Statistical quality control 2007

Project 1

Voluntary. Approved exercise can give up to one bonus point to the ordinary exam.
Last day: 5 December 2007.
The project shall be done individually and shall be presented in written.

Introduction

A Swedish company are manufacturing steel axes to companies in the automotive business. They are manufacturing the axes in batches of size 3300 units. There are a number of important characteristics and dimensions of the axis. Since the axis are going to be used in an gear box the diameter is very important and is dimensioned to

$$D = 18mm \pm 0.05 \ mm$$

You have become quality manager for the product group of steel axis. Your first assignment is to investigate the alternative acceptance sampling and process control and write a report to the company management where you also recommend one of the methods.

Method 1 (Acceptance sampling)

The customer demands that all axes must fulfill the specification, but marketing department and production has agreed on that ISO 2859-1 (MIL105E) shall be followed with "General Inspection Level II" and AQL=0.15%. Simple plans shall be used.

Your task is to design the acceptance plans according to the standard. Draw also the OC-curve for the plan "Normal Inspection".

Method 2 (Process control)

Last month the company had to scrap a whole batch of axes and want to avoid to do so in the future by using statistical process control instead. Your predecessor has taken 20 samples, one each hour, of sample size 5.

Stickprov nr	Provnummer				
	1	2	3	4	5
1	17.976	18.003	17.993	18.009	17.991
2	17.956	18.013	17.983	17.982	18.007
3	18.020	17.977	18.010	18.001	18.015
4	17.990	17.991	18.030	17.987	18.042
5	18.007	17.995	17.989	18.011	17.973
6	18.005	17.976	17.983	18.011	17.980
7	18.000	17.974	17.995	17.996	18.021
8	17.980	18.019	18.013	17.959	17.992
9	17.981	18.000	17.983	18.003	17.972
10	17.993	17.987	17.976	18.032	18.006
11	17.976	18.016	17.998	18.020	18.031
12	17.979	18.005	17.999	17.968	18.014
13	18.029	17.980	18.010	17.998	18.039
14	18.001	18.027	17.988	17.986	18.010
15	17.976	18.006	17.997	17.980	18.037
16	17.999	18.030	17.991	17.975	17.993
17	17.977	18.023	17.998	18.006	17.977
18	17.973	17.986	18.031	17.991	17.996
19	17.995	17.974	17.988	18.001	18.024
20	18.019	17.999	17.973	17.993	17.978

Design a statistical process control for these data. Is the process stable? Is the process capable?