ECSA Report
GA4 Assessment

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Abstract

The aim of this report was to make use of statistical methods to analyze the performance of a company that deals with online sales of various product classes. The given data was processed and interpreted with the aid of the base RStudio program.

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Part 6.1: Taguchi loss function for Lafrideradora

Problem 6:
A blueprint specification for the thickness of a refrigerator part at Cool Food, Inc. is 0.06 ‡ 0.04 centimeters (cm). It costs $45 to scrap a part that is outside the specifications. Determine the Taguchi loss function for this situation.
Where:
L = loss
m = target/mean value
y = actual size of product
k = constant

$L = k(y-m)^2 = 45$ when $(y-m)=0.04$

$k = 45/(0.04^2) = 28125$

$L = 28125(y-0.06)^2$

In this situation the company may determine their loss by using the function $28125(y-0.06)^2$ of the loss value.

Problem 7:
A team was formed to study the refrigerator part at Cool Food, Inc. described in Problem 6. While continuing to work to find the root cause of scrap, they found a way to reduce the scrap cost to $35 per part.

a. Determine the Taguchi loss function for this situation.

$k = 35/(0.04^2) = 21875$

$L = 21875(y-0.06)^2$

In this situation the company may determine their loss by using the function $21875(y-0.06)^2$ of the loss value.

b. If the process deviation from target can be reduced to 0.027 cm, what is the Taguchi loss?

$L= 21875*0.027^2 = 15.95$

Part 6.2: Magnaplex

Problem 27:

Magnaplex, Inc. has a complex manufacturing process, with three operations that are performed in series. Because of the nature of the process, machines frequently fall out of adjustment and must be repaired. To keep the system going, two identical machines are used at each stage; thus, if one fails, the other can be used while the first is repaired.

a.

Analyse the system reliability, assuming only one machine at each stage (all the backup machines are out of operation).
R(1M) = $A \times B \times C$ = (0.85)(0.92)(0.90)
= 0.7038

= 70.38%

It is found that Magnaplex may rely on their system to be up and running for 70.38% of the time, while having only one machine for each processing step in the production system.

b.

How much is the reliability improved by having two machines at each stage?

$R(2M)=(1-(1-A)^2)\times(1-(1-B)^2)\times(1-(1-C)^2)$ = (0.9775) × (0.9936) × (0.99)

= 0.9615

= 96.15%

Improvement = ((R(2M)/R(1M)) – 1)(100) = ((0.9615)/(0.7038) – 1)(100)
= 36.62%
Improvement = (R(2M) – R(1M)

= (96.15) – (70.38) = 25.77%

The reliability of the system has improved by 25.77% when using 2 machines at each processing stage opposed to using only one machine. The total reliability of the improved system is 96.15%.

Part 6.3: Binomial probabilities of reliable delivery times

For the delivery process, there are 20 delivery vehicles available, of which 19 is required to be operating at any time to give reliable service. During the past 1560 days, the number of days that there was only 20 vehicles available was 190 days, only 19 vehicles available was 22 days, only 18 vehicles available was 3 days and 17 vehicles available only once.

There are also 21 drivers, who each work an 8 hour shift per day. During the past 1560 days, the number of days that there were only 20 drivers available was 95 days, only 19 drivers available was 6 days and only 18 drivers available, once only.

Estimate on how many days per year we should expect reliable delivery times, given the information above. If we increased our number of vehicles by one to 22, how many days per year we should expect reliable delivery times?

Conclusion

References