

Turbine Example

The reading of the pressure drop across an expansion valve of a turbine is expected to be influenced by gas temperature on the inlet side, operator, and the pressure gauge used by the operator. A three-way random effects experiment is used to study the effects of these three factors. Three temperatures, four operators, and three gauges are randomly selected. Two observations are taken at each treatment level.

A three-way complete model is used.

Analysis of Variance for Drop

Source	DF	SS	MS	F	P
Temp	2	1023.36	511.68	*	
Operator	3	423.82	141.27	*	
Gauge	2	7.19	3.60	*	
Temp*Operator	6	1211.97	202.00	14.59	0.000
Temp*Gauge	4	137.89	34.47	2.49	0.099
Operator*Gauge	6	209.47	34.91	2.52	0.081
Temp*Operator*Gauge	12	166.11	13.84	0.65	0.788
Error	36	770.50	21.40		
Total	71	3950.32			

- No exact F-test can be calculated.

Approximate F-test for “main effect” of gauge:

Approximate F-test with denominator: Temp*Gauge + Operator*Gauge
 - Temp*Operator*Gauge

Denominator MS = 55.542 with 6 degrees of freedom

Numerator	DF	MS	F	P
Gauge	2	3.597	0.06	0.938