Donald P. Shiley School of Engineering
University of Portland
ME 403/503 – Engineering Design, Product Realization
Fall 2016

Lake-Side Resort Development

Next Tuesday we will have another open design review (with the entire class) for the lake-side resort project. Your team is to prepare another presentation for the client. Identify two different viable concepts and present both of them to the client (Lulay). They may each be based on different assumptions, or the same assumptions. For both concepts include:

- sketches to convey the concept
- preliminary identification of work required to accomplish each concept (for example: flow rates would need be determined, a proper sized pump would need selected, etc.).
- "risks" and "benefits" of each concept. An example of a risk could be: *this concept assumes expansion within 5-10 years to 15 new cabins – if development does not happen, then this option will likely be more expensive than necessary, if it does happen, this is the least expensive option in the long-term.*

Bottom line: there should be enough information for the client to determine the next engineering step.

Design of Experiments, t-test

1) Consider the "red/green" paint example in the DOE powerpoint. The data is:

R: 80.3, 81.2, 82.1, 83.1, 82.2; Ave=81.9
G: 78.2, 82.1, 79.8, 79.6, 81.1; Ave=80.2

Feel free to use Matlab or Excel for the following – or your own calculator, or slide rule….

a) Calculate the average and standard deviation of the R and G groups of data.
b) Calculate the "pooled" standard deviation
c) Calculate the "t statistic" (aka t_o).
d) Using a t-distribution table, determine $t_{0.05/2,\ 8}$
e) At what level of confidence are you able to reject the null hypothesis?
f) Compare your answers to those in the powerpoint notes.

2) Determine t_0 and $t_{\alpha/2,\ DOF}$ for the following data. The data was obtained from 12 different machines – one datum from a "slow" setting on the machine and one from a "fast" setting. At what level on confidence can you reject the null hypothesis – if at all?

   An important question to ask is "is this data reasonable"? Is it? Does it seem like Mother Nature could have created this or does it seem strange – something that would only really exist in a homework problem made up by a mad professor?

Grinder	Response for Slow	Response for Fast
1	1.22	1.96
2	1.63	1.8
3	2.42	3.01
4	3.12	3.05
5	0.76	1.23
6	4.23	4.89
7	1.58	1.3
8	2.81	3.17
9	2.19	2.94
10	3.75	3.9
11	1.66	2.28
12	3.8	4.4
Average	X_L=2.431	X_H=2.828
Deviation	s_L=1.118	S_H=1.171
Samples	n_L=12	n_H=12

3) One more time…fill in the values for average and deviation at the bottom of the table, and then determine t_0 and $t_{\alpha/2,\,DOF}$ for the following data (except for grinder 8, the data is identical to the previous problem). The data was obtained from 12 different machines – one datum from a "slow" setting on the machine and one from a "fast" setting. At what level on confidence can you reject the null hypothesis – if at all?

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