| 1200(rpm) | B2 | 3.95 | 0.4964 | 80 | 0.2844 | 572.8835 | 15.6318 |
| 1200(rpm) | B3 | 4.1 | 0.5153 | 80 | 0.2844 | 551.9244 | 16.2255 |
| 1200(rpm) | B4 | 4.2 | 0.5279 | 82 | 0.2775 | 525.6422 | 17.0367 |
| 1200(rpm) | A1 | 3.95 | 0.4964 | 80 | 0.2844 | 572.8835 | 15.6318 |
| 1200(rpm) | A2 | 4 | 0.5027 | 81 | 0.2809 | 558.7382 | 16.0276 |
| 1200(rpm) | A3 | 4 | 0.5027 | 81.5 | 0.2792 | 555.3104 | 16.1265 |
| 1200(rpm) | A4 | 4.1 | 0.5153 | 82 | 0.2775 | 538.4628 | 16.6311 |
| 1400(rpm) | Ao | 4.2 | 0.6158 | 62.2 | 0.3426 | 556.3801 | 14.7054 |
| 1400(rpm) | B1 | 4.2 | 0.6158 | 64.2 | 0.3320 | 539.0474 | 16.6131 |
| 1400(rpm) | B2 | 4.15 | 0.6085 | 65.2 | 0.3490 | 573.4703 | 15.6158 |
| 1400(rpm) | B3 | 4.3 | 0.6305 | 65.2 | 0.3490 | 553.4655 | 16.1803 |
| 1400(rpm) | B4 | 4.4 | 0.6452 | 67.2 | 0.3386 | 524.7889 | 17.0644 |
| 1400(rpm) | A1 | 3.95 | 0.5792 | 63.2 | 0.3600 | 621.5734 | 14.4073 |
| 1400(rpm) | A2 | 4 | 0.5865 | 64.2 | 0.3544 | 604.2430 | 14.8206 |
| 1400(rpm) | A3 | 4.15 | 0.6085 | 64.7 | 0.3517 | 577.9021 | 15.4961 |
| 1400(rpm) | A4 | 4.25 | 0.6232 | 65.2 | 0.3490 | 559.9769 | 15.9921 |
| 1600(rpm) | Ao | 4.8 | 0.8044 | 59.2 | 0.3600 | 447.5652 | 18.2807 |
| 1600(rpm) | B1 | 4.7 | 0.7876 | 61.2 | 0.3718 | 472.0254 | 18.9719 |
| 1600(rpm) | B2 | 4.7 | 0.7876 | 62.2 | 0.3658 | 464.4366 | 19.2819 |
| 1600(rpm) | B3 | 4.9 | 0.8211 | 62.2 | 0.3658 | 445.4800 | 20.1024 |
| 1600(rpm) | B4 | 5 | 0.8379 | 64.2 | 0.3544 | 422.9701 | 21.1722 |
| 1600(rpm) | A1 | 4.8 | 0.8044 | 60.2 | 0.3779 | 469.8692 | 19.0590 |
| 1600(rpm) | A2 | 4.75 | 0.7960 | 61.2 | 0.3718 | 467.0567 | 19.1737 |
| 1600(rpm) | A3 | 4.8 | 0.8044 | 61.7 | 0.3688 | 458.4461 | 19.5339 |
| 1600(rpm) | A4 | 4.9 | 0.8211 | 62.2 | 0.3658 | 445.4800 | 20.1024 |
| 1800(rpm) | Ao | 4.8 | 0.9049 | 54.2 | 0.3932 | 434.5365 | 18.8288 |
| 1800(rpm) | B1 | 4.8 | 0.9049 | 56.2 | 0.4048 | 447.3883 | 20.0167 |
| 1800(rpm) | B2 | 4.9 | 0.9237 | 57.2 | 0.3978 | 430.5960 | 20.7973 |
| 1800(rpm) | B3 | 5 | 0.9426 | 57.2 | 0.3978 | 421.9841 | 21.2217 |
| 1800(rpm) | B4 | 5.1 | 0.9615 | 59.2 | 0.3843 | 399.7332 | 22.4030 |
| 1800(rpm) | A1 | 4.75 | 0.8955 | 55.2 | 0.4122 | 460.2878 | 19.4557 |
| 1800(rpm) | A2 | 4.8 | 0.9049 | 56.2 | 0.4048 | 447.3883 | 20.0167 |
| 1800(rpm) | A3 | 4.8 | 0.9049 | 56.7 | 0.4013 | 443.4430 | 20.1948 |
| 1800(rpm) | A4 | 4.9 | 0.9237 | 57.2 | 0.3978 | 430.5960 | 20.7973 |
| 2200(rpm) | Ao | 5.6 | 1.2903 | 47.2 | 0.4515 | 349.9343 | 23.3810 |
| 2200(rpm) | B1 | 5.6 | 1.2903 | 49.2 | 0.4624 | 358.3924 | 24.9872 |
| 2200(rpm) | B2 | 5.7 | 1.3134 | 50.2 | 0.4532 | 345.0908 | 25.9503 |
| 2200(rpm) | B3 | 5.65 | 1.3018 | 50.2 | 0.4532 | 348.1447 | 25.7227 |
| 2200(rpm) | B4 | 5.8 | 1.3364 | 52.2 | 0.4359 | 326.1471 | 27.4576 |
| 2200(rpm) | A1 | 5.5 | 1.2673 | 48.2 | 0.4720 | 372.4794 | 24.0422 |
| 2200(rpm) | A2 | 5.5 | 1.2673 | 49.2 | 0.4624 | 364.9087 | 24.5410 |
| 2200(rpm) | A3 | 5.6 | 1.2903 | 49.7 | 0.4578 | 354.7869 | 25.2411 |
| 2200(rpm) | A4 | 5.75 | 1.3249 | 50.2 | 0.4532 | 342.0900 | 26.1780 |
| 2500(rpm) | Ao | 6 | 1.5710 | 45 | 0.4736 | 301.4640 | 27.1403 |
| 2500(rpm) | B1 | 6.1 | 1.5972 | 47 | 0.4841 | 303.0868 | 29.5467 |
| 2500(rpm) | B2 | 6.1 | 1.5972 | 48 | 0.4740 | 296.7724 | 30.1754 |
| 2500(rpm) | B3 | 6.2 | 1.6234 | 48 | 0.4740 | 291.9858 | 30.6701 |
| 2500(rpm) | B4 | 6.2 | 1.6234 | 50 | 0.4550 | 280.3064 | 31.9480 |
| 2500(rpm) | A1 | 6 | 1.5710 | 46 | 0.4946 | 314.8369 | 28.4440 |
| 2500(rpm) | A2 | 6 | 1.5710 | 47 | 0.4841 | 308.1382 | 29.0624 |
| 2500(rpm) | A3 | 5.95 | 1.5579 | 47.5 | 0.4790 | 307.4568 | 29.1268 |
| 2500(rpm) | A4 | 5.9 | 1.5448 | 48 | 0.4740 | 306.8325 | 29.1860 |
| 3000(rpm) | Ao | 6.6 | 2.0737 | 42 | 0.5074 | 244.6948 | 33.4368 |
| 3000(rpm) | B1 | 6.7 | 2.1051 | 44 | 0.5171 | 245.6326 | 36.4578 |
| 3000(rpm) | B2 | 6.72 | 2.1114 | 45 | 0.5056 | 239.4592 | 37.3977 |
| 3000(rpm) | B3 | 6.7 | 2.1051 | 45 | 0.5056 | 240.1741 | 37.2864 |
| 3000(rpm) | B4 | 6.8 | 2.1366 | 47 | 0.4841 | 226.5722 | 39.5248 |
| 3000(rpm) | A1 | 6.7 | 2.1051 | 45 | 0.5056 | 240.1741 | 37.2864 |
| 3000(rpm) | A2 | 6.7 | 2.1051 | 46 | 0.4946 | 234.9529 | 38.1150 |
| 3000(rpm) | A3 | 6.75 | 2.1209 | 46.5 | 0.4893 | 230.7048 | 38.8168 |
| 3000(rpm) | A4 | 6.8 | 2.1366 | 47 | 0.4841 | 226.5722 | 39.5248 |
| 3500(rpm) | Ao | 6 | 2.1994 | 37 | 0.5760 | 261.8896 | 31.2415 |
| 3500(rpm) | B1 | 6.05 | 2.2177 | 39 | 0.5812 | 262.0561 | 34.1729 |
| 3500(rpm) | B2 | 5.8 | 2.1261 | 40 | 0.5688 | 267.5338 | 33.4732 |
| 3500(rpm) | B3 | 6.2 | 2.2727 | 40 | 0.5688 | 250.2735 | 35.7817 |
| 3500(rpm) | B4 | 6.21 | 2.2764 | 42 | 0.5417 | 237.9719 | 37.6314 |
| 3500(rpm) | A1 | 6.4 | 2.3460 | 40 | 0.5688 | 242.4525 | 36.9360 |
| 3500(rpm) | A2 | 6.43 | 2.3570 | 41 | 0.5549 | 235.4354 | 38.0369 |
| 3500(rpm) | A3 | 6.5 | 2.3827 | 41.5 | 0.5482 | 230.0939 | 38.9199 |
| 3500(rpm) | A4 | 6.5 | 2.3827 | 42 | 0.5417 | 227.3547 | 39.3888 |

In order to find out exactly which groups are different from each other, we must conduct a post hoc test (also known as a multiple comparison test), which will allow us to explore the difference between multiple groups means while also controlling for the family-wise error rate.

## family-wise error rate

There basically two Type of error, Type one error and Type two error. Type I error occurs when H0 is statistically rejected even though it is actually true, whereas type II error refers to a false negative, H0 is statistically accepted but H0 is false. The type I error that occurs when each family is compared is called the ‘family-wise error’ (FWE). in a hypothesis test, there is always a type I error rate, which is defined by our significance level (alpha) and tells us the probability of rejecting a null hypothesis that is actually true. In other words, it’s the probability of getting a “false positive”, i.e. when we claim there is a statistically significant difference among groups, but there actually isn’t.

When we perform one hypothesis test, the type I error rate is equal to the significance level, which is commonly chosen to be 0.01, 0.05, or 0.10. However, when we conduct multiple hypothesis tests at once, the probability of getting a false positive increase.

When we conduct an ANOVA, there are often three or more groups that we are comparing to one another. Thus, when we conduct a post hoc test to explore the difference between the group means, there are several pairwise comparisons we want to explore.

# Methods use for the Post Hoc test

There are various methods for finding out which are the samples that represent two different populations.

Usually, MCTs are categorized into two classes, single-step and stepwise procedures. Stepwise procedures are further divided into step-up and step-down methods. This classification depends on the method used to handle type I error. As indicated by its name, single-step procedure assumes one hypothetical type I error rate. Under this assumption, almost all pairwise comparisons (multiple hypotheses) are performed (tested using one critical value). In other words, every comparison is independent. A typical example is Fisher’s least significant difference (LSD) test. Other examples are Bonferroni, Sidak, Scheffé, Tukey, Tukey-Kramer, Hochberg’s GF2, Gabriel, and Dunnett tests.

The stepwise procedure handles type I error according to previously selected comparison results, that is, it processes pairwise comparisons in a predetermined order, and each comparison is performed only when the previous comparison result is statistically significant. In general, this method improves the statistical power of the process while preserving the type I error rate throughout. Among the comparison test statistics, the most significant test (for step-down procedures) or least significant test (for step-up procedures) is identified, and comparisons are successively performed when the previous test result is significant. If one comparison test during the process fails to reject a null hypothesis, all the remaining tests are rejected. This method does not determine the same level of significance as single-step methods; rather, it classifies all relevant groups into the statistically similar subgroups. The stepwise methods include Ryan-Einot-Gabriel-Welsch Q (REGWQ), Ryan-Einot-Gabriel-Welsch F (REGWF), Student-Newman-Keuls (SNK), and Duncan tests. These methods have different uses, for example, the SNK test is started to compare the two groups with the largest differences; the other two groups with the second largest differences are compared only if there is a significant difference in prior comparison. It is noted that the critical value for comparison varies for each pair. That is, it depends on the range of mean differences between groups. The smaller the range of comparison, the smaller the critical value for the range; hence, although the power increases, the probability of type I error increases.

All the aforementioned methods can be used only in the situation of equal variance assumption. If equal variance assumption is violent during the ANOVA process, pairwise comparisons should be based on the statistics of Tamhane’s T2, Dunnett’s T3, Games-Howell, and Dunnett’s C tests.

Tukey’s Test, least significant difference test – useful when you want to make every possible pairwise comparison. This method tests every possible pair of all groups. Initially, the Tukey test was called the ‘Honestly significant difference’ test, or simply the ‘T test,’4) because this method was based on the t-distribution. It is noted that the Tukey test is based on the same sample counts between groups (balanced data) as ANOVA.

Holm’s Method – a slightly more conservative test compared to Tukey’s Test

Dunnett’s Correction – useful when you want to compare every group mean to a control mean, and you’re not interested in comparing the treatment means with one another.

Notice that we specified our confidence level to be 95%, which means we want our family-wise error rate to be .05.

# Analysis and Result

Table Multivariate Tests of the independent variable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Multivariate Testsa** | | | | | | |
| Effect | | Value | F | Hypothesis df | Error df | Sig. |
| Intercept | Pillai's Trace | 1.000 | 8999759.377b | 4.000 | 807.000 | .000 |
| Wilks' Lambda | .000 | 8999759.377b | 4.000 | 807.000 | .000 |
| Hotelling's Trace | 44608.473 | 8999759.377b | 4.000 | 807.000 | .000 |
| Roy's Largest Root | 44608.473 | 8999759.377b | 4.000 | 807.000 | .000 |
| Speed level | Pillai's Trace | 3.522 | 746.878 | 32.000 | 3240.000 | .000 |
| Wilks' Lambda | .000 | 10434.841 | 32.000 | 2977.664 | .000 |
| Hotelling's Trace | 5986.194 | 150683.734 | 32.000 | 3222.000 | .000 |
| Roy's Largest Root | 5661.575 | 573234.491c | 8.000 | 810.000 | .000 |
| Fuel level | Pillai's Trace | 1.723 | 76.577 | 32.000 | 3240.000 | .000 |
| Wilks' Lambda | .001 | 513.379 | 32.000 | 2977.664 | .000 |
| Hotelling's Trace | 332.963 | 8381.310 | 32.000 | 3222.000 | .000 |
| Roy's Largest Root | 331.104 | 33524.291c | 8.000 | 810.000 | .000 |
| Speed level \* Fuel level | Pillai's Trace | 1.968 | 12.261 | 256.000 | 3240.000 | .000 |
| Wilks' Lambda | .002 | 49.832 | 256.000 | 3226.398 | .000 |
| Hotelling's Trace | 155.823 | 490.294 | 256.000 | 3222.000 | .000 |
| Roy's Largest Root | 153.817 | 1946.751c | 64.000 | 810.000 | .000 |
| a. Design: Intercept + Speed\_level + Fuel\_level + Speed\_level \* Fuel\_level | | | | | | |
| b. Exact statistic | | | | | | |
| c. The statistic is an upper bound on F that yields a lower bound on the significance level. | | | | | | |

# Multivariate Tests of the independent variable Description.

As seen from table 3.2 above there is a statically evidence from the four criterion that the 9 levels of fuel variation and speed level are different from each other, since the p>α at 0.05 significant level. This can also be seen from the descriptive statistics (Table 3.3) of mean and variance. As such we reject the null hypothesis that the mean of the dependent variables is equal across the independent variable of different level. So, there is a significant difference from the values of dependent for fuel and speed to the average torque, speed and time taken to consume 8ml (s) is the same so a post hoc analysis is conducted to for each factor to ascertain their level of difference.

