Calculating Relative Standard Error (RSE)

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To calculate RSE you need to know:

1. The true concentration of each calibration standard. This is x_i
2. The measured concentration of each calibration standard. This is x'_i
3. The number of standard levels in the curve. This is n
4. The type of curve (average, linear or quadratic) the type of curve determines the value of p. For an average curve, p=1, for linear p=2 and quadratic p=3

1. Calculate the measured result –the true concentration / the true concentration for each level, then square the results.

$$\left[\frac{x_i' - x_i}{x_i}\right]^2$$

2. Divide each value determined in (1.) by n-p. For example if there are 5 calibration levels and the curve type is linear, 5=2 = 3 so divide each value by 3.

$$\frac{\left[\frac{x_i' - x_i}{x_i}\right]^2}{n-p}$$

3. Add all the values determined in (2.) together

$$\sum_{i=1}^{n} \frac{\left[\frac{x_i' - x_i}{x_i}\right]^2}{n-p}$$

4. Take the square root of the value determined in (3.)

$$\sqrt{\sum_{i=1}^{n} \frac{\left[\frac{x_i' - x_i}{x_i}\right]^2}{n-p}}$$

5. Multiply the result obtained in (4.) by 100% to obtain the RSE.

$$\%RSE = 100\times\sqrt{\sum_{i=1}^{n} \frac{\left[\frac{x_i' - x_i}{x_i}\right]^2}{n-p}}$$

Notes

Units do not matter so long as all of the calibration levels and results are in the same units

Weighting does not matter (the value of p for a linear curve is 2 whether weighted or not)

Example

Column A	Column B	Column C	Column D
True value	Measured value	(Measured-true/true)^2	(Column C result) / (n-p)
0.05	0.0582	0.026896	0.008965333
0.5	0.4396	0.01459264	0.004864213
2.5	2.304	0.00614656	0.002048853
5	4.876	0.00061504	0.000205013
10	10.34	0.001156	0.000385333

Sum of the values in Column D = 0.016468747

Square root of that sum = 0.1283

Multiply by 100%, RSE = 12.83%

A companion excel spreadsheet is available to simplify this process.