MINI PAPER

COMMENTS ON 'A TUTORIAL ON PROBABILISTIC RISK ASSESSMENT FOR NET PACKAGE CONTENTS'

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In reading Dennis King's minipaper on Probabilistic Risk Assessment in the Fall 1997 ASQ Statistics Division Newsletter, two thoughts came to mind: first, the risk is heavily dependent on the standard deviation as well as the average fill weight setting; secondly, the capital cost to achieve lower standard deviation may be less than the material cost to 'overfill', on average, in order to avoid underweight penalties.

1. Control Importance

King shows the computation of Case II Risk (penalty if the weight of the lightest container in a sample of 10 falls below 99% of the Lower Fill Level) in the instance of a process with a fill accuracy standard deviation of .3 oz. No mention is made of the need to monitor the accuracy and compute the potential risk if control of the standard deviation is lost. What happens to risk of the process standard deviation also changes? Computations similar to King's yields the results in the table below.

Risk of Violation

	Process Standard Deviation				
Fill Level	.250	.275	.300	.325	.350
64.01	.0456	.0868	.1414	.2056	.2750
64.05	.0285	.0590	.1022	.1565	.2184
64.10	.0153	.0350	.0661	.1083	.1597
64.15	.0079	.0202	.0415	.0728	.1137
64.20	.0039	.0112	.0252	.0477	.0790
64.25	.0018	.0060	.0149	.0304	.0536

Thus the risk can change quickly and dramatically with a small change in control of the standard deviation. If the standard deviation changes from .3 oz at the 64.15 oz fill level by as much as 0.05 ounce the risk can be lowered to less than 1% or can increase to more than 11 percent.

2. Capital Investment

Using the same numbers, the capital investment computation could be illustrated: Facts assumed: 1,000,000 packages per year and product cost $1.60. If the 95% 'comfort level' is elected at the .3oz standard deviation the annual cost of quality between it and the .250 standard deviation is approxiately .13 oz (ie a 5% risk requires a setting of 64.13 when the standard deviation is 0.30, but a setting of 64.00 yields a 5% risk when thec standard deviation is 0.25) of product per package for an annual cost of .13 ounce * 1,000,000 packages * 1.60 per pound / 16 ounces per pound, or $13,000 per year. Thus if the standard deviation can be reduced to 0.25, a material or content savings of $13,000 per year can be realized.

This amount can then be utilized to compare to the capital required to improve the fill standard deviation. If the capital cost is less than $13,000 per year, then invest in the 'equipment' which can reduce the standard deviation from 0.3 to 0.250.

References:

King, Dennis W., (1997), 'A Tutorial on Probabilistic Risk Assessment for Net Package Contents', ASQ Statistics Division Newsletter, Vol. 16, No. 7.