Table Descriptive statistics of Dependent variable per independent variable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Descriptive Statistics** | | | | | |
|  | Speed level | Fuel level | Mean | Std. Deviation | N |
| Specific\_Fuel\_Consumption | 1000(rpm) | Ao | 633.98605657 | 36.582052323 | 11 |
| B1 | 687.83404091 | 40.845385055 | 11 |
| B2 | 658.03541675 | 37.756024135 | 11 |
| B3 | 658.03541675 | 37.756024135 | 11 |
| B4 | 629.94711216 | 35.348658192 | 11 |
| A1 | 661.61344777 | 38.176198847 | 11 |
| A2 | 672.54884001 | 39.937709837 | 11 |
| A3 | 659.61456363 | 38.607250066 | 11 |
| A4 | 643.57309986 | 36.926221398 | 11 |
| Total | 656.13199938 | 40.326738788 | 99 |
| 1200(rpm) | Ao | 551.92857357 | 29.355598352 | 11 |
| B1 | 574.30405632 | 30.545690144 | 11 |
| B2 | 574.34107426 | 30.951120026 | 11 |
| B3 | 553.22557052 | 28.677068723 | 11 |
| B4 | 526.82197230 | 26.631978156 | 11 |
| A1 | 574.34107426 | 30.951120026 | 11 |
| A2 | 560.12370920 | 29.791475607 | 11 |
| A3 | 556.68736747 | 29.608705809 | 11 |
| A4 | 539.73226395 | 27.977628003 | 11 |
| Total | 556.83396243 | 32.205612374 | 99 |
| 1400(rpm) | Ao | 557.62878795 | 28.189328644 | 11 |
| B1 | 540.25717463 | 27.311156392 | 11 |
| B2 | 574.78922845 | 29.421189650 | 11 |
| B3 | 554.64942637 | 27.361109115 | 11 |
| B4 | 525.86006685 | 25.328906918 | 11 |
| A1 | 623.15487264 | 33.581685383 | 11 |
| A2 | 605.74126099 | 32.217750639 | 11 |
| A3 | 579.23118537 | 29.648555865 | 11 |
| A4 | 561.20365339 | 28.023030221 | 11 |
| Total | 569.16840629 | 40.255040889 | 99 |
| 1600(rpm) | Ao | 448.33035113 | 19.733081126 | 11 |
| B1 | 472.86768300 | 21.271389305 | 11 |
| B2 | 465.26530870 | 20.929405562 | 11 |
| B3 | 446.21024238 | 19.225589561 | 11 |
| B4 | 423.63550395 | 17.875990914 | 11 |
| A1 | 470.67239517 | 20.716457272 | 11 |
| A2 | 467.87236335 | 20.817471227 | 11 |
| A3 | 459.22979236 | 20.212815686 | 11 |
| A4 | 446.21024238 | 19.225589561 | 11 |
| Total | 455.58820916 | 24.425255404 | 99 |
| 1800(rpm) | Ao | 435.27932409 | 19.158645381 | 11 |
| B1 | 448.15307538 | 19.725278388 | 11 |
| B2 | 431.30189705 | 18.583242747 | 11 |
| B3 | 422.64800858 | 17.834321925 | 11 |
| B4 | 400.33729895 | 16.551132630 | 11 |
| A1 | 461.09160446 | 20.515768741 | 11 |
| A2 | 448.15307538 | 19.725278388 | 11 |
| A3 | 444.20110822 | 19.551334152 | 11 |
| A4 | 431.30189705 | 18.583242747 | 11 |
| Total | 435.82969879 | 24.674364684 | 99 |
| 2200(rpm) | Ao | 350.37166814 | 13.155126212 | 11 |
| B1 | 358.84033071 | 13.473092320 | 11 |
| B2 | 345.50686699 | 12.738561768 | 11 |
| B3 | 348.57202017 | 12.968488097 | 11 |
| B4 | 326.52664965 | 11.825563408 | 11 |
| A1 | 372.96221945 | 14.265280687 | 11 |
| A2 | 365.38168653 | 13.975335962 | 11 |
| A3 | 355.23026705 | 13.337548122 | 11 |
| A4 | 342.49521692 | 12.514703511 | 11 |
| Total | 351.76521396 | 18.003128484 | 99 |
| 2500(rpm) | Ao | 301.79158625 | 10.555892615 | 11 |
| B1 | 303.40521515 | 10.433901717 | 11 |
| B2 | 297.08427315 | 10.216528763 | 11 |
| B3 | 292.28264813 | 9.885208704 | 11 |
| B4 | 280.59134218 | 9.489800377 | 11 |
| A1 | 315.17893337 | 11.024147561 | 11 |
| A2 | 308.47299864 | 10.789591226 | 11 |
| A3 | 307.79655312 | 10.858784224 | 11 |
| A4 | 307.17746426 | 10.931225490 | 11 |
| Total | 301.53122381 | 14.019097482 | 99 |
| 3000(rpm) | Ao | 244.91402834 | 7.769388753 | 11 |
| B1 | 245.84598995 | 7.679879143 | 11 |
| B2 | 239.66606970 | 7.464035755 | 11 |
| B3 | 240.38274575 | 7.509215140 | 11 |
| B4 | 226.76326550 | 6.977238821 | 11 |
| A1 | 240.38274575 | 7.509215140 | 11 |
| A2 | 235.15703386 | 7.345971344 | 11 |
| A3 | 230.90229645 | 7.158414153 | 11 |
| A4 | 226.76326550 | 6.977238821 | 11 |
| Total | 236.75304898 | 9.860969810 | 99 |
| 3500(rpm) | Ao | 262.17415795 | 9.170176998 | 11 |
| B1 | 262.33608022 | 9.098045939 | 11 |
| B2 | 267.84514605 | 9.700340736 | 11 |
| B3 | 250.52798409 | 8.473036047 | 11 |
| B4 | 238.21307554 | 8.043238319 | 11 |
| A1 | 242.68363274 | 7.945023153 | 11 |
| A2 | 235.65774875 | 7.678146751 | 11 |
| A3 | 230.30651089 | 7.421062667 | 11 |
| A4 | 227.56476671 | 7.332716680 | 11 |
| Total | 246.36767810 | 16.278963273 | 99 |
| Total | Ao | 420.71161489 | 134.577647995 | 99 |
| B1 | 432.64929403 | 145.604009349 | 99 |
| B2 | 428.20392012 | 144.640544192 | 99 |
| B3 | 418.50378475 | 141.871748518 | 99 |
| B4 | 397.63292079 | 135.828351739 | 99 |
| A1 | 440.23121396 | 151.818374267 | 99 |
| A2 | 433.23430186 | 152.550045782 | 99 |
| A3 | 424.79996051 | 148.298372384 | 99 |
| A4 | 414.00243000 | 142.738790404 | 99 |
| Total | 423.32993788 | 144.178388240 | 891 |
| Brake\_Thermal\_Efficiency | 1000(rpm) | Ao | 12.94289773 | .716893166 | 11 |
| B1 | 13.05951256 | .743445457 | 11 |
| B2 | 13.64817999 | .751893699 | 11 |
| B3 | 13.64817999 | .751893699 | 11 |
| B4 | 14.25498562 | .768790187 | 11 |
| A1 | 13.57480267 | .751893699 | 11 |
| A2 | 13.35631967 | .760341945 | 11 |
| A3 | 13.61705646 | .764566066 | 11 |
| A4 | 13.95488066 | .768790187 | 11 |
| Total | 13.56186837 | .818861079 | 99 |
| 1200(rpm) | Ao | 14.86081081 | .761389983 | 11 |
| B1 | 15.63184080 | .800893515 | 11 |
| B2 | 15.63184080 | .811031407 | 11 |
| B3 | 16.22545500 | .811031408 | 11 |
| B4 | 17.03672775 | .831307193 | 11 |
| A1 | 15.63184080 | .811031407 | 11 |
| A2 | 16.02758360 | .821169300 | 11 |
| A3 | 16.12651930 | .826238247 | 11 |
| A4 | 16.63109138 | .831307192 | 11 |
| Total | 15.97819003 | .984494249 | 99 |
| 1400(rpm) | Ao | 14.70544779 | .717552380 | 11 |
| B1 | 16.61305567 | .810634113 | 11 |
| B2 | 15.61584619 | .771155696 | 11 |
| B3 | 16.18027437 | .771155696 | 11 |
| B4 | 17.06442975 | .794810782 | 11 |
| A1 | 14.40734660 | .747500615 | 11 |
| A2 | 14.82056805 | .759328157 | 11 |
| A3 | 15.49609277 | .765241927 | 11 |
| A4 | 15.99213164 | .771155696 | 11 |
| Total | 15.65502142 | 1.126287017 | 99 |
| 1600(rpm) | Ao | 18.28072727 | .780507136 | 11 |
| B1 | 18.97191007 | .827252034 | 11 |
| B2 | 19.28190860 | .840769225 | 11 |
| B3 | 20.10241535 | .840769225 | 11 |
| B4 | 21.17224007 | .867803607 | 11 |
| A1 | 19.05897349 | .813734845 | 11 |
| A2 | 19.17373890 | .827252034 | 11 |
| A3 | 19.53386485 | .834010632 | 11 |
| A4 | 20.10241535 | .840769225 | 11 |
| Total | 19.51979933 | 1.125157588 | 99 |
| 1800(rpm) | Ao | 18.82884029 | .803909164 | 11 |
| B1 | 20.01667108 | .854624348 | 11 |
| B2 | 20.79727376 | .869831186 | 11 |
| B3 | 21.22170792 | .869831184 | 11 |
| B4 | 22.40300019 | .900244863 | 11 |
| A1 | 19.45570565 | .839417506 | 11 |
| A2 | 20.01667108 | .854624348 | 11 |
| A3 | 20.19475534 | .862227766 | 11 |
| A4 | 20.79727376 | .869831186 | 11 |
| Total | 20.41465545 | 1.285803443 | 99 |
| 2200(rpm) | Ao | 23.38100901 | .855657316 | 11 |
| B1 | 24.98720071 | .914437913 | 11 |
| B2 | 25.95033976 | .933024049 | 11 |
| B3 | 25.72270520 | .933024049 | 11 |
| B4 | 27.45762517 | .970196324 | 11 |
| A1 | 24.04219987 | .895851775 | 11 |
| A2 | 24.54100069 | .914437914 | 11 |
| A3 | 25.24113567 | .923730980 | 11 |
| A4 | 26.17797432 | .933024048 | 11 |
| Total | 25.27791004 | 1.455993412 | 99 |
| 2500(rpm) | Ao | 27.14027948 | .927017027 | 11 |
| B1 | 29.54673494 | .992668651 | 11 |
| B2 | 30.17538888 | 1.013789260 | 11 |
| B3 | 30.67006738 | 1.013789259 | 11 |
| B4 | 31.94798686 | 1.056030477 | 11 |
| A1 | 28.44401411 | .971548041 | 11 |
| A2 | 29.06236224 | .992668650 | 11 |
| A3 | 29.12677350 | 1.003228955 | 11 |
| A4 | 29.18603187 | 1.013789259 | 11 |
| Total | 29.47773770 | 1.609925145 | 99 |
| 3000(rpm) | Ao | 33.43682432 | 1.038259070 | 11 |
| B1 | 36.45780591 | 1.115168185 | 11 |
| B2 | 37.39769507 | 1.140512918 | 11 |
| B3 | 37.28639241 | 1.140512914 | 11 |
| B4 | 39.52481265 | 1.191202380 | 11 |
| A1 | 37.28639241 | 1.140512914 | 11 |
| A2 | 38.11497890 | 1.165857650 | 11 |
| A3 | 38.81680403 | 1.178530015 | 11 |
| A4 | 39.52481265 | 1.191202380 | 11 |
| Total | 37.53850204 | 2.085063745 | 99 |
| 3500(rpm) | Ao | 31.24147727 | 1.067099599 | 11 |
| B1 | 34.17292706 | 1.157581162 | 11 |
| B2 | 33.47324559 | 1.182754137 | 11 |
| B3 | 35.78174528 | 1.182754136 | 11 |
| B4 | 37.63143066 | 1.241891843 | 11 |
| A1 | 36.93599513 | 1.182754136 | 11 |
| A2 | 38.03686092 | 1.212322990 | 11 |
| A3 | 38.91986206 | 1.227107415 | 11 |
| A4 | 39.38877606 | 1.241891843 | 11 |
| Total | 36.17581334 | 2.831135144 | 99 |
| Total | Ao | 21.64647933 | 7.182267876 | 99 |
| B1 | 23.27307320 | 8.055218309 | 99 |
| B2 | 23.55241318 | 8.182807898 | 99 |
| B3 | 24.09321588 | 8.352539246 | 99 |
| B4 | 25.38813763 | 8.828799131 | 99 |
| A1 | 23.20414119 | 8.740469896 | 99 |
| A2 | 23.68334267 | 9.044123382 | 99 |
| A3 | 24.11920711 | 9.197715607 | 99 |
| A4 | 24.63948752 | 9.224131543 | 99 |
| Total | 23.73327752 | 8.575307265 | 891 |
| Torque | 1000(rpm) | Ao | 3.70000 | .204939 | 11 |
| B1 | 3.60000 | .204939 | 11 |
| B2 | 3.72000 | .204939 | 11 |
| B3 | 3.72000 | .204939 | 11 |
| B4 | 3.80000 | .204939 | 11 |
| A1 | 3.70000 | .204939 | 11 |
| A2 | 3.60000 | .204939 | 11 |
| A3 | 3.65000 | .204939 | 11 |
| A4 | 3.72000 | .204939 | 11 |
| Total | 3.69000 | .205555 | 99 |
| 1200(rpm) | Ao | 4.00000 | .204939 | 11 |
| B1 | 4.00000 | .204939 | 11 |
| B2 | 3.95000 | .204939 | 11 |
| B3 | 4.10000 | .204939 | 11 |
| B4 | 4.20000 | .204939 | 11 |
| A1 | 3.95000 | .204939 | 11 |
| A2 | 4.00000 | .204939 | 11 |
| A3 | 4.00000 | .204939 | 11 |
| A4 | 4.10000 | .204939 | 11 |
| Total | 4.03333 | .211530 | 99 |
| 1400(rpm) | Ao | 4.20000 | .204939 | 11 |
| B1 | 4.20000 | .204939 | 11 |
| B2 | 4.15000 | .204939 | 11 |
| B3 | 4.30000 | .204939 | 11 |
| B4 | 4.40000 | .204939 | 11 |
| A1 | 3.95000 | .204939 | 11 |
| A2 | 4.00000 | .204939 | 11 |
| A3 | 4.15000 | .204939 | 11 |
| A4 | 4.25000 | .204939 | 11 |
| Total | 4.17778 | .236710 | 99 |
| 1600(rpm) | Ao | 4.80000 | .204939 | 11 |
| B1 | 4.70000 | .204939 | 11 |
| B2 | 4.70000 | .204939 | 11 |
| B3 | 4.90000 | .204939 | 11 |
| B4 | 5.00000 | .204939 | 11 |
| A1 | 4.80000 | .204939 | 11 |
| A2 | 4.75000 | .204939 | 11 |
| A3 | 4.80000 | .204939 | 11 |
| A4 | 4.90000 | .204939 | 11 |
| Total | 4.81667 | .218062 | 99 |
| 1800(rpm) | Ao | 4.80000 | .204939 | 11 |
| B1 | 4.80000 | .204939 | 11 |
| B2 | 4.90000 | .204939 | 11 |
| B3 | 5.00000 | .204939 | 11 |
| B4 | 5.10000 | .204939 | 11 |
| A1 | 4.75000 | .204939 | 11 |
| A2 | 4.80000 | .204939 | 11 |
| A3 | 4.80000 | .204939 | 11 |
| A4 | 4.90000 | .204939 | 11 |
| Total | 4.87222 | .224543 | 99 |
| 2200(rpm) | Ao | 5.60000 | .204939 | 11 |
| B1 | 5.60000 | .204939 | 11 |
| B2 | 5.70000 | .204939 | 11 |
| B3 | 5.65000 | .204939 | 11 |
| B4 | 5.80000 | .204939 | 11 |
| A1 | 5.50000 | .204939 | 11 |
| A2 | 5.50000 | .204939 | 11 |
| A3 | 5.60000 | .204939 | 11 |
| A4 | 5.75000 | .204939 | 11 |
| Total | 5.63333 | .219345 | 99 |
| 2500(rpm) | Ao | 6.00000 | .204939 | 11 |
| B1 | 6.10000 | .204939 | 11 |
| B2 | 6.10000 | .204939 | 11 |
| B3 | 6.20000 | .204939 | 11 |
| B4 | 6.20000 | .204939 | 11 |
| A1 | 6.00000 | .204939 | 11 |
| A2 | 6.00000 | .204939 | 11 |
| A3 | 5.95000 | .204939 | 11 |
| A4 | 5.90000 | .204939 | 11 |
| Total | 6.05000 | .220621 | 99 |
| 3000(rpm) | Ao | 6.60000 | .204939 | 11 |
| B1 | 6.70000 | .204939 | 11 |
| B2 | 6.72000 | .204939 | 11 |
| B3 | 6.70000 | .204939 | 11 |
| B4 | 6.80000 | .204939 | 11 |
| A1 | 6.70000 | .204939 | 11 |
| A2 | 6.70000 | .204939 | 11 |
| A3 | 6.75000 | .204939 | 11 |
| A4 | 6.80000 | .204939 | 11 |
| Total | 6.71889 | .204704 | 99 |
| 3500(rpm) | Ao | 6.00000 | .204939 | 11 |
| B1 | 6.05000 | .204939 | 11 |
| B2 | 5.80000 | .204939 | 11 |
| B3 | 6.20000 | .204939 | 11 |
| B4 | 6.21000 | .204939 | 11 |
| A1 | 6.40000 | .204939 | 11 |
| A2 | 6.43000 | .204939 | 11 |
| A3 | 6.50000 | .204939 | 11 |
| A4 | 6.50000 | .204939 | 11 |
| Total | 6.23222 | .305188 | 99 |
| Total | Ao | 5.07778 | .983596 | 99 |
| B1 | 5.08333 | 1.036625 | 99 |
| B2 | 5.08222 | 1.013131 | 99 |
| B3 | 5.19667 | 1.012679 | 99 |
