Exercise 7

Inventory Sampling

Session Objectives:

After the session the participants will be able to do the following:

1. Determine sample size based on various population sizes, goal quantities, and probabilities of defect selection.
2. Determine the Pd from a given inspection plan from a given inventory and sampling plan for a single inventory.
3. Determine the Pd from a given inspection plan from a given inventory and sampling plan over multiple inventories.
4. Apply insider scenario, sampling, and Pd logic to a simulated inventory.

Estimated Time:

30 minutes in subgroup
+60 minutes in large group discussion
90 Minutes total

Small Group Exercises:

Materials need: Computer for each subgroup and Sampling Formula Spreadsheet.

1) Determine the sample size for the following situations.
    a. Goal quantity 2. Probability of Selection 90%. Population size 500
    b. Goal quantity 3. Probability of Selection 50%. Population size 100
    c. Goal quantity 1. Probability of Selection 95%. Population size 100
2) For 1a, 1b, and 1c determine how many inventories it takes for the probability of detection to reach .999. Assume if the defective item is selected the Pd = 1.
3) Based on a given insider scenarios and inventory procedure, identify the associated probability of detection.

Large Group Exercise:

4) Review correct answers to problems from small group breakout session.
5) Play inventory sampling game using population of 100 items.

Exercise 3-1 – Use the Population from 1b

Insider Scenario – insider has stolen a single container of material.
Inventory Procedure – 100% of the inventory is verified by serial number, TID, and location. No confirmatory or verification measurements are made.

What is the probability of detecting the missing item?

How many inventory periods does it take for the probability to be greater than 99%?

Exercise 3-2 - Use the Population from 1b

Insider Scenario – insider has removed 100 grams of material from a single item. The insider was successful in defeating the TID and other safeguards so the item appears normal to a visual inspection.
Inventory Procedure – 100% of the inventory is verified by serial number, TID, and location.

What is the probability of detecting the defect in the item?

How many inventories does it take for the probability to be greater than 99%?

Exercise 3-3 - Use the Population from 1b

Insider Scenario – insider has removed 100 grams of material from a single item. The insider was successful in defeating the TID and other safeguards so the item appears normal to a visual inspection.
Inventory Procedure – 100% of the inventory is verified by serial number, TID, and location. A confirmatory weight measurement is made on a random sample of the inventory.

What is the probability of detecting the defect in the item?

How many inventories does it take for the probability to be greater than 99%?

Exercise 3-4 - Use the Population from 1b

Insider Scenario – insider has removed 100 grams of material from a single item and substituted inert material weighing 100 grams. The insider was successful in defeating the TID and other safeguards so the item appears normal to a visual inspection.
Inventory Procedure – 100% of the inventory is verified by serial number, TID, and location. A confirmatory weight measurement is made on a random sample of the inventory.

What is the probability of detecting the defect in the item?

How many inventories does it take for the probability to be greater than 99%?

Exercise 3-5 - Use the Population from 1b

Insider Scenario – insider has removed 100 grams of material from a single item and substituted inert material weighing 100 grams. The insider was successful in defeating the TID and other safeguards so the item appears normal to a visual inspection.
Inventory Procedure – 100% of the inventory is verified by serial number, TID, and location. A verification measurement is made on a random sample of the inventory.

What is the probability of detecting the defect in the item?

How many inventories does it take for the probability to be greater than 99%?

Exercise 5 – Large Group

Materials Needed –

1) Inventory of 100 small containers (preferably small transparent prescription bottles) serialized 1-100. Inside 85 containers place 2 normal small pieces of candy. Inside 5 containers place only 1 small piece of candy. Inside 5 containers place 1 normal piece of candy and 1 piece of candy that is the same color but has a distinctly different flavor.
2) Inventory sampling spreadsheet to determine random sample.

Instructions:

1) Develop a sampling plan based on 90% probability of selecting a defective item.
2) Demonstrate each scenario in section 3 (3-1, 3-2, 3-3, 3-4, and 3-5).
    a. For missing item or 3-1 remove one container from the population.
    b. The 5 items with one piece of candy missing should be considered the items where the insider has reduced the weight by 100 grams. Weighing can be done but a visual of the container contents can be used to simulate the confirmatory measurement.
    c. For 3-5 or verification measurement, the method of verification measurement will be destructive analysis (e.g., eat the candy to identify the ones containing the different flavor).

Review Pd of detection and the relationship to goal quantity, insider scenario, and method of inspection.