

Simple Effect Contrasts

(ch6-3-VacTubes_HO2.out)

Least Squares Means for Effect voltage*exhaust

Exhaust	Contrast (C)	C_hat	CI
60	u_220,60 - u_170,60	58.0-46.5=11.5	11.5 +/- (2.26)(4.028) (a) (2.39, 20.61) *
90	u_220,90 - u_170,90	12.0-21.1=-9.0	11.5 +/- (2.26)(4.028) (b) (-18.11, 0.11)
120	u_220,120 - u_170,120	7.5- 8.5=-1.0	11.5 +/- (2.26)(4.028) (c) (-10.11, 8.11)

i	j	Difference Between Means	95% Confidence Limits for LSMean(i)-LSMean(j)	
1	2	22.500000	13.388750	31.611250
1	3	42.000000	32.888750	51.111250
1	4	6.500000	-2.611250	15.611250
1	5	32.000000	22.888750	41.111250
1	6	44.500000	35.388750	53.611250
1	7	-5.000000	-14.111250	4.111250
1	8	41.000000	31.888750	50.111250
1	9	45.500000	36.388750	54.611250
2	3	19.500000	10.388750	28.611250
2	4	-16.000000	-25.111250	-6.888750
2	5	9.500000	0.388750	18.611250
2	6	22.000000	12.888750	31.111250
2	7	-27.500000	-36.611250	-18.388750
2	8	18.500000	9.388750	27.611250
2	9	23.000000	13.888750	32.111250
3	4	-35.500000	-44.611250	-26.388750
3	5	-10.000000	-19.111250	-0.888750
3	6	2.500000	-6.611250	11.611250
3	7	-47.000000	-56.111250	-37.888750
3	8	-1.000000	-10.111250	8.111250
3	9	3.500000	-5.611250	12.611250
4	5	25.500000	16.388750	34.611250
4	6	38.000000	28.888750	47.111250
4	7	-11.500000	-20.611250	-2.388750 (a)
4	8	34.500000	25.388750	43.611250
4	9	39.000000	29.888750	48.111250
5	6	12.500000	3.388750	21.611250
5	7	-37.000000	-46.111250	-27.888750
5	8	9.000000	-0.111250	18.111250 (b)
5	9	13.500000	4.388750	22.611250
6	7	-49.500000	-58.611250	-40.388750
6	8	-3.500000	-12.611250	5.611250
6	9	1.000000	-8.111250	10.111250 (c)
7	8	46.000000	36.888750	55.111250
7	9	50.500000	41.388750	59.611250
8	9	4.500000	-4.611250	13.611250

LSMEANS voltage*exhaust / STDERR CL PDIFF=ALL ADJUST=T;

* STDERR in LSMEANS voltage*exhaust --> SE=sqrt(MSE/2), r=2;
 * CL asks for Confidence Limits;
 * PDIFF=ALL gives all PairwiseDIFFerences using LSMEAN(i) - LSMEAN(j);
 * ADJUST=T --> NO adjustment (ordinary T-tests);

Least Squares Means

voltage	exhaust	pressure LSMEAN	Standard Error	Pr > t	LSMEAN Number
120	60	53.0000000	2.8480012	<.0001	1
120	90	30.5000000	2.8480012	<.0001	2
120	120	11.0000000	2.8480012	0.0038	3
170	60	46.5000000	2.8480012	<.0001	4 (a)
170	90	21.0000000	2.8480012	<.0001	5 (b)
170	120	8.5000000	2.8480012	0.0153	6 (c)
220	60	58.0000000	2.8480012	<.0001	7 (a)
220	90	12.0000000	2.8480012	0.0023	8 (b)
220	120	7.5000000	2.8480012	0.0272	9 (c)

Least Squares Means for effect voltage*exhaust
 Pr > |t| for H0: LSMean(i)=LSMean(j)

i/j	1	2	3	4	5	6	7	8	9
1		0.0003	<.0001	0.1410	<.0001	<.0001	0.2458	<.0001	<.0001
2	0.0003		0.0009	0.0032	0.0427	0.0004	<.0001	0.0013	0.0003
3	<.0001	0.0009		<.0001	0.0348	0.5502	<.0001	0.8095	0.4074
4	0.1410	0.0032	<.0001		0.0001	<.0001	0.0189(a)	<.0001	<.0001
5	<.0001	0.0427	0.0348	0.0001		0.0127	<.0001	0.0523(b)	0.0085
6	<.0001	0.0004	0.5502	<.0001	0.0127		<.0001	0.4074	0.8095(c)
7	0.2458	<.0001	<.0001	0.0189(a)	<.0001	<.0001		<.0001	<.0001
8	<.0001	0.0013	0.8095	<.0001	0.0523(b)	0.4074	<.0001		0.2928
9	<.0001	0.0003	0.4074	<.0001	0.0085	0.8095(c)	<.0001	0.2928	

voltage	exhaust	pressure LSMEAN	95% Confidence Limits	
120	60	53.0000000	46.557374	59.442626
120	90	30.5000000	24.057374	36.942626
120	120	11.0000000	4.557374	17.442626
170	60	46.5000000	40.057374	52.942626
170	90	21.0000000	14.557374	27.442626
170	120	8.5000000	2.057374	14.942626
220	60	58.0000000	51.557374	64.442626
220	90	12.0000000	5.557374	18.442626
220	120	7.5000000	1.057374	13.942626

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

*Fitting the CELL MEANS model using TREATMENT_COMBINATIONS (TC);
 *Allows HOV tests, & LINES (vs. CLDIFF) in the MEANS statement;

```
DATA tubes;
  INFILE file1 FIRSTOBS=2 EXPANDTABS;
  INPUT exhaust voltage treat_comb pressure;
  TC = 1000*voltage + exhaust;
  TC2 = compress(voltage) || compress(exhaust);
  TC3 = compress(voltage) || "-" || compress(exhaust);
RUN;
```

T Grouping	Mean	N	TC	[MEANS TC / T LINES; * T --> no adjustment;]
D	58.000	2	220060	-(a)
E	53.000	2	120060	
E	46.500	2	170060	-(a)
F	30.500	2	120090	
G	21.000	2	170090	\(b)
H	12.000	2	220090	/
H	11.000	2	120120	
H	8.500	2	170120	\(c)
H	7.500	2	220120	/