| B4 | 5.27889 | .998238 | 99 |
| A1 | 5.08333 | 1.079328 | 99 |
| A2 | 5.08667 | 1.086831 | 99 |
| A3 | 5.13333 | 1.079588 | 99 |
| A4 | 5.20222 | 1.052494 | 99 |
| Total | 5.13605 | 1.036308 | 891 |
| Breake\_Power | 1000(rpm) | Ao | .387513333 | .0214639463 | 11 |
| B1 | .377040000 | .0214639461 | 11 |
| B2 | .389608000 | .0214639461 | 11 |
| B3 | .389608000 | .0214639461 | 11 |
| B4 | .397986667 | .0214639463 | 11 |
| A1 | .387513333 | .0214639463 | 11 |
| A2 | .377040000 | .0214639461 | 11 |
| A3 | .382276667 | .0214639463 | 11 |
| A4 | .389608000 | .0214639461 | 11 |
| Total | .386466000 | .0215285121 | 99 |
| 1200(rpm) | Ao | .502720000 | .0257567354 | 11 |
| B1 | .502720000 | .0257567354 | 11 |
| B2 | .496436000 | .0257567354 | 11 |
| B3 | .515288000 | .0257567354 | 11 |
| B4 | .527856000 | .0257567354 | 11 |
| A1 | .496436000 | .0257567354 | 11 |
| A2 | .502720000 | .0257567354 | 11 |
| A3 | .502720000 | .0257567354 | 11 |
| A4 | .515288000 | .0257567354 | 11 |
| Total | .506909333 | .0265850776 | 99 |
| 1400(rpm) | Ao | .615832000 | .0300495248 | 11 |
| B1 | .615832000 | .0300495248 | 11 |
| B2 | .608500667 | .0300495246 | 11 |
| B3 | .630494667 | .0300495246 | 11 |
| B4 | .645157333 | .0300495246 | 11 |
| A1 | .579175333 | .0300495246 | 11 |
| A2 | .586506667 | .0300495246 | 11 |
| A3 | .608500667 | .0300495246 | 11 |
| A4 | .623163333 | .0300495246 | 11 |
| Total | .612573630 | .0347080360 | 99 |
| 1600(rpm) | Ao | .804352000 | .0343423138 | 11 |
| B1 | .787594667 | .0343423140 | 11 |
| B2 | .787594667 | .0343423140 | 11 |
| B3 | .821109333 | .0343423140 | 11 |
| B4 | .837866667 | .0343423140 | 11 |
| A1 | .804352000 | .0343423138 | 11 |
| A2 | .795973333 | .0343423140 | 11 |
| A3 | .804352000 | .0343423138 | 11 |
| A4 | .821109333 | .0343423140 | 11 |
| Total | .807144889 | .0365413703 | 99 |
| 1800(rpm) | Ao | .904896000 | .0386351032 | 11 |
| B1 | .904896000 | .0386351032 | 11 |
| B2 | .923748000 | .0386351032 | 11 |
| B3 | .942600000 | .0386351032 | 11 |
| B4 | .961452000 | .0386351032 | 11 |
| A1 | .895470000 | .0386351032 | 11 |
| A2 | .904896000 | .0386351032 | 11 |
| A3 | .904896000 | .0386351032 | 11 |
| A4 | .923748000 | .0386351032 | 11 |
| Total | .918511333 | .0423308221 | 99 |
| 2200(rpm) | Ao | 1.290314667 | .0472206817 | 11 |
| B1 | 1.290314667 | .0472206817 | 11 |
| B2 | 1.313356000 | .0472206816 | 11 |
| B3 | 1.301835333 | .0472206817 | 11 |
| B4 | 1.336397333 | .0472206817 | 11 |
| A1 | 1.267273333 | .0472206817 | 11 |
| A2 | 1.267273333 | .0472206817 | 11 |
| A3 | 1.290314667 | .0472206817 | 11 |
| A4 | 1.324876667 | .0472206817 | 11 |
| Total | 1.297995111 | .0505400210 | 99 |
| 2500(rpm) | Ao | 1.571000000 | .0536598654 | 11 |
| B1 | 1.597183333 | .0536598656 | 11 |
| B2 | 1.597183333 | .0536598656 | 11 |
| B3 | 1.623366667 | .0536598656 | 11 |
| B4 | 1.623366667 | .0536598656 | 11 |
| A1 | 1.571000000 | .0536598654 | 11 |
| A2 | 1.571000000 | .0536598654 | 11 |
| A3 | 1.557908333 | .0536598656 | 11 |
| A4 | 1.544816667 | .0536598656 | 11 |
| Total | 1.584091667 | .0577658391 | 99 |
| 3000(rpm) | Ao | 2.073720000 | .0643918386 | 11 |
| B1 | 2.105140000 | .0643918386 | 11 |
| B2 | 2.111424000 | .0643918386 | 11 |
| B3 | 2.105140000 | .0643918386 | 11 |
| B4 | 2.136560000 | .0643918386 | 11 |
| A1 | 2.105140000 | .0643918386 | 11 |
| A2 | 2.105140000 | .0643918386 | 11 |
| A3 | 2.120850000 | .0643918386 | 11 |
| A4 | 2.136560000 | .0643918386 | 11 |
| Total | 2.111074889 | .0643180945 | 99 |
| 3500(rpm) | Ao | 2.199400000 | .0751238118 | 11 |
| B1 | 2.217728333 | .0751238117 | 11 |
| B2 | 2.126086667 | .0751238117 | 11 |
| B3 | 2.272713333 | .0751238117 | 11 |
| B4 | 2.276379000 | .0751238118 | 11 |
| A1 | 2.346026667 | .0751238117 | 11 |
| A2 | 2.357023667 | .0751238117 | 11 |
| A3 | 2.382683333 | .0751238117 | 11 |
| A4 | 2.382683333 | .0751238117 | 11 |
| Total | 2.284524926 | .1118718643 | 99 |
| Total | Ao | 1.149972000 | .6387116052 | 99 |
| B1 | 1.155383222 | .6516082760 | 99 |
| B2 | 1.150437481 | .6359076583 | 99 |
| B3 | 1.178017259 | .6559043345 | 99 |
| B4 | 1.193669074 | .6566868216 | 99 |
| A1 | 1.161376296 | .6758179907 | 99 |
| A2 | 1.163063667 | .6780397993 | 99 |
| A3 | 1.172722407 | .6818859091 | 99 |
| A4 | 1.184650370 | .6787351776 | 99 |
| Total | 1.167699086 | .6588703387 | 891 |
| Time\_for\_8ml | 1000(rpm) | Ao | 87.00000 | .000000 | 11 |
| B1 | 88.00000 | .000000 | 11 |
| B2 | 89.00000 | .000000 | 11 |
| B3 | 89.00000 | .000000 | 11 |
| B4 | 91.00000 | .000000 | 11 |
| A1 | 89.00000 | .000000 | 11 |
| A2 | 90.00000 | .000000 | 11 |
| A3 | 90.50000 | .000000 | 11 |
| A4 | 91.00000 | .000000 | 11 |
| Total | 89.38889 | 1.292750 | 99 |
| 1200(rpm) | Ao | 77.00000 | .000000 | 11 |
| B1 | 79.00000 | .000000 | 11 |
| B2 | 80.00000 | .000000 | 11 |
| B3 | 80.00000 | .000000 | 11 |
| B4 | 82.00000 | .000000 | 11 |
| A1 | 80.00000 | .000000 | 11 |
| A2 | 81.00000 | .000000 | 11 |
| A3 | 81.50000 | .000000 | 11 |
| A4 | 82.00000 | .000000 | 11 |
| Total | 80.27778 | 1.518966 | 99 |
| 1400(rpm) | Ao | 62.20000 | .000000 | 11 |
| B1 | 64.20000 | .000000 | 11 |
| B2 | 65.20000 | .000000 | 11 |
| B3 | 65.20000 | .000000 | 11 |
| B4 | 67.20000 | .000000 | 11 |
| A1 | 63.20000 | .000000 | 11 |
| A2 | 64.20000 | .000000 | 11 |
| A3 | 64.70000 | .000000 | 11 |
| A4 | 65.20000 | .000000 | 11 |
| Total | 64.58889 | 1.335457 | 99 |
| 1600(rpm) | Ao | 59.20000 | .000000 | 11 |
| B1 | 61.20000 | .000000 | 11 |
| B2 | 62.20000 | .000000 | 11 |
| B3 | 62.20000 | .000000 | 11 |
| B4 | 64.20000 | .000000 | 11 |
| A1 | 60.20000 | .000000 | 11 |
| A2 | 61.20000 | .000000 | 11 |
| A3 | 61.70000 | .000000 | 11 |
| A4 | 62.20000 | .000000 | 11 |
| Total | 61.58889 | 1.335457 | 99 |
| 1800(rpm) | Ao | 54.20000 | .000000 | 11 |
| B1 | 56.20000 | .000000 | 11 |
| B2 | 57.20000 | .000000 | 11 |
| B3 | 57.20000 | .000000 | 11 |
| B4 | 59.20000 | .000000 | 11 |
| A1 | 55.20000 | .000000 | 11 |
| A2 | 56.20000 | .000000 | 11 |
| A3 | 56.70000 | .000000 | 11 |
| A4 | 57.20000 | .000000 | 11 |
| Total | 56.58889 | 1.335457 | 99 |
| 2200(rpm) | Ao | 47.20000 | .000000 | 11 |
| B1 | 49.20000 | .000000 | 11 |
| B2 | 50.20000 | .000000 | 11 |
| B3 | 50.20000 | .000000 | 11 |
| B4 | 52.20000 | .000000 | 11 |
| A1 | 48.20000 | .000000 | 11 |
| A2 | 49.20000 | .000000 | 11 |
| A3 | 49.70000 | .000000 | 11 |
| A4 | 50.20000 | .000000 | 11 |
| Total | 49.58889 | 1.335457 | 99 |
| 2500(rpm) | Ao | 45.00000 | .000000 | 11 |
| B1 | 47.00000 | .000000 | 11 |
| B2 | 48.00000 | .000000 | 11 |
| B3 | 48.00000 | .000000 | 11 |
| B4 | 50.00000 | .000000 | 11 |
| A1 | 46.00000 | .000000 | 11 |
| A2 | 47.00000 | .000000 | 11 |
| A3 | 47.50000 | .000000 | 11 |
| A4 | 48.00000 | .000000 | 11 |
| Total | 47.38889 | 1.335457 | 99 |
| 3000(rpm) | Ao | 42.00000 | .000000 | 11 |
| B1 | 44.00000 | .000000 | 11 |
| B2 | 45.00000 | .000000 | 11 |
| B3 | 45.00000 | .000000 | 11 |
| B4 | 47.00000 | .000000 | 11 |
| A1 | 45.00000 | .000000 | 11 |
| A2 | 46.00000 | .000000 | 11 |
| A3 | 46.50000 | .000000 | 11 |
| A4 | 47.00000 | .000000 | 11 |
| Total | 45.27778 | 1.518966 | 99 |
| 3500(rpm) | Ao | 37.00000 | .000000 | 11 |
| B1 | 39.00000 | .000000 | 11 |
| B2 | 40.00000 | .000000 | 11 |
| B3 | 40.00000 | .000000 | 11 |
| B4 | 42.00000 | .000000 | 11 |
| A1 | 40.00000 | .000000 | 11 |
| A2 | 41.00000 | .000000 | 11 |
| A3 | 41.50000 | .000000 | 11 |
| A4 | 42.00000 | .000000 | 11 |
| Total | 40.27778 | 1.518966 | 99 |
| Total | Ao | 56.75556 | 15.729358 | 99 |
| B1 | 58.64444 | 15.515247 | 99 |
| B2 | 59.64444 | 15.515247 | 99 |
| B3 | 59.64444 | 15.515247 | 99 |
| B4 | 61.64444 | 15.515247 | 99 |
| A1 | 58.53333 | 15.768478 | 99 |
| A2 | 59.53333 | 15.768478 | 99 |
| A3 | 60.03333 | 15.768478 | 99 |
| A4 | 60.53333 | 15.768478 | 99 |
| Total | 59.44074 | 15.635580 | 891 |
| Fuel\_Mass\_Flow\_Rate | 1000(rpm) | Ao | .244965517 | .0000000000 | 11 |
| B1 | .258545455 | .0000000000 | 11 |
| B2 | .255640449 | .0000000000 | 11 |
| B3 | .255640449 | .0000000000 | 11 |
| B4 | .250021978 | .0000000000 | 11 |
| A1 | .255640449 | .0000000000 | 11 |
| A2 | .252800000 | .0000000000 | 11 |
| A3 | .251403315 | .0000000000 | 11 |
| A4 | .250021978 | .0000000000 | 11 |
| Total | .252742177 | .0039063554 | 99 |
| 1200(rpm) | Ao | .276779221 | .0000000000 | 11 |
| B1 | .288000000 | .0000000000 | 11 |
| B2 | .284400000 | .0000000000 | 11 |
| B3 | .284400000 | .0000000000 | 11 |
| B4 | .277463415 | .0000000000 | 11 |
| A1 | .284400000 | .0000000000 | 11 |
| A2 | .280888889 | .0000000000 | 11 |
| A3 | .279165644 | .0000000000 | 11 |
| A4 | .277463415 | .0000000000 | 11 |
| Total | .281440065 | .0037925619 | 99 |
| 1400(rpm) | Ao | .342636656 | .0000000000 | 11 |
| B1 | .331962617 | .0000000000 | 11 |
| B2 | .348957055 | .0000000000 | 11 |
| B3 | .348957055 | .0000000000 | 11 |
| B4 | .338571429 | .0000000000 | 11 |
| A1 | .360000000 | .0000000000 | 11 |
| A2 | .354392523 | .0000000000 | 11 |
| A3 | .351653787 | .0000000000 | 11 |
| A4 | .348957055 | .0000000000 | 11 |
| Total | .347343131 | .0080123257 | 99 |
| 1600(rpm) | Ao | .360000000 | .0000000000 | 11 |
| B1 | .371764706 | .0000000000 | 11 |
| B2 | .365787781 | .0000000000 | 11 |
| B3 | .365787781 | .0000000000 | 11 |
| B4 | .354392523 | .0000000000 | 11 |
| A1 | .377940199 | .0000000000 | 11 |
| A2 | .371764706 | .0000000000 | 11 |
| A3 | .368752026 | .0000000000 | 11 |
| A4 | .365787781 | .0000000000 | 11 |
| Total | .366886389 | .0065343944 | 99 |
| 1800(rpm) | Ao | .393210332 | .0000000000 | 11 |
| B1 | .404839858 | .0000000000 | 11 |
| B2 | .397762238 | .0000000000 | 11 |
| B3 | .397762238 | .0000000000 | 11 |
| B4 | .384324324 | .0000000000 | 11 |
| A1 | .412173913 | .0000000000 | 11 |
| A2 | .404839858 | .0000000000 | 11 |
| A3 | .401269841 | .0000000000 | 11 |
| A4 | .397762238 | .0000000000 | 11 |
| Total | .399327204 | .0074872981 | 99 |
| 2200(rpm) | Ao | .451525424 | .0000000000 | 11 |
| B1 | .462439024 | .0000000000 | 11 |
| B2 | .453227092 | .0000000000 | 11 |
| B3 | .453227092 | .0000000000 | 11 |
| B4 | .435862069 | .0000000000 | 11 |
| A1 | .472033195 | .0000000000 | 11 |
| A2 | .462439024 | .0000000000 | 11 |
| A3 | .457786720 | .0000000000 | 11 |
| A4 | .453227092 | .0000000000 | 11 |
| Total | .455751859 | .0094240987 | 99 |
| 2500(rpm) | Ao | .473600000 | .0000000000 | 11 |
| B1 | .484085106 | .0000000000 | 11 |
| B2 | .474000000 | .0000000000 | 11 |
| B3 | .474000000 | .0000000000 | 11 |
| B4 | .455040000 | .0000000000 | 11 |
| A1 | .494608696 | .0000000000 | 11 |
| A2 | .484085106 | .0000000000 | 11 |
| A3 | .478989474 | .0000000000 | 11 |
| A4 | .474000000 | .0000000000 | 11 |
| Total | .476934265 | .0102454708 | 99 |
| 3000(rpm) | Ao | .507428571 | .0000000000 | 11 |
| B1 | .517090909 | .0000000000 | 11 |
| B2 | .505600000 | .0000000000 | 11 |
| B3 | .505600000 | .0000000000 | 11 |
| B4 | .484085106 | .0000000000 | 11 |
| A1 | .505600000 | .0000000000 | 11 |
| A2 | .494608696 | .0000000000 | 11 |
| A3 | .489290323 | .0000000000 | 11 |
| A4 | .484085106 | .0000000000 | 11 |
| Total | .499265412 | .0110449963 | 99 |
| 3500(rpm) | Ao | .576000000 | .0000000000 | 11 |
| B1 | .581169231 | .0000000000 | 11 |
| B2 | .568800000 | .0000000000 | 11 |
| B3 | .568800000 | .0000000000 | 11 |
| B4 | .541714286 | .0000000000 | 11 |
| A1 | .568800000 | .0000000000 | 11 |
| A2 | .554926829 | .0000000000 | 11 |
| A3 | .548240964 | .0000000000 | 11 |
| A4 | .541714286 | .0000000000 | 11 |
| Total | .561129511 | .0140461809 | 99 |
| Total | Ao | .402905080 | .1030827503 | 99 |
| B1 | .411099656 | .1029341964 | 99 |
| B2 | .406019402 | .0980279548 | 99 |
| B3 | .406019402 | .0980279548 | 99 |
| B4 | .391275014 | .0913786758 | 99 |
| A1 | .414577384 | .0995606373 | 99 |
| A2 | .406749515 | .0960945863 | 99 |
| A3 | .402950233 | .0944318947 | 99 |
| A4 | .399224328 | .0928137721 | 99 |
| Total | .404535557 | .0972187657 | 891 |

