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.

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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:

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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
```