# Explanation of The Post Hoc Text

The post hoc test was conducted as shown in Table 3.4 and Table 3.5 for each factor, on the basis that the null hypothesis was rejected that there is significate difference between the mean of the dependent variable base on our two factors. Turkey method was used to make every possible pairwise comparison for each group, and Dunnett’s Correction was also used to compare every group mean to a control mean. First each level of significant was check using their p-value. If the P-value ≤ α in our case α = 0.05, we conclude that there is a statistically significance associated between the response variable and the term, else vice-verse. If the above is true, the mean difference between the factor level are investigated in other to understand and determine which group term perform better. Either a negative or positive helps us to understand this better.

From table 3.7 it is evident that there a statistical significance between each independent variable of speed level with reference to speed level of 1000rpm for the dependent variable (specific fuel consumption). The mean difference between each pair of the independent variable speed level is positive with respect to 1000rpm which shows that the other speed levels perform less than 1000rpm for specific fuel consumption. On the other hand, comparing other speed levels to 1200rpm, it’s evident that 1000rpm and 1400rpm performed better than 1200rpm, while the others performed less with respect to specific fuel consumption. On this basis are all interpretation done on these results both on table 3.5.

Table Post Hoc Test for Speed Level

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Multiple Comparisons | | | | | | | | |
| Dependent Variable | | (I) Speed\_level | (J) Speed\_level | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
| Lower Bound | Upper Bound |
| Specific\_Fuel\_Consumption | Tukey-HSD | 1000(rpm) | 1200(rpm) | 99.29803695\* | 3.116196452 | .000 | 89.60609603 | 108.98997787 |
| 1400(rpm) | 86.96359308\* | 3.116196452 | .000 | 77.27165216 | 96.65553401 |
| 1600(rpm) | 200.54379022\* | 3.116196452 | .000 | 190.85184930 | 210.23573114 |
| 1800(rpm) | 220.30230058\* | 3.116196452 | .000 | 210.61035966 | 229.99424151 |
| 2200(rpm) | 304.36678542\* | 3.116196452 | .000 | 294.67484450 | 314.05872635 |
| 2500(rpm) | 354.60077557\* | 3.116196452 | .000 | 344.90883465 | 364.29271650 |
| 3000(rpm) | 419.37895040\* | 3.116196452 | .000 | 409.68700948 | 429.07089132 |
| 3500(rpm) | 409.76432128\* | 3.116196452 | .000 | 400.07238035 | 419.45626220 |
| 1200(rpm) | 1000(rpm) | -99.29803695\* | 3.116196452 | .000 | -108.9899777 | -89.60609603 |
| 1400(rpm) | -12.33444387\* | 3.116196452 | .003 | -22.02638479 | -2.64250294 |
| 1600(rpm) | 101.24575327\* | 3.116196452 | .000 | 91.55381235 | 110.93769419 |
| 1800(rpm) | 121.00426363\* | 3.116196452 | .000 | 111.31232271 | 130.69620456 |
| 2200(rpm) | 205.06874847\* | 3.116196452 | .000 | 195.37680755 | 214.76068940 |
| 2500(rpm) | 255.30273862\* | 3.116196452 | .000 | 245.61079770 | 264.99467955 |
| 3000(rpm) | 320.08091345\* | 3.116196452 | .000 | 310.38897253 | 329.77285437 |
| 3500(rpm) | 310.46628433\* | 3.116196452 | .000 | 300.77434340 | 320.15822525 |
| 1400(rpm) | 1000(rpm) | -86.96359308\* | 3.116196452 | .000 | -96.65553401 | -77.27165216 |
| 1200(rpm) | 12.33444387\* | 3.116196452 | .003 | 2.64250294 | 22.02638479 |
| 1600(rpm) | 113.58019714\* | 3.116196452 | .000 | 103.88825621 | 123.27213806 |
| 1800(rpm) | 133.33870750\* | 3.116196452 | .000 | 123.64676658 | 143.03064842 |
| 2200(rpm) | 217.40319234\* | 3.116196452 | .000 | 207.71125141 | 227.09513326 |
| 2500(rpm) | 267.63718249\* | 3.116196452 | .000 | 257.94524157 | 277.32912341 |
| 3000(rpm) | 332.41535732\* | 3.116196452 | .000 | 322.72341639 | 342.10729824 |
| 3500(rpm) | 322.80072819\* | 3.116196452 | .000 | 313.10878727 | 332.49266912 |
| 1600(rpm) | 1000(rpm) | -200.5437902\* | 3.116196452 | .000 | -210.2357311 | -190.8518493 |
| 1200(rpm) | -101.2457532\* | 3.116196452 | .000 | -110.9376941 | -91.55381235 |
| 1400(rpm) | -113.5801971\* | 3.116196452 | .000 | -123.2721380 | -103.8882562 |
| 1800(rpm) | 19.75851036\* | 3.116196452 | .000 | 10.06656944 | 29.45045129 |
| 2200(rpm) | 103.82299520\* | 3.116196452 | .000 | 94.13105428 | 113.51493613 |
| 2500(rpm) | 154.05698535\* | 3.116196452 | .000 | 144.36504443 | 163.74892628 |
| 3000(rpm) | 218.83516018\* | 3.116196452 | .000 | 209.14321926 | 228.52710110 |
| 3500(rpm) | 209.22053106\* | 3.116196452 | .000 | 199.52859013 | 218.91247198 |
| 1800(rpm) | 1000(rpm) | -220.3023005\* | 3.116196452 | .000 | -229.9942415 | -210.6103596 |
| 1200(rpm) | -121.0042636\* | 3.116196452 | .000 | -130.6962045 | -111.3123227 |
| 1400(rpm) | -133.3387075\* | 3.116196452 | .000 | -143.0306484 | -123.6467665 |
| 1600(rpm) | -19.75851036\* | 3.116196452 | .000 | -29.45045129 | -10.06656944 |
| 2200(rpm) | 84.06448484\* | 3.116196452 | .000 | 74.37254392 | 93.75642576 |
| 2500(rpm) | 134.29847499\* | 3.116196452 | .000 | 124.60653407 | 143.99041591 |
| 3000(rpm) | 199.07664982\* | 3.116196452 | .000 | 189.38470889 | 208.76859074 |
| 3500(rpm) | 189.46202069\* | 3.116196452 | .000 | 179.77007977 | 199.15396162 |
| 2200(rpm) | 1000(rpm) | -304.3667854\* | 3.116196452 | .000 | -314.0587263 | -294.6748445 |
| 1200(rpm) | -205.0687484\* | 3.116196452 | .000 | -214.7606894 | -195.3768075 |
| 1400(rpm) | -217.4031923\* | 3.116196452 | .000 | -227.0951332 | -207.7112514 |
| 1600(rpm) | -103.8229952\* | 3.116196452 | .000 | -113.5149361 | -94.13105428 |
| 1800(rpm) | -84.06448484\* | 3.116196452 | .000 | -93.75642576 | -74.37254392 |
| 2500(rpm) | 50.23399015\* | 3.116196452 | .000 | 40.54204923 | 59.92593107 |
| 3000(rpm) | 115.01216498\* | 3.116196452 | .000 | 105.32022405 | 124.70410590 |
| 3500(rpm) | 105.39753585\* | 3.116196452 | .000 | 95.70559493 | 115.08947678 |
| 2500(rpm) | 1000(rpm) | -354.6007755\* | 3.116196452 | .000 | -364.2927165 | -344.9088346 |
| 1200(rpm) | -255.3027386\* | 3.116196452 | .000 | -264.9946795 | -245.6107977 |
| 1400(rpm) | -267.6371824 | 3.116196452 | .000 | -277.3291234 | -257.9452415 |
| 1600(rpm) | -154.0569853\* | 3.116196452 | .000 | -163.7489262 | -144.3650444 |
| 1800(rpm) | -134.2984749\* | 3.116196452 | .000 | -143.9904159 | -124.6065347 |
| 2200(rpm) | -50.23399015\* | 3.116196452 | .000 | -59.92593107 | -40.54204923 |
| 3000(rpm) | 64.77817483\* | 3.116196452 | .000 | 55.08623390 | 74.47011575 |
| 3500(rpm) | 55.16354570\* | 3.116196452 | .000 | 45.47160478 | 64.85548663 |
| 3000(rpm) | 1000(rpm) | -419.3789504\* | 3.116196452 | .000 | -429.0708913 | -409.6870094 |
| 1200(rpm) | -320.0809134\* | 3.116196452 | .000 | -329.7728543 | -310.3889725 |
| 1400(rpm) | -332.4153573\* | 3.116196452 | .000 | -342.1072982 | -322.7234163 |
| 1600(rpm) | -218.8351601\* | 3.116196452 | .000 | -228.5271011 | -209.1432192 |
| 1800(rpm) | -199.0766498\* | 3.116196452 | .000 | -208.7685907 | -189.3847088 |
| 2200(rpm) | -115.0121649\* | 3.116196452 | .000 | -124.7041059 | -105.3202240 |
| 2500(rpm) | -64.77817483\* | 3.116196452 | .000 | -74.47011575 | -55.08623390 |
| 3500(rpm) | -9.61462912 | 3.116196452 | .054 | -19.30657005 | .07731180 |
| 3500(rpm) | 1000(rpm) | -409.7643212\* | 3.116196452 | .000 | -419.4562622 | -400.0723803 |
| 1200(rpm) | -310.4662843\* | 3.116196452 | .000 | -320.1582252 | -300.7743434 |
| 1400(rpm) | -322.8007281\* | 3.116196452 | .000 | -332.4926691 | -313.1087872 |
| 1600(rpm) | -209.2205310\* | 3.116196452 | .000 | -218.9124719 | -199.5285901 |
| 1800(rpm) | -189.4620206 | 3.116196452 | .000 | -199.1539616 | -179.7700797 |
| 2200(rpm) | -105.3975358 | 3.116196452 | .000 | -115.0894767 | -95.70559493 |
| 2500(rpm) | -55.16354570\* | 3.116196452 | .000 | -64.85548663 | -45.47160478 |
| 3000(rpm) | 9.61462912 | 3.116196452 | .054 | -.07731180 | 19.30657005 |
| Dunnett t (2-sided)b | 1200(rpm) | 1000(rpm) | -99.29803695\* | 3.116196452 | .000 | -107.5809878 | -91.01508606 |
| 1400(rpm) | 1000(rpm) | -86.96359308\* | 3.116196452 | .000 | -95.24654398 | -78.68064219 |
| 1600(rpm) | 1000(rpm) | -200.5437902\* | 3.116196452 | .000 | -208.8267411 | -192.2608393 |
| 1800(rpm) | 1000(rpm) | -220.3023005\* | 3.116196452 | .000 | -228.5852514 | -212.0193496 |
| 2200(rpm) | 1000(rpm) | -304.3667854\* | 3.116196452 | .000 | -312.6497363 | -296.0838345 |
| 2500(rpm) | 1000(rpm) | -354.6007755\* | 3.116196452 | .000 | -362.8837264 | -346.3178246 |
| 3000(rpm) | 1000(rpm) | -419.3789504\* | 3.116196452 | .000 | -427.6619012 | -411.0959995 |
| 3500(rpm) | 1000(rpm) | -409.7643212\* | 3.116196452 | .000 | -418.0472721 | -401.4813703 |
| Brake\_Thermal\_Efficiency | Tukey HSD | 1000(rpm) | 1200(rpm) | -2.41632165\* | .132443962 | .000 | -2.82824660 | -2.00439671 |
| 1400(rpm) | -2.09315305\* | .132443962 | .000 | -2.50507800 | -1.68122811 |
| 1600(rpm) | -5.95793096\* | .132443962 | .000 | -6.36985590 | -5.54600601 |
| 1800(rpm) | -6.85278708\* | .132443962 | .000 | -7.26471202 | -6.44086213 |
| 2200(rpm) | -11.71604167\* | .132443962 | .000 | -12.12796662 | -11.30411673 |
| 2500(rpm) | -15.91586932\* | .132443962 | .000 | -16.32779427 | -15.50394438 |
| 3000(rpm) | -23.97663367\* | .132443962 | .000 | -24.38855861 | -23.56470872 |
| 3500(rpm) | -22.61394496\* | .132443962 | .000 | -23.02586991 | -22.20202002 |
| 1200(rpm) | 1000(rpm) | 2.41632165\* | .132443962 | .000 | 2.00439671 | 2.82824660 |
| 1400(rpm) | .32316860 | .132443962 | .264 | -.08875634 | .73509355 |
| 1600(rpm) | -3.54160930\* | .132443962 | .000 | -3.95353425 | -3.12968436 |
| 1800(rpm) | -4.43646542\* | .132443962 | .000 | -4.84839037 | -4.02454048 |
| 2200(rpm) | -9.29972002\* | .132443962 | .000 | -9.71164496 | -8.88779507 |
| 2500(rpm) | -13.49954767\* | .132443962 | .000 | -13.91147261 | -13.08762272 |
| 3000(rpm) | -21.56031201\* | .132443962 | .000 | -21.97223696 | -21.14838707 |
| 3500(rpm) | -20.19762331\* | .132443962 | .000 | -20.60954826 | -19.78569836 |
| 1400(rpm) | 1000(rpm) | 2.09315305\* | .132443962 | .000 | 1.68122811 | 2.50507800 |
| 1200(rpm) | -.32316860 | .132443962 | .264 | -.73509355 | .08875634 |
| 1600(rpm) | -3.86477790\* | .132443962 | .000 | -4.27670285 | -3.45285296 |
| 1800(rpm) | -4.75963403\* | .132443962 | .000 | -5.17155897 | -4.34770908 |
| 2200(rpm) | -9.62288862\* | .132443962 | .000 | -10.03481356 | -9.21096367 |
| 2500(rpm) | -13.82271627\* | .132443962 | .000 | -14.23464122 | -13.41079133 |
| 3000(rpm) | -21.88348061\* | .132443962 | .000 | -22.29540556 | -21.47155567 |
| 3500(rpm) | -20.52079191\* | .132443962 | .000 | -20.93271686 | -20.10886697 |
| 1600(rpm) | 1000(rpm) | 5.95793096\* | .132443962 | .000 | 5.54600601 | 6.36985590 |
| 1200(rpm) | 3.54160930\* | .132443962 | .000 | 3.12968436 | 3.95353425 |
| 1400(rpm) | 3.86477790\* | .132443962 | .000 | 3.45285296 | 4.27670285 |
| 1800(rpm) | -.89485612\* | .132443962 | .000 | -1.30678107 | -.48293118 |
| 2200(rpm) | -5.75811072\* | .132443962 | .000 | -6.17003566 | -5.34618577 |
| 2500(rpm) | -9.95793837\* | .132443962 | .000 | -10.36986331 | -9.54601342 |
| 3000(rpm) | -18.01870271\* | .132443962 | .000 | -18.43062766 | -17.60677777 |
| 3500(rpm) | -16.65601401\* | .132443962 | .000 | -17.06793895 | -16.24408906 |
| 1800(rpm) | 1000(rpm) | 6.85278708\* | .132443962 | .000 | 6.44086213 | 7.26471202 |
| 1200(rpm) | 4.43646542\* | .132443962 | .000 | 4.02454048 | 4.84839037 |
| 1400(rpm) | 4.75963403\* | .132443962 | .000 | 4.34770908 | 5.17155897 |
| 1600(rpm) | .89485612\* | .132443962 | .000 | .48293118 | 1.30678107 |
| 2200(rpm) | -4.86325459\* | .132443962 | .000 | -5.27517954 | -4.45132965 |
| 2500(rpm) | -9.06308225\* | .132443962 | .000 | -9.47500719 | -8.65115730 |
| 3000(rpm) | -17.12384659\* | .132443962 | .000 | -17.53577153 | -16.71192164 |
| 3500(rpm) | -15.76115789\* | .132443962 | .000 | -16.17308283 | -15.34923294 |
| 2200(rpm) | 1000(rpm) | 11.71604167\* | .132443962 | .000 | 11.30411673 | 12.12796662 |
| 1200(rpm) | 9.29972002\* | .132443962 | .000 | 8.88779507 | 9.71164496 |
| 1400(rpm) | 9.62288862\* | .132443962 | .000 | 9.21096367 | 10.03481356 |
| 1600(rpm) | 5.75811072\* | .132443962 | .000 | 5.34618577 | 6.17003566 |
| 1800(rpm) | 4.86325459\* | .132443962 | .000 | 4.45132965 | 5.27517954 |
| 2500(rpm) | -4.19982765\* | .132443962 | .000 | -4.61175260 | -3.78790271 |
| 3000(rpm) | -12.26059199\* | .132443962 | .000 | -12.67251694 | -11.84866705 |
| 3500(rpm) | -10.89790329\* | .132443962 | .000 | -11.30982824 | -10.48597835 |
| 2500(rpm) | 1000(rpm) | 15.91586932\* | .132443962 | .000 | 15.50394438 | 16.32779427 |
| 1200(rpm) | 13.49954767\* | .132443962 | .000 | 13.08762272 | 13.91147261 |
| 1400(rpm) | 13.82271627\* | .132443962 | .000 | 13.41079133 | 14.23464122 |
| 1600(rpm) | 9.95793837\* | .132443962 | .000 | 9.54601342 | 10.36986331 |
| 1800(rpm) | 9.06308225\* | .132443962 | .000 | 8.65115730 | 9.47500719 |
| 2200(rpm) | 4.19982765\* | .132443962 | .000 | 3.78790271 | 4.61175260 |
| 3000(rpm) | -8.06076434\* | .132443962 | .000 | -8.47268929 | -7.64883940 |
| 3500(rpm) | -6.69807564\* | .132443962 | .000 | -7.11000059 | -6.28615070 |
| 3000(rpm) | 1000(rpm) | 23.97663367\* | .132443962 | .000 | 23.56470872 | 24.38855861 |
| 1200(rpm) | 21.56031201\* | .132443962 | .000 | 21.14838707 | 21.97223696 |
| 1400(rpm) | 21.88348061\* | .132443962 | .000 | 21.47155567 | 22.29540556 |
| 1600(rpm) | 18.01870271\* | .132443962 | .000 | 17.60677777 | 18.43062766 |
| 1800(rpm) | 17.12384659\* | .132443962 | .000 | 16.71192164 | 17.53577153 |
| 2200(rpm) | 12.26059199\* | .132443962 | .000 | 11.84866705 | 12.67251694 |
| 2500(rpm) | 8.06076434\* | .132443962 | .000 | 7.64883940 | 8.47268929 |
| 3500(rpm) | 1.36268870\* | .132443962 | .000 | .95076376 | 1.77461365 |
| 3500(rpm) | 1000(rpm) | 22.61394496\* | .132443962 | .000 | 22.20202002 | 23.02586991 |
| 1200(rpm) | 20.19762331\* | .132443962 | .000 | 19.78569836 | 20.60954826 |
| 1400(rpm) | 20.52079191\* | .132443962 | .000 | 20.10886697 | 20.93271686 |
| 1600(rpm) | 16.65601401\* | .132443962 | .000 | 16.24408906 | 17.06793895 |
| 1800(rpm) | 15.76115789\* | .132443962 | .000 | 15.34923294 | 16.17308283 |
| 2200(rpm) | 10.89790329\* | .132443962 | .000 | 10.48597835 | 11.30982824 |
| 2500(rpm) | 6.69807564\* | .132443962 | .000 | 6.28615070 | 7.11000059 |
| 3000(rpm) | -1.36268870\* | .132443962 | .000 | -1.77461365 | -.95076376 |
| Dunnett t (2-sided)b | 1200(rpm) | 1000(rpm) | 2.41632165\* | .132443962 | .000 | 2.06428132 | 2.76836199 |
| 1400(rpm) | 1000(rpm) | 2.09315305\* | .132443962 | .000 | 1.74111272 | 2.44519338 |
| 1600(rpm) | 1000(rpm) | 5.95793096\* | .132443962 | .000 | 5.60589062 | 6.30997129 |
| 1800(rpm) | 1000(rpm) | 6.85278708\* | .132443962 | .000 | 6.50074675 | 7.20482741 |
| 2200(rpm) | 1000(rpm) | 11.71604167\* | .132443962 | .000 | 11.36400134 | 12.06808200 |
| 2500(rpm) | 1000(rpm) | 15.91586932\* | .132443962 | .000 | 15.56382899 | 16.26790966 |
| 3000(rpm) | 1000(rpm) | 23.97663367\* | .132443962 | .000 | 23.62459334 | 24.32867400 |
| 3500(rpm) | 1000(rpm) | 22.61394496\* | .132443962 | .000 | 22.26190463 | 22.96598530 |
| Torque | Tukey HSD | 1000(rpm) | 1200(rpm) | -.34333\* | .029129 | .000 | -.43393 | -.25274 |
| 1400(rpm) | -.48778\* | .029129 | .000 | -.57837 | -.39718 |
| 1600(rpm) | -1.12667\* | .029129 | .000 | -1.21726 | -1.03607 |
| 1800(rpm) | -1.18222\* | .029129 | .000 | -1.27282 | -1.09163 |
| 2200(rpm) | -1.94333\* | .029129 | .000 | -2.03393 | -1.85274 |
| 2500(rpm) | -2.36000\* | .029129 | .000 | -2.45060 | -2.26940 |
| 3000(rpm) | -3.02889\* | .029129 | .000 | -3.11948 | -2.93829 |
| 3500(rpm) | -2.54222\* | .029129 | .000 | -2.63282 | -2.45163 |
| 1200(rpm) | 1000(rpm) | .34333\* | .029129 | .000 | .25274 | .43393 |
| 1400(rpm) | -.14444\* | .029129 | .000 | -.23504 | -.05385 |
| 1600(rpm) | -.78333\* | .029129 | .000 | -.87393 | -.69274 |
| 1800(rpm) | -.83889\* | .029129 | .000 | -.92948 | -.74829 |
| 2200(rpm) | -1.60000\* | .029129 | .000 | -1.69060 | -1.50940 |
| 2500(rpm) | -2.01667\* | .029129 | .000 | -2.10726 | -1.92607 |
| 3000(rpm) | -2.68556\* | .029129 | .000 | -2.77615 | -2.59496 |
| 3500(rpm) | -2.19889\* | .029129 | .000 | -2.28948 | -2.10829 |
| 1400(rpm) | 1000(rpm) | .48778\* | .029129 | .000 | .39718 | .57837 |
| 1200(rpm) | .14444\* | .029129 | .000 | .05385 | .23504 |
| 1600(rpm) | -.63889\* | .029129 | .000 | -.72948 | -.54829 |
| 1800(rpm) | -.69444\* | .029129 | .000 | -.78504 | -.60385 |
| 2200(rpm) | -1.45556\* | .029129 | .000 | -1.54615 | -1.36496 |
| 2500(rpm) | -1.87222\* | .029129 | .000 | -1.96282 | -1.78163 |
| 3000(rpm) | -2.54111\* | .029129 | .000 | -2.63171 | -2.45052 |
| 3500(rpm) | -2.05444\* | .029129 | .000 | -2.14504 | -1.96385 |
| 1600(rpm) | 1000(rpm) | 1.12667\* | .029129 | .000 | 1.03607 | 1.21726 |
| 1200(rpm) | .78333\* | .029129 | .000 | .69274 | .87393 |
| 1400(rpm) | .63889\* | .029129 | .000 | .54829 | .72948 |
| 1800(rpm) | -.05556 | .029129 | .609 | -.14615 | .03504 |
| 2200(rpm) | -.81667\* | .029129 | .000 | -.90726 | -.72607 |
| 2500(rpm) | -1.23333\* | .029129 | .000 | -1.32393 | -1.14274 |
| 3000(rpm) | -1.90222\* | .029129 | .000 | -1.99282 | -1.81163 |
| 3500(rpm) | -1.41556\* | .029129 | .000 | -1.50615 | -1.32496 |
| 1800(rpm) | 1000(rpm) | 1.18222\* | .029129 | .000 | 1.09163 | 1.27282 |
| 1200(rpm) | .83889\* | .029129 | .000 | .74829 | .92948 |
| 1400(rpm) | .69444\* | .029129 | .000 | .60385 | .78504 |
| 1600(rpm) | .05556 | .029129 | .609 | -.03504 | .14615 |
| 2200(rpm) | -.76111\* | .029129 | .000 | -.85171 | -.67052 |
| 2500(rpm) | -1.17778\* | .029129 | .000 | -1.26837 | -1.08718 |
| 3000(rpm) | -1.84667\* | .029129 | .000 | -1.93726 | -1.75607 |
| 3500(rpm) | -1.36000\* | .029129 | .000 | -1.45060 | -1.26940 |
| 2200(rpm) | 1000(rpm) | 1.94333\* | .029129 | .000 | 1.85274 | 2.03393 |
| 1200(rpm) | 1.60000\* | .029129 | .000 | 1.50940 | 1.69060 |
| 1400(rpm) | 1.45556\* | .029129 | .000 | 1.36496 | 1.54615 |
| 1600(rpm) | .81667\* | .029129 | .000 | .72607 | .90726 |
| 1800(rpm) | .76111\* | .029129 | .000 | .67052 | .85171 |
| 2500(rpm) | -.41667\* | .029129 | .000 | -.50726 | -.32607 |
| 3000(rpm) | -1.08556\* | .029129 | .000 | -1.17615 | -.99496 |
| 3500(rpm) | -.59889\* | .029129 | .000 | -.68948 | -.50829 |
| 2500(rpm) | 1000(rpm) | 2.36000\* | .029129 | .000 | 2.26940 | 2.45060 |
| 1200(rpm) | 2.01667\* | .029129 | .000 | 1.92607 | 2.10726 |
| 1400(rpm) | 1.87222\* | .029129 | .000 | 1.78163 | 1.96282 |
| 1600(rpm) | 1.23333\* | .029129 | .000 | 1.14274 | 1.32393 |
| 1800(rpm) | 1.17778\* | .029129 | .000 | 1.08718 | 1.26837 |
| 2200(rpm) | .41667\* | .029129 | .000 | .32607 | .50726 |
| 3000(rpm) | -.66889\* | .029129 | .000 | -.75948 | -.57829 |
| 3500(rpm) | -.18222\* | .029129 | .000 | -.27282 | -.09163 |
| 3000(rpm) | 1000(rpm) | 3.02889\* | .029129 | .000 | 2.93829 | 3.11948 |
| 1200(rpm) | 2.68556\* | .029129 | .000 | 2.59496 | 2.77615 |
| 1400(rpm) | 2.54111\* | .029129 | .000 | 2.45052 | 2.63171 |
| 1600(rpm) | 1.90222\* | .029129 | .000 | 1.81163 | 1.99282 |
| 1800(rpm) | 1.84667\* | .029129 | .000 | 1.75607 | 1.93726 |
| 2200(rpm) | 1.08556\* | .029129 | .000 | .99496 | 1.17615 |
| 2500(rpm) | .66889\* | .029129 | .000 | .57829 | .75948 |
| 3500(rpm) | .48667\* | .029129 | .000 | .39607 | .57726 |
| 3500(rpm) | 1000(rpm) | 2.54222\* | .029129 | .000 | 2.45163 | 2.63282 |
| 1200(rpm) | 2.19889\* | .029129 | .000 | 2.10829 | 2.28948 |
| 1400(rpm) | 2.05444\* | .029129 | .000 | 1.96385 | 2.14504 |
| 1600(rpm) | 1.41556\* | .029129 | .000 | 1.32496 | 1.50615 |
| 1800(rpm) | 1.36000\* | .029129 | .000 | 1.26940 | 1.45060 |
| 2200(rpm) | .59889\* | .029129 | .000 | .50829 | .68948 |
| 2500(rpm) | .18222\* | .029129 | .000 | .09163 | .27282 |
| 3000(rpm) | -.48667\* | .029129 | .000 | -.57726 | -.39607 |
| Dunnett t (2-sided)b | 1200(rpm) | 1000(rpm) | .34333\* | .029129 | .000 | .26591 | .42076 |
| 1400(rpm) | 1000(rpm) | .48778\* | .029129 | .000 | .41035 | .56520 |
| 1600(rpm) | 1000(rpm) | 1.12667\* | .029129 | .000 | 1.04924 | 1.20409 |
| 1800(rpm) | 1000(rpm) | 1.18222\* | .029129 | .000 | 1.10480 | 1.25965 |
| 2200(rpm) | 1000(rpm) | 1.94333\* | .029129 | .000 | 1.86591 | 2.02076 |
| 2500(rpm) | 1000(rpm) | 2.36000\* | .029129 | .000 | 2.28257 | 2.43743 |
| 3000(rpm) | 1000(rpm) | 3.02889\* | .029129 | .000 | 2.95146 | 3.10631 |
| 3500(rpm) | 1000(rpm) | 2.54222\* | .029129 | .000 | 2.46480 | 2.61965 |
| Breake\_Power | Tukey HSD | 1000(rpm) | 1200(rpm) | -.120443333\* | .0066326100 | .000 | -.141071963 | -.099814703 |
| 1400(rpm) | -.226107630\* | .0066326100 | .000 | -.246736260 | -.205478999 |
| 1600(rpm) | -.420678889\* | .0066326100 | .000 | -.441307519 | -.400050259 |
| 1800(rpm) | -.532045333\* | .0066326100 | .000 | -.552673963 | -.511416703 |
| 2200(rpm) | -.911529111\* | .0066326100 | .000 | -.932157741 | -.890900481 |
| 2500(rpm) | -1.197625667\* | .0066326100 | .000 | -1.218254297 | -1.176997037 |
| 3000(rpm) | -1.724608889\* | .0066326100 | .000 | -1.745237519 | -1.703980259 |
| 3500(rpm) | -1.898058926\* | .0066326100 | .000 | -1.918687556 | -1.877430296 |
| 1200(rpm) | 1000(rpm) | .120443333\* | .0066326100 | .000 | .099814703 | .141071963 |
| 1400(rpm) | -.105664296\* | .0066326100 | .000 | -.126292926 | -.085035666 |
| 1600(rpm) | -.300235556\* | .0066326100 | .000 | -.320864186 | -.279606925 |
| 1800(rpm) | -.411602000\* | .0066326100 | .000 | -.432230630 | -.390973370 |
| 2200(rpm) | -.791085778\* | .0066326100 | .000 | -.811714408 | -.770457148 |
| 2500(rpm) | -1.077182333\* | .0066326100 | .000 | -1.097810963 | -1.056553703 |
| 3000(rpm) | -1.604165556\* | .0066326100 | .000 | -1.624794186 | -1.583536925 |
| 3500(rpm) | -1.777615593\* | .0066326100 | .000 | -1.798244223 | -1.756986962 |
| 1400(rpm) | 1000(rpm) | .226107630\* | .0066326100 | .000 | .205478999 | .246736260 |
| 1200(rpm) | .105664296\* | .0066326100 | .000 | .085035666 | .126292926 |
| 1600(rpm) | -.194571259\* | .0066326100 | .000 | -.215199889 | -.173942629 |
| 1800(rpm) | -.305937704\* | .0066326100 | .000 | -.326566334 | -.285309074 |
| 2200(rpm) | -.685421481\* | .0066326100 | .000 | -.706050112 | -.664792851 |
| 2500(rpm) | -.971518037\* | .0066326100 | .000 | -.992146667 | -.950889407 |
| 3000(rpm) | -1.498501259\* | .0066326100 | .000 | -1.519129889 | -1.477872629 |
| 3500(rpm) | -1.671951296\* | .0066326100 | .000 | -1.692579926 | -1.651322666 |
| 1600(rpm) | 1000(rpm) | .420678889\* | .0066326100 | .000 | .400050259 | .441307519 |
| 1200(rpm) | .300235556\* | .0066326100 | .000 | .279606925 | .320864186 |
| 1400(rpm) | .194571259\* | .0066326100 | .000 | .173942629 | .215199889 |
| 1800(rpm) | -.111366444\* | .0066326100 | .000 | -.131995075 | -.090737814 |
| 2200(rpm) | -.490850222\* | .0066326100 | .000 | -.511478852 | -.470221592 |
| 2500(rpm) | -.776946778\* | .0066326100 | .000 | -.797575408 | -.756318148 |
| 3000(rpm) | -1.303930000\* | .0066326100 | .000 | -1.324558630 | -1.283301370 |
| 3500(rpm) | -1.477380037\* | .0066326100 | .000 | -1.498008667 | -1.456751407 |
| 1800(rpm) | 1000(rpm) | .532045333\* | .0066326100 | .000 | .511416703 | .552673963 |
| 1200(rpm) | .411602000\* | .0066326100 | .000 | .390973370 | .432230630 |
| 1400(rpm) | .305937704\* | .0066326100 | .000 | .285309074 | .326566334 |
| 1600(rpm) | .111366444\* | .0066326100 | .000 | .090737814 | .131995075 |
| 2200(rpm) | -.379483778\* | .0066326100 | .000 | -.400112408 | -.358855148 |
| 2500(rpm) | -.665580333\* | .0066326100 | .000 | -.686208963 | -.644951703 |
| 3000(rpm) | -1.192563556\* | .0066326100 | .000 | -1.213192186 | -1.171934925 |
| 3500(rpm) | -1.366013593\* | .0066326100 | .000 | -1.386642223 | -1.345384962 |
| 2200(rpm) | 1000(rpm) | .911529111\* | .0066326100 | .000 | .890900481 | .932157741 |
| 1200(rpm) | .791085778\* | .0066326100 | .000 | .770457148 | .811714408 |
| 1400(rpm) | .685421481\* | .0066326100 | .000 | .664792851 | .706050112 |
| 1600(rpm) | .490850222\* | .0066326100 | .000 | .470221592 | .511478852 |
| 1800(rpm) | .379483778\* | .0066326100 | .000 | .358855148 | .400112408 |
| 2500(rpm) | -.286096556\* | .0066326100 | .000 | -.306725186 | -.265467925 |
| 3000(rpm) | -.813079778\* | .0066326100 | .000 | -.833708408 | -.792451148 |
| 3500(rpm) | -.986529815\* | .0066326100 | .000 | -1.007158445 | -.965901185 |
| 2500(rpm) | 1000(rpm) | 1.197625667\* | .0066326100 | .000 | 1.176997037 | 1.218254297 |
| 1200(rpm) | 1.077182333\* | .0066326100 | .000 | 1.056553703 | 1.097810963 |
| 1400(rpm) | .971518037\* | .0066326100 | .000 | .950889407 | .992146667 |
| 1600(rpm) | .776946778\* | .0066326100 | .000 | .756318148 | .797575408 |
| 1800(rpm) | .665580333\* | .0066326100 | .000 | .644951703 | .686208963 |
| 2200(rpm) | .286096556\* | .0066326100 | .000 | .265467925 | .306725186 |
| 3000(rpm) | -.526983222\* | .0066326100 | .000 | -.547611852 | -.506354592 |
| 3500(rpm) | -.700433259\* | .0066326100 | .000 | -.721061889 | -.679804629 |
| 3000(rpm) | 1000(rpm) | 1.724608889\* | .0066326100 | .000 | 1.703980259 | 1.745237519 |
| 1200(rpm) | 1.604165556\* | .0066326100 | .000 | 1.583536925 | 1.624794186 |
| 1400(rpm) | 1.498501259\* | .0066326100 | .000 | 1.477872629 | 1.519129889 |
| 1600(rpm) | 1.303930000\* | .0066326100 | .000 | 1.283301370 | 1.324558630 |
| 1800(rpm) | 1.192563556\* | .0066326100 | .000 | 1.171934925 | 1.213192186 |
| 2200(rpm) | .813079778\* | .0066326100 | .000 | .792451148 | .833708408 |
| 2500(rpm) | .526983222\* | .0066326100 | .000 | .506354592 | .547611852 |
| 3500(rpm) | -.173450037\* | .0066326100 | .000 | -.194078667 | -.152821407 |
| 3500(rpm) | 1000(rpm) | 1.898058926\* | .0066326100 | .000 | 1.877430296 | 1.918687556 |
| 1200(rpm) | 1.777615593\* | .0066326100 | .000 | 1.756986962 | 1.798244223 |
| 1400(rpm) | 1.671951296\* | .0066326100 | .000 | 1.651322666 | 1.692579926 |
| 1600(rpm) | 1.477380037\* | .0066326100 | .000 | 1.456751407 | 1.498008667 |
| 1800(rpm) | 1.366013593\* | .0066326100 | .000 | 1.345384962 | 1.386642223 |
| 2200(rpm) | .986529815\* | .0066326100 | .000 | .965901185 | 1.007158445 |
| 2500(rpm) | .700433259\* | .0066326100 | .000 | .679804629 | .721061889 |
| 3000(rpm) | .173450037\* | .0066326100 | .000 | .152821407 | .194078667 |
| Dunnett t (2-sided)b | 1200(rpm) | 1000(rpm) | .120443333\* | .0066326100 | .000 | .102813642 | .138073025 |
| 1400(rpm) | 1000(rpm) | .226107630\* | .0066326100 | .000 | .208477938 | .243737321 |
| 1600(rpm) | 1000(rpm) | .420678889\* | .0066326100 | .000 | .403049197 | .438308581 |
| 1800(rpm) | 1000(rpm) | .532045333\* | .0066326100 | .000 | .514415642 | .549675025 |
| 2200(rpm) | 1000(rpm) | .911529111\* | .0066326100 | .000 | .893899419 | .929158803 |
| 2500(rpm) | 1000(rpm) | 1.197625667\* | .0066326100 | .000 | 1.179995975 | 1.215255358 |
| 3000(rpm) | 1000(rpm) | 1.724608889\* | .0066326100 | .000 | 1.706979197 | 1.742238581 |
| 3500(rpm) | 1000(rpm) | 1.898058926\* | .0066326100 | .000 | 1.880429234 | 1.915688618 |
| Based on observed means.  The error term is Mean Square(Error) = .000. | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Dunnett t-tests treat one group as a control, and compare all other groups against it. | | | | | | | | |

Table Post hoc test for fuel level

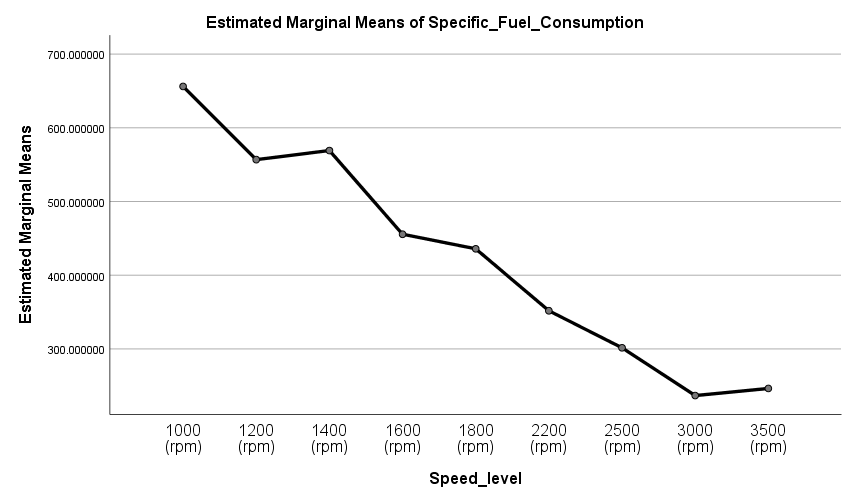
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Multiple Comparisons** | | | | | | | | |
| Dependent Variable | | (I) Fuel\_level | (J) Fuel\_level | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
| Lower Bound | Upper Bound |
| Specific\_Fuel\_Consumption | Tukey HSD | Ao | B1 | -11.9376791\* | 3.116196452 | .004 | -21.6296200 | -2.24573822 |
| B2 | -7.49230523 | 3.116196452 | .283 | -17.1842461 | 2.19963569 |
| B3 | 2.20783014 | 3.116196452 | .999 | -7.48411079 | 11.89977106 |
| B4 | 23.07869410\* | 3.116196452 | .000 | 13.38675318 | 32.77063502 |
| A1 | -19.5195990\* | 3.116196452 | .000 | -29.2115399 | -9.82765815 |
| A2 | -12.5226869\* | 3.116196452 | .002 | -22.2146278 | -2.83074604 |
| A3 | -4.08834562 | 3.116196452 | .928 | -13.7802865 | 5.60359530 |
| A4 | 6.70918488 | 3.116196452 | .438 | -2.98275604 | 16.40112581 |
| B1 | Ao | 11.93767914\* | 3.116196452 | .004 | 2.24573822 | 21.62962007 |
| B2 | 4.44537391 | 3.116196452 | .888 | -5.24656702 | 14.13731483 |
| B3 | 14.14550928\* | 3.116196452 | .000 | 4.45356836 | 23.83745020 |
| B4 | 35.01637324\* | 3.116196452 | .000 | 25.32443232 | 44.70831417 |
| A1 | -7.58191993 | 3.116196452 | .267 | -17.2738608 | 2.11002100 |
| A2 | -.58500783 | 3.116196452 | 1.000 | -10.2769487 | 9.10693310 |
| A3 | 7.84933352 | 3.116196452 | .224 | -1.84260740 | 17.54127445 |
| A4 | 18.64686403\* | 3.116196452 | .000 | 8.95492310 | 28.33880495 |
| B2 | Ao | 7.49230523 | 3.116196452 | .283 | -2.19963569 | 17.18424616 |
| B1 | -4.44537391 | 3.116196452 | .888 | -14.1373148 | 5.24656702 |
| B3 | 9.70013537\* | 3.116196452 | .050 | .00819445 | 19.39207630 |
| B4 | 30.57099933\* | 3.116196452 | .000 | 20.87905841 | 40.26294026 |
| A1 | -12.0272938\* | 3.116196452 | .004 | -21.7192347 | -2.33535291 |
| A2 | -5.03038173 | 3.116196452 | .797 | -14.7223226 | 4.66155919 |
| A3 | 3.40395961 | 3.116196452 | .975 | -6.28798131 | 13.09590054 |
| A4 | 14.20149012\* | 3.116196452 | .000 | 4.50954920 | 23.89343104 |
| B3 | Ao | -2.20783014 | 3.116196452 | .999 | -11.8997710 | 7.48411079 |
| B1 | -14.1455092\* | 3.116196452 | .000 | -23.8374502 | -4.45356836 |
| B2 | -9.70013537\* | 3.116196452 | .050 | -19.3920763 | -.00819445 |
| B4 | 20.87086396\* | 3.116196452 | .000 | 11.17892304 | 30.56280489 |
| A1 | -21.7274292\* | 3.116196452 | .000 | -31.4193701 | -12.0354882 |
| A2 | -14.7305171\* | 3.116196452 | .000 | -24.4224580 | -5.03857618 |
| A3 | -6.29617576 | 3.116196452 | .529 | -15.9881166 | 3.39576517 |
| A4 | 4.50135475 | 3.116196452 | .880 | -5.19058618 | 14.19329567 |
| B4 | Ao | -23.0786941\* | 3.116196452 | .000 | -32.7706350 | -13.3867531 |
| B1 | -35.0163732\* | 3.116196452 | .000 | -44.7083141 | -25.3244323 |
| B2 | -30.5709993\* | 3.116196452 | .000 | -40.2629402 | -20.8790584 |
| B3 | -20.8708639\* | 3.116196452 | .000 | -30.5628048 | -11.1789230 |
| A1 | -42.5982931\* | 3.116196452 | .000 | -52.2902340 | -32.9063522 |
| A2 | -35.6013810\* | 3.116196452 | .000 | -45.2933219 | -25.9094401 |
| A3 | -27.1670397\* | 3.116196452 | .000 | -36.8589806 | -17.4750988 |
| A4 | -16.3695092\* | 3.116196452 | .000 | -26.0614501 | -6.67756829 |
| A1 | Ao | 19.51959907\* | 3.116196452 | .000 | 9.82765815 | 29.21153999 |
| B1 | 7.58191993 | 3.116196452 | .267 | -2.11002100 | 17.27386085 |
| B2 | 12.02729384\* | 3.116196452 | .004 | 2.33535291 | 21.71923476 |
| B3 | 21.72742921\* | 3.116196452 | .000 | 12.03548828 | 31.41937013 |
| B4 | 42.59829317\* | 3.116196452 | .000 | 32.90635225 | 52.29023409 |
| A2 | 6.99691210 | 3.116196452 | .377 | -2.69502882 | 16.68885303 |
| A3 | 15.43125345\* | 3.116196452 | .000 | 5.73931253 | 25.12319437 |
| A4 | 26.22878396\* | 3.116196452 | .000 | 16.53684303 | 35.92072488 |
| A2 | Ao | 12.52268697\* | 3.116196452 | .002 | 2.83074604 | 22.21462789 |
| B1 | .58500783 | 3.116196452 | 1.000 | -9.10693310 | 10.27694875 |
| B2 | 5.03038173 | 3.116196452 | .797 | -4.66155919 | 14.72232266 |
| B3 | 14.73051711\* | 3.116196452 | .000 | 5.03857618 | 24.42245803 |
| B4 | 35.60138107\* | 3.116196452 | .000 | 25.90944014 | 45.29332199 |
| A1 | -6.99691210 | 3.116196452 | .377 | -16.6888530 | 2.69502882 |
| A3 | 8.43434135 | 3.116196452 | .147 | -1.25759958 | 18.12628227 |
| A4 | 19.23187185\* | 3.116196452 | .000 | 9.53993093 | 28.92381278 |
| A3 | Ao | 4.08834562 | 3.116196452 | .928 | -5.60359530 | 13.78028654 |
| B1 | -7.84933352 | 3.116196452 | .224 | -17.5412744 | 1.84260740 |
| B2 | -3.40395961 | 3.116196452 | .975 | -13.0959005 | 6.28798131 |
| B3 | 6.29617576 | 3.116196452 | .529 | -3.39576517 | 15.98811668 |
| B4 | 27.16703972\* | 3.116196452 | .000 | 17.47509880 | 36.85898064 |
| A1 | -15.4312534\* | 3.116196452 | .000 | -25.1231943 | -5.73931253 |
| A2 | -8.43434135 | 3.116196452 | .147 | -18.1262822 | 1.25759958 |
| A4 | 10.79753051\* | 3.116196452 | .016 | 1.10558958 | 20.48947143 |
| A4 | Ao | -6.70918488 | 3.116196452 | .438 | -16.4011258 | 2.98275604 |
| B1 | -18.6468640\* | 3.116196452 | .000 | -28.3388049 | -8.95492310 |
| B2 | -14.2014901\* | 3.116196452 | .000 | -23.8934310 | -4.50954920 |
| B3 | -4.50135475 | 3.116196452 | .880 | -14.1932956 | 5.19058618 |
| B4 | 16.36950922\* | 3.116196452 | .000 | 6.67756829 | 26.06145014 |
| A1 | -26.2287839\* | 3.116196452 | .000 | -35.9207248 | -16.5368430 |
| A2 | -19.2318718\* | 3.116196452 | .000 | -28.9238127 | -9.53993093 |
| A3 | -10.7975305\* | 3.116196452 | .016 | -20.4894714 | -1.10558958 |
| Dunnett t (2-sided)b | B1 | Ao | 11.93767914\* | 3.116196452 | .001 | 3.65472825 | 20.22063003 |
| B2 | Ao | 7.49230523 | 3.116196452 | .096 | -.79064566 | 15.77525613 |
| B3 | Ao | -2.20783014 | 3.116196452 | .981 | -10.4907810 | 6.07512075 |
| B4 | Ao | -23.0786941\* | 3.116196452 | .000 | -31.3616449 | -14.7957432 |
| A1 | Ao | 19.51959907\* | 3.116196452 | .000 | 11.23664818 | 27.80254996 |
| A2 | Ao | 12.52268697\* | 3.116196452 | .000 | 4.23973608 | 20.80563786 |
| A3 | Ao | 4.08834562 | 3.116196452 | .681 | -4.19460527 | 12.37129651 |
| A4 | Ao | -6.70918488 | 3.116196452 | .170 | -14.9921357 | 1.57376601 |
| Brake\_Thermal\_Efficiency | Tukey HSD | Ao | B1 | -1.62659387\* | .132443962 | .000 | -2.03851881 | -1.21466892 |
| B2 | -1.90593385\* | .132443962 | .000 | -2.31785879 | -1.49400890 |
| B3 | -2.44673655\* | .132443962 | .000 | -2.85866149 | -2.03481160 |
| B4 | -3.74165830\* | .132443962 | .000 | -4.15358325 | -3.32973336 |
| A1 | -1.55766186\* | .132443962 | .000 | -1.96958680 | -1.14573691 |
| A2 | -2.03686334\* | .132443962 | .000 | -2.44878829 | -1.62493840 |
| A3 | -2.47272778\* | .132443962 | .000 | -2.88465272 | -2.06080283 |
| A4 | -2.99300819\* | .132443962 | .000 | -3.40493313 | -2.58108324 |
| B1 | Ao | 1.62659387\* | .132443962 | .000 | 1.21466892 | 2.03851881 |
| B2 | -.27933998 | .132443962 | .468 | -.69126493 | .13258496 |
| B3 | -.82014268\* | .132443962 | .000 | -1.23206762 | -.40821773 |
| B4 | -2.11506444\* | .132443962 | .000 | -2.52698938 | -1.70313949 |
| A1 | .06893201 | .132443962 | 1.000 | -.34299294 | .48085695 |
| A2 | -.41026947 | .132443962 | .052 | -.82219442 | .00165547 |
| A3 | -.84613391\* | .132443962 | .000 | -1.25805886 | -.43420897 |
| A4 | -1.36641432\* | .132443962 | .000 | -1.77833926 | -.95448937 |
| B2 | Ao | 1.90593385\* | .132443962 | .000 | 1.49400890 | 2.31785879 |
| B1 | .27933998 | .132443962 | .468 | -.13258496 | .69126493 |
| B3 | -.54080270\* | .132443962 | .002 | -.95272764 | -.12887775 |
| B4 | -1.83572445\* | .132443962 | .000 | -2.24764940 | -1.42379951 |
| A1 | .34827199 | .132443962 | .176 | -.06365296 | .76019693 |
| A2 | -.13092949 | .132443962 | .987 | -.54285444 | .28099545 |
| A3 | -.56679393\* | .132443962 | .001 | -.97871887 | -.15486898 |
| A4 | -1.08707434\* | .132443962 | .000 | -1.49899928 | -.67514939 |
| B3 | Ao | 2.44673655\* | .132443962 | .000 | 2.03481160 | 2.85866149 |
| B1 | .82014268\* | .132443962 | .000 | .40821773 | 1.23206762 |
| B2 | .54080270\* | .132443962 | .002 | .12887775 | .95272764 |
| B4 | -1.29492176\* | .132443962 | .000 | -1.70684670 | -.88299681 |
| A1 | .88907469\* | .132443962 | .000 | .47714974 | 1.30099963 |
| A2 | .40987320 | .132443962 | .052 | -.00205174 | .82179815 |
| A3 | -.02599123 | .132443962 | 1.000 | -.43791618 | .38593371 |
| A4 | -.54627164\* | .132443962 | .001 | -.95819659 | -.13434670 |
| B4 | Ao | 3.74165830\* | .132443962 | .000 | 3.32973336 | 4.15358325 |
| B1 | 2.11506444\* | .132443962 | .000 | 1.70313949 | 2.52698938 |
| B2 | 1.83572445\* | .132443962 | .000 | 1.42379951 | 2.24764940 |
| B3 | 1.29492176\* | .132443962 | .000 | .88299681 | 1.70684670 |
| A1 | 2.18399644\* | .132443962 | .000 | 1.77207150 | 2.59592139 |
| A2 | 1.70479496\* | .132443962 | .000 | 1.29287002 | 2.11671991 |
| A3 | 1.26893053\* | .132443962 | .000 | .85700558 | 1.68085547 |
| A4 | .74865012\* | .132443962 | .000 | .33672517 | 1.16057506 |
| A1 | Ao | 1.55766186\* | .132443962 | .000 | 1.14573691 | 1.96958680 |
| B1 | -.06893201 | .132443962 | 1.000 | -.48085695 | .34299294 |
| B2 | -.34827199 | .132443962 | .176 | -.76019693 | .06365296 |
| B3 | -.88907469\* | .132443962 | .000 | -1.30099963 | -.47714974 |
| B4 | -2.18399644\* | .132443962 | .000 | -2.59592139 | -1.77207150 |
| A2 | -.47920148\* | .132443962 | .010 | -.89112643 | -.06727654 |
| A3 | -.91506592\* | .132443962 | .000 | -1.32699086 | -.50314097 |
| A4 | -1.43534633\* | .132443962 | .000 | -1.84727127 | -1.02342138 |
| A2 | Ao | 2.03686334\* | .132443962 | .000 | 1.62493840 | 2.44878829 |
| B1 | .41026947 | .132443962 | .052 | -.00165547 | .82219442 |
| B2 | .13092949 | .132443962 | .987 | -.28099545 | .54285444 |
| B3 | -.40987320 | .132443962 | .052 | -.82179815 | .00205174 |
| B4 | -1.70479496\* | .132443962 | .000 | -2.11671991 | -1.29287002 |
| A1 | .47920148\* | .132443962 | .010 | .06727654 | .89112643 |
| A3 | -.43586444\* | .132443962 | .029 | -.84778938 | -.02393949 |
| A4 | -.95614485\* | .132443962 | .000 | -1.36806979 | -.54421990 |
| A3 | Ao | 2.47272778\* | .132443962 | .000 | 2.06080283 | 2.88465272 |
| B1 | .84613391\* | .132443962 | .000 | .43420897 | 1.25805886 |
| B2 | .56679393\* | .132443962 | .001 | .15486898 | .97871887 |
| B3 | .02599123 | .132443962 | 1.000 | -.38593371 | .43791618 |
| B4 | -1.26893053\* | .132443962 | .000 | -1.68085547 | -.85700558 |
| A1 | .91506592\* | .132443962 | .000 | .50314097 | 1.32699086 |
| A2 | .43586444\* | .132443962 | .029 | .02393949 | .84778938 |
| A4 | -.52028041\* | .132443962 | .003 | -.93220535 | -.10835546 |
| A4 | Ao | 2.99300819\* | .132443962 | .000 | 2.58108324 | 3.40493313 |
| B1 | 1.36641432\* | .132443962 | .000 | .95448937 | 1.77833926 |
| B2 | 1.08707434\* | .132443962 | .000 | .67514939 | 1.49899928 |
| B3 | .54627164\* | .132443962 | .001 | .13434670 | .95819659 |
| B4 | -.74865012\* | .132443962 | .000 | -1.16057506 | -.33672517 |
| A1 | 1.43534633\* | .132443962 | .000 | 1.02342138 | 1.84727127 |
| A2 | .95614485\* | .132443962 | .000 | .54421990 | 1.36806979 |
| A3 | .52028041\* | .132443962 | .003 | .10835546 | .93220535 |
| Dunnett t (2-sided)b | B1 | Ao | 1.62659387\* | .132443962 | .000 | 1.27455354 | 1.97863420 |
| B2 | Ao | 1.90593385\* | .132443962 | .000 | 1.55389352 | 2.25797418 |
| B3 | Ao | 2.44673655\* | .132443962 | .000 | 2.09469621 | 2.79877688 |
| B4 | Ao | 3.74165830\* | .132443962 | .000 | 3.38961797 | 4.09369863 |
| A1 | Ao | 1.55766186\* | .132443962 | .000 | 1.20562153 | 1.90970219 |
| A2 | Ao | 2.03686334\* | .132443962 | .000 | 1.68482301 | 2.38890367 |
| A3 | Ao | 2.47272778\* | .132443962 | .000 | 2.12068745 | 2.82476811 |
| A4 | Ao | 2.99300819\* | .132443962 | .000 | 2.64096786 | 3.34504852 |
| Torque | Tukey HSD | Ao | B1 | -.00556 | .029129 | 1.000 | -.09615 | .08504 |
| B2 | -.00444 | .029129 | 1.000 | -.09504 | .08615 |
| B3 | -.11889\* | .029129 | .002 | -.20948 | -.02829 |
| B4 | -.20111\* | .029129 | .000 | -.29171 | -.11052 |
| A1 | -.00556 | .029129 | 1.000 | -.09615 | .08504 |
| A2 | -.00889 | .029129 | 1.000 | -.09948 | .08171 |
| A3 | -.05556 | .029129 | .609 | -.14615 | .03504 |
| A4 | -.12444\* | .029129 | .001 | -.21504 | -.03385 |
| B1 | Ao | .00556 | .029129 | 1.000 | -.08504 | .09615 |
| B2 | .00111 | .029129 | 1.000 | -.08948 | .09171 |
| B3 | -.11333\* | .029129 | .003 | -.20393 | -.02274 |
| B4 | -.19556\* | .029129 | .000 | -.28615 | -.10496 |
| A1 | .00000 | .029129 | 1.000 | -.09060 | .09060 |
| A2 | -.00333 | .029129 | 1.000 | -.09393 | .08726 |
| A3 | -.05000 | .029129 | .736 | -.14060 | .04060 |
| A4 | -.11889\* | .029129 | .002 | -.20948 | -.02829 |
| B2 | Ao | .00444 | .029129 | 1.000 | -.08615 | .09504 |
| B1 | -.00111 | .029129 | 1.000 | -.09171 | .08948 |
| B3 | -.11444\* | .029129 | .003 | -.20504 | -.02385 |
| B4 | -.19667\* | .029129 | .000 | -.28726 | -.10607 |
| A1 | -.00111 | .029129 | 1.000 | -.09171 | .08948 |
| A2 | -.00444 | .029129 | 1.000 | -.09504 | .08615 |
| A3 | -.05111 | .029129 | .712 | -.14171 | .03948 |
| A4 | -.12000\* | .029129 | .001 | -.21060 | -.02940 |
| B3 | Ao | .11889\* | .029129 | .002 | .02829 | .20948 |
| B1 | .11333\* | .029129 | .003 | .02274 | .20393 |
| B2 | .11444\* | .029129 | .003 | .02385 | .20504 |
| B4 | -.08222 | .029129 | .110 | -.17282 | .00837 |
| A1 | .11333\* | .029129 | .003 | .02274 | .20393 |
| A2 | .11000\* | .029129 | .005 | .01940 | .20060 |
| A3 | .06333 | .029129 | .424 | -.02726 | .15393 |
| A4 | -.00556 | .029129 | 1.000 | -.09615 | .08504 |
| B4 | Ao | .20111\* | .029129 | .000 | .11052 | .29171 |
| B1 | .19556\* | .029129 | .000 | .10496 | .28615 |
| B2 | .19667\* | .029129 | .000 | .10607 | .28726 |
| B3 | .08222 | .029129 | .110 | -.00837 | .17282 |
| A1 | .19556\* | .029129 | .000 | .10496 | .28615 |
| A2 | .19222\* | .029129 | .000 | .10163 | .28282 |
| A3 | .14556\* | .029129 | .000 | .05496 | .23615 |
| A4 | .07667 | .029129 | .175 | -.01393 | .16726 |
| A1 | Ao | .00556 | .029129 | 1.000 | -.08504 | .09615 |
| B1 | .00000 | .029129 | 1.000 | -.09060 | .09060 |
| B2 | .00111 | .029129 | 1.000 | -.08948 | .09171 |
| B3 | -.11333\* | .029129 | .003 | -.20393 | -.02274 |
| B4 | -.19556\* | .029129 | .000 | -.28615 | -.10496 |
| A2 | -.00333 | .029129 | 1.000 | -.09393 | .08726 |
| A3 | -.05000 | .029129 | .736 | -.14060 | .04060 |
| A4 | -.11889\* | .029129 | .002 | -.20948 | -.02829 |
| A2 | Ao | .00889 | .029129 | 1.000 | -.08171 | .09948 |
| B1 | .00333 | .029129 | 1.000 | -.08726 | .09393 |
| B2 | .00444 | .029129 | 1.000 | -.08615 | .09504 |
| B3 | -.11000\* | .029129 | .005 | -.20060 | -.01940 |
| B4 | -.19222\* | .029129 | .000 | -.28282 | -.10163 |
| A1 | .00333 | .029129 | 1.000 | -.08726 | .09393 |
| A3 | -.04667 | .029129 | .804 | -.13726 | .04393 |
| A4 | -.11556\* | .029129 | .003 | -.20615 | -.02496 |
| A3 | Ao | .05556 | .029129 | .609 | -.03504 | .14615 |
| B1 | .05000 | .029129 | .736 | -.04060 | .14060 |
| B2 | .05111 | .029129 | .712 | -.03948 | .14171 |
| B3 | -.06333 | .029129 | .424 | -.15393 | .02726 |
| B4 | -.14556\* | .029129 | .000 | -.23615 | -.05496 |
| A1 | .05000 | .029129 | .736 | -.04060 | .14060 |
| A2 | .04667 | .029129 | .804 | -.04393 | .13726 |
| A4 | -.06889 | .029129 | .305 | -.15948 | .02171 |
| A4 | Ao | .12444\* | .029129 | .001 | .03385 | .21504 |
| B1 | .11889\* | .029129 | .002 | .02829 | .20948 |
| B2 | .12000\* | .029129 | .001 | .02940 | .21060 |
| B3 | .00556 | .029129 | 1.000 | -.08504 | .09615 |
| B4 | -.07667 | .029129 | .175 | -.16726 | .01393 |
| A1 | .11889\* | .029129 | .002 | .02829 | .20948 |
| A2 | .11556\* | .029129 | .003 | .02496 | .20615 |
| A3 | .06889 | .029129 | .305 | -.02171 | .15948 |
| Dunnett t (2-sided)b | B1 | Ao | .00556 | .029129 | 1.000 | -.07187 | .08298 |
| B2 | Ao | .00444 | .029129 | 1.000 | -.07298 | .08187 |
| B3 | Ao | .11889\* | .029129 | .000 | .04146 | .19631 |
| B4 | Ao | .20111\* | .029129 | .000 | .12369 | .27854 |
| A1 | Ao | .00556 | .029129 | 1.000 | -.07187 | .08298 |
| A2 | Ao | .00889 | .029129 | 1.000 | -.06854 | .08631 |
| A3 | Ao | .05556 | .029129 | .278 | -.02187 | .13298 |
| A4 | Ao | .12444\* | .029129 | .000 | .04702 | .20187 |
| Breake\_Power | Tukey HSD | Ao | B1 | -.005411222 | .0066326100 | .996 | -.026039852 | .015217408 |
| B2 | -.000465481 | .0066326100 | 1.000 | -.021094112 | .020163149 |
| B3 | -.028045259\* | .0066326100 | .001 | -.048673889 | -.007416629 |
| B4 | -.043697074\* | .0066326100 | .000 | -.064325704 | -.023068444 |
| A1 | -.011404296 | .0066326100 | .735 | -.032032926 | .009224334 |
| A2 | -.013091667 | .0066326100 | .562 | -.033720297 | .007536963 |
| A3 | -.022750407\* | .0066326100 | .018 | -.043379038 | -.002121777 |
| A4 | -.034678370\* | .0066326100 | .000 | -.055307001 | -.014049740 |
| B1 | Ao | .005411222 | .0066326100 | .996 | -.015217408 | .026039852 |
| B2 | .004945741 | .0066326100 | .998 | -.015682889 | .025574371 |
| B3 | -.022634037\* | .0066326100 | .019 | -.043262667 | -.002005407 |
| B4 | -.038285852\* | .0066326100 | .000 | -.058914482 | -.017657222 |
| A1 | -.005993074 | .0066326100 | .993 | -.026621704 | .014635556 |
| A2 | -.007680444 | .0066326100 | .965 | -.028309075 | .012948186 |
| A3 | -.017339185 | .0066326100 | .182 | -.037967815 | .003289445 |
| A4 | -.029267148\* | .0066326100 | .000 | -.049895778 | -.008638518 |
| B2 | Ao | .000465481 | .0066326100 | 1.000 | -.020163149 | .021094112 |
| B1 | -.004945741 | .0066326100 | .998 | -.025574371 | .015682889 |
| B3 | -.027579778\* | .0066326100 | .001 | -.048208408 | -.006951148 |
| B4 | -.043231593\* | .0066326100 | .000 | -.063860223 | -.022602962 |
| A1 | -.010938815 | .0066326100 | .777 | -.031567445 | .009689815 |
| A2 | -.012626185 | .0066326100 | .611 | -.033254815 | .008002445 |
| A3 | -.022284926\* | .0066326100 | .023 | -.042913556 | -.001656296 |
| A4 | -.034212889\* | .0066326100 | .000 | -.054841519 | -.013584259 |
| B3 | Ao | .028045259\* | .0066326100 | .001 | .007416629 | .048673889 |
| B1 | .022634037\* | .0066326100 | .019 | .002005407 | .043262667 |
| B2 | .027579778\* | .0066326100 | .001 | .006951148 | .048208408 |
| B4 | -.015651815 | .0066326100 | .308 | -.036280445 | .004976815 |
| A1 | .016640963 | .0066326100 | .229 | -.003987667 | .037269593 |
| A2 | .014953593 | .0066326100 | .371 | -.005675038 | .035582223 |
| A3 | .005294852 | .0066326100 | .997 | -.015333778 | .025923482 |
| A4 | -.006633111 | .0066326100 | .986 | -.027261741 | .013995519 |
| B4 | Ao | .043697074\* | .0066326100 | .000 | .023068444 | .064325704 |
| B1 | .038285852\* | .0066326100 | .000 | .017657222 | .058914482 |
| B2 | .043231593\* | .0066326100 | .000 | .022602962 | .063860223 |
| B3 | .015651815 | .0066326100 | .308 | -.004976815 | .036280445 |
| A1 | .032292778\* | .0066326100 | .000 | .011664148 | .052921408 |
| A2 | .030605407\* | .0066326100 | .000 | .009976777 | .051234038 |
| A3 | .020946667\* | .0066326100 | .043 | .000318037 | .041575297 |
| A4 | .009018704 | .0066326100 | .912 | -.011609926 | .029647334 |
| A1 | Ao | .011404296 | .0066326100 | .735 | -.009224334 | .032032926 |
| B1 | .005993074 | .0066326100 | .993 | -.014635556 | .026621704 |
| B2 | .010938815 | .0066326100 | .777 | -.009689815 | .031567445 |
| B3 | -.016640963 | .0066326100 | .229 | -.037269593 | .003987667 |
| B4 | -.032292778\* | .0066326100 | .000 | -.052921408 | -.011664148 |
| A2 | -.001687370 | .0066326100 | 1.000 | -.022316001 | .018941260 |
| A3 | -.011346111 | .0066326100 | .740 | -.031974741 | .009282519 |
| A4 | -.023274074\* | .0066326100 | .014 | -.043902704 | -.002645444 |
| A2 | Ao | .013091667 | .0066326100 | .562 | -.007536963 | .033720297 |
| B1 | .007680444 | .0066326100 | .965 | -.012948186 | .028309075 |
| B2 | .012626185 | .0066326100 | .611 | -.008002445 | .033254815 |
| B3 | -.014953593 | .0066326100 | .371 | -.035582223 | .005675038 |
| B4 | -.030605407\* | .0066326100 | .000 | -.051234038 | -.009976777 |
| A1 | .001687370 | .0066326100 | 1.000 | -.018941260 | .022316001 |
| A3 | -.009658741 | .0066326100 | .875 | -.030287371 | .010969889 |
| A4 | -.021586704\* | .0066326100 | .032 | -.042215334 | -.000958074 |
| A3 | Ao | .022750407\* | .0066326100 | .018 | .002121777 | .043379038 |
| B1 | .017339185 | .0066326100 | .182 | -.003289445 | .037967815 |
| B2 | .022284926\* | .0066326100 | .023 | .001656296 | .042913556 |
| B3 | -.005294852 | .0066326100 | .997 | -.025923482 | .015333778 |
| B4 | -.020946667\* | .0066326100 | .043 | -.041575297 | -.000318037 |
| A1 | .011346111 | .0066326100 | .740 | -.009282519 | .031974741 |
| A2 | .009658741 | .0066326100 | .875 | -.010969889 | .030287371 |
| A4 | -.011927963 | .0066326100 | .683 | -.032556593 | .008700667 |
| A4 | Ao | .034678370\* | .0066326100 | .000 | .014049740 | .055307001 |
| B1 | .029267148\* | .0066326100 | .000 | .008638518 | .049895778 |
| B2 | .034212889\* | .0066326100 | .000 | .013584259 | .054841519 |
| B3 | .006633111 | .0066326100 | .986 | -.013995519 | .027261741 |
| B4 | -.009018704 | .0066326100 | .912 | -.029647334 | .011609926 |
| A1 | .023274074\* | .0066326100 | .014 | .002645444 | .043902704 |
| A2 | .021586704\* | .0066326100 | .032 | .000958074 | .042215334 |
| A3 | .011927963 | .0066326100 | .683 | -.008700667 | .032556593 |
| Dunnett t (2-sided)b | B1 | Ao | .005411222 | .0066326100 | .959 | -.012218469 | .023040914 |
| B2 | Ao | .000465481 | .0066326100 | 1.000 | -.017164210 | .018095173 |
| B3 | Ao | .028045259\* | .0066326100 | .000 | .010415568 | .045674951 |
| B4 | Ao | .043697074\* | .0066326100 | .000 | .026067382 | .061326766 |
| A1 | Ao | .011404296 | .0066326100 | .387 | -.006225395 | .029033988 |
| A2 | Ao | .013091667 | .0066326100 | .245 | -.004538025 | .030721358 |
| A3 | Ao | .022750407\* | .0066326100 | .005 | .005120716 | .040380099 |
| A4 | Ao | .034678370\* | .0066326100 | .000 | .017048679 | .052308062 |
| Based on observed means.  The error term is Mean Square (Error) = .000. | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Dunnett t-tests treat one group as a control, and compare all other groups against it. | | | | | | | | |

# Profile and Residuals Plots

The figures below are line plot of different marginal means of each dependent variable level for each independent variable showing the high and low marginal mean of each dependent variable level, the best among these levels is of high marginal mean. For each of this independent variable of four in one plot of histogram of residual, normal probability plot of residual, residuals versus fits and residuals versus order.

The histogram of the residuals shows the distribution of the residuals for all observation whether the data are skewed or include outliers. The normal probability plot of the residuals is use to verify the assumption that the residuals are normally distributed, and should approximately follow a straight line. The residuals versus fits plot is use to verify that the residuals are randomly distributed and have constant variance. Ideally, the point should fall randomly on both sides of 0, with no recognizable patterns in the point. The residual versus order plot is use to verify the assumption that the residuals are independent from one another. Independent residuals show no trends or patterns when displayed in time order. Patterns in the point may indicate that residual near each other may be correlated, and thus, not independent. Ideally, the residual plot should fall randomly around the center line.

Figure Specific Fuel Consumption figures



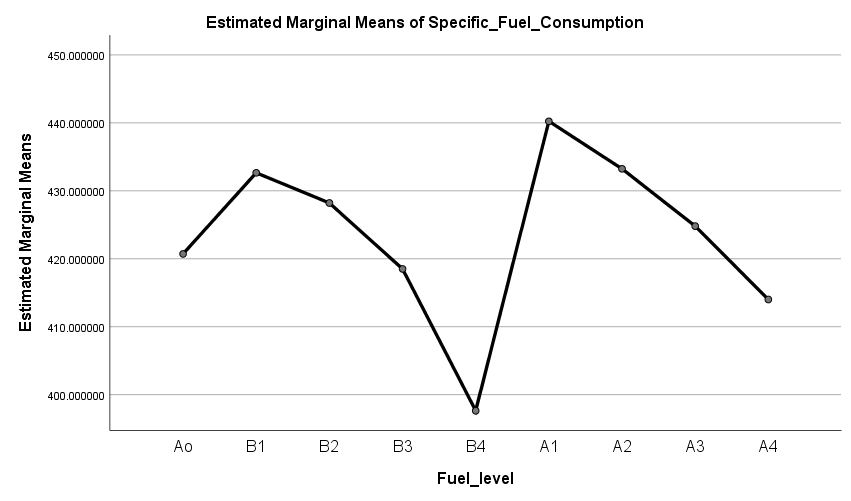
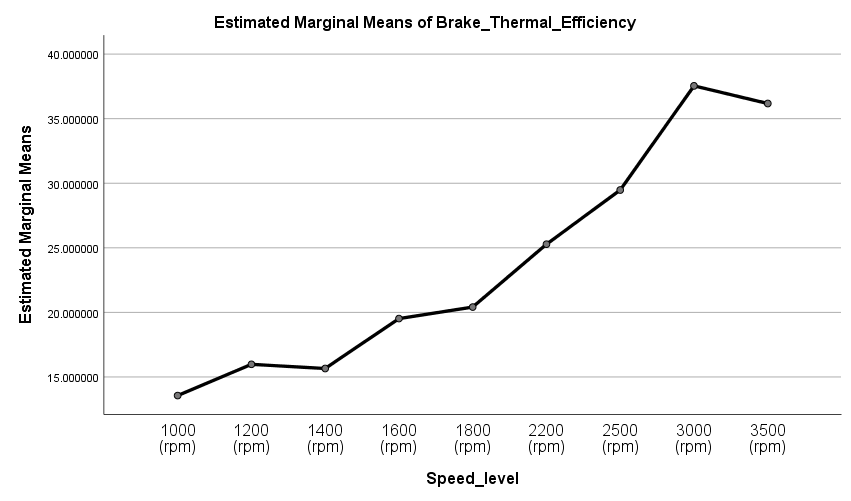




Figure Brake Thermal Efficiency



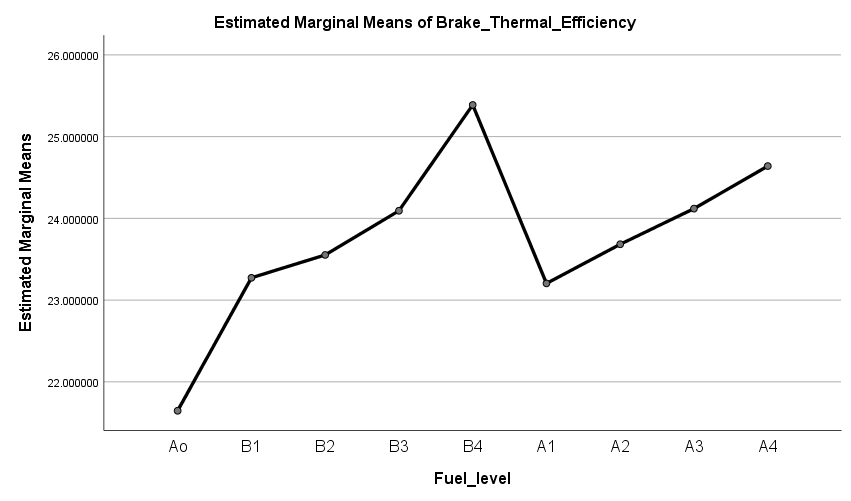
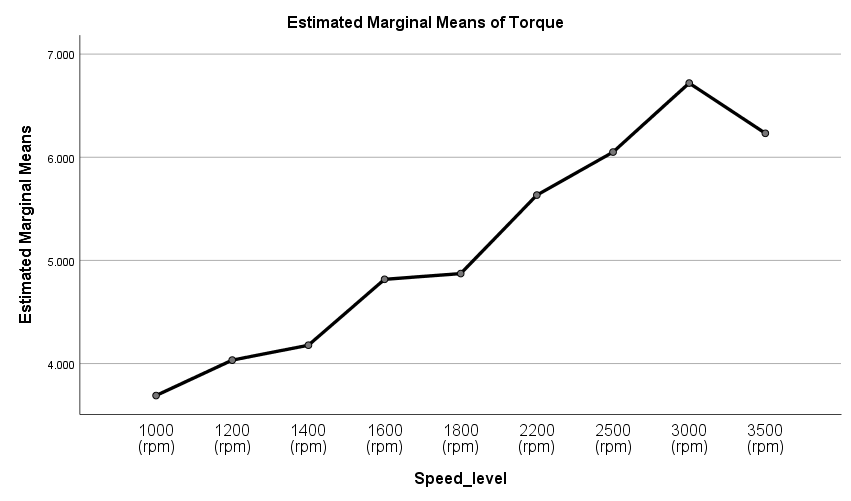




Figure Torque



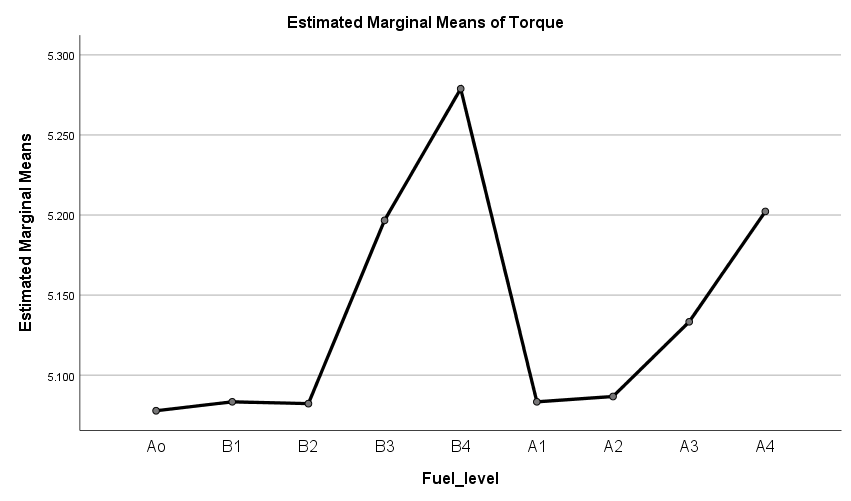
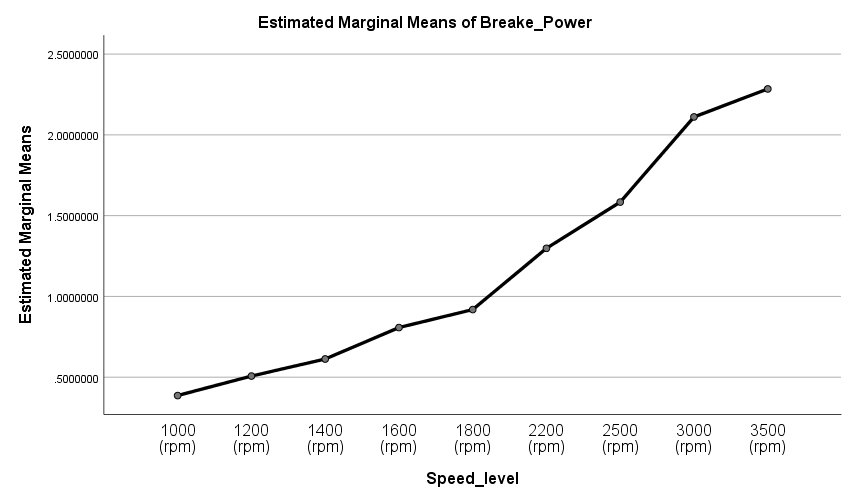
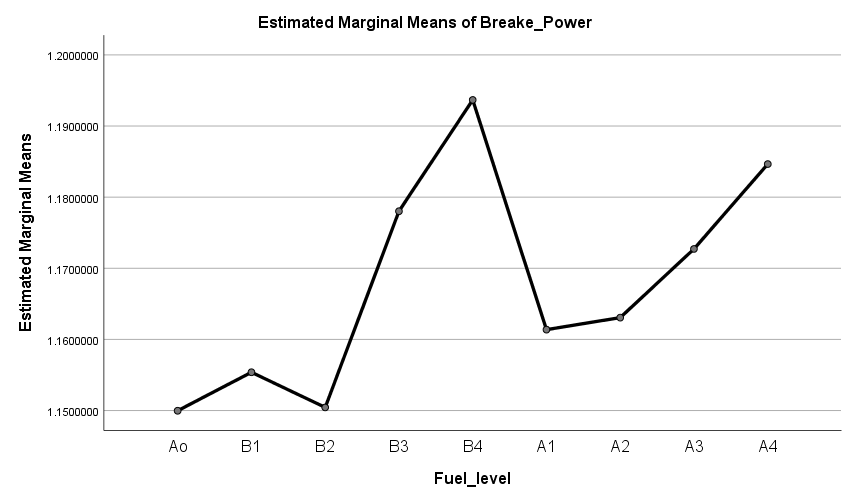




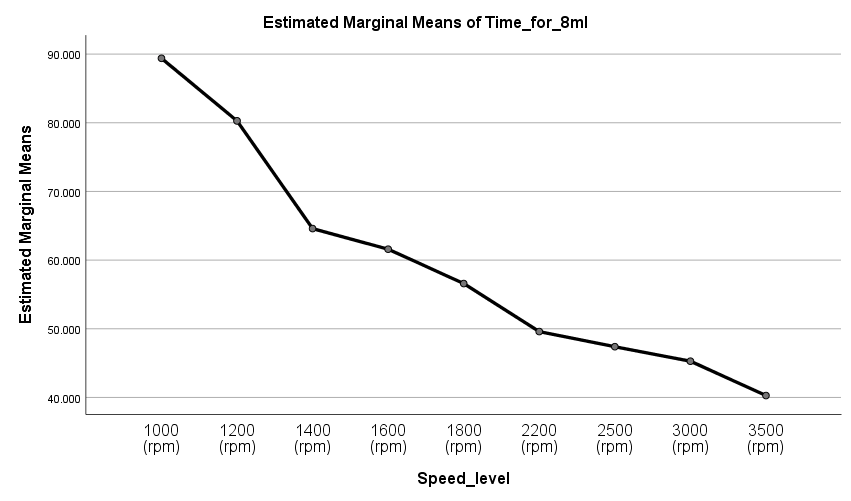
Figure Brake Power

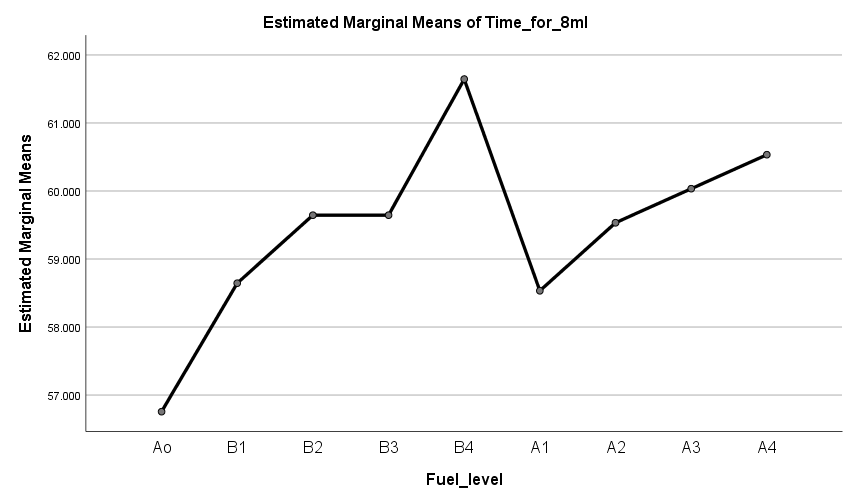




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Figure Time for 8ml







**Fuel mass flow rate**

