QUALITY INVESTIGATION OF SANITARY BODY FAUCET PART S11005-3S AT PT X

I Wayan Sukania and Gheanny

Industrial Engineering Program of Tarumanagara University, Jakarta
e-mail: iwayansukania@tarumanagara.ac.id, *iwayansukania@yahoo.com*

Abstract

PT. X is one of famous company in sanitary product industry. The product have been well known in the market. The company realize that the output not optimal yet. Short investigation on field show there are some problems of product quality. More accurate investigation will be done to know the level of quality of body faucet part S11005-3S. Investigation is started by collecting data from quality control section. The data collected come from ream, lathes and drill process. Based on data analysis is known that the product body faucet part S11005-3S has not in statistical quality control base on 3 sigma.

Keyword: *Data part S11005-3S, 3 sigma, quality*

1. INTRODUCTION

PT X is one of the company produce fitting and sanitary products. Faucet, shower, soap holder, tissue box, towel rack, washbowl glass, closet, bathtub, and some equipment used for the bathroom are the main product. Market share of PT. X is not only in Indonesia country, but PT. X has owned international agents in some continents and has exported its product to 24 countries in the world.

In fact, the company has fulfill requirement of the consumer need, through achievement of the company to the standard which has been specified. Even though, it is very importance to investigate the quality of product to be more assures that the product has fulfill the quality standard.

The investigation started from collect data at quality control department. Data resulted from drill, rim and lathe processes collected from March to October 2009. Analysis using statistical tools with 3 sigma controller will give the fact description of product body faucet part S11005-3S in statistical control or not.

2. PRODUCTION PROCESS

PT. X produce faucets part S11005-3S through some steps as showed at figure 1. Figure 2 show the body faucet part S11005-3S.

Figure 1: Production process part S11005-3S

Machining department produces ± 1100 part numbers. One part number can be processed only once process, whereas the other part number must be through several processes. One machines, can produce some part numbers and one part number can be produced at some different machines.

Row material of body faucet part S11005-3S is brass casting. Machining process body faucet part S11005-3S through three processes, using three different machine types. That is machining process at riming machine, CNC lathe and drilling machine. The time process required at riming machine 30 seconds, while at machine CNC lathe required 75 seconds, and at drilling machine about 60 seconds.

Figure 2: Body faucet part S11005-3S

2.1. Process on Riming Machine

Machining process at rimer machine is the first process for body faucet part S11005-3S to make inner thread and outer thread. They used is horizontal rimer machine type with sigmat, micrometer gauge measuring instrument. Figure 3 show the rimmer machine and figure 4 show the rimer machine output.

Figure 3: Rimer machines

Figure 4: Rimer machine output

2.2. Process on Lathe CNC

The lathe CNC machine used to makes threads, hole and cutting the product with ring gauge to check outer thread. Figure 5 show the CNC lathe machine and figure 6 show the CNC lathe machine output.

Figure 5: CNC lathe machine

Figure 6: CNC lathe output

2. 3. Process on Drilling Machine

The last machining process for body faucet part S11005-3S is to make hole or makes drat of product at drilling machine Figure 7 show the drilling machine and figure 8 show the drilling machine output.

Figure 7: Drilling machine

Figure 8: Drilling machine output

3. DATA AND ANALYSIS

31. Data

Several data of part 11005-3S as a result of riming, CNC lathe and drilling process collected from quality control department start from March until October 2009. Data measurement of part 11005-3S showed at table 1.

Table 1: Data measurement of part 11005-3S

No	Date	Rim			CNC		Drill	
		R2 (mm)	R11 (mm)	R14 (mm)	CNC2 (mm)	CNC5 (mm)	D1	D2
1	17/3/2009	21,95	10,64	24,71	57,05	5,48	5,64	2,90
		22,04	10,70	24,72	56,99	5,49	5,57	2,89
2	18/3/2009	22,01	10,58	24,69	57,06	5,51	5,58	2,87
		22,26	10,72	24,73	57,08	5,58	5,53	2,97
3	7/4/2009	22,21	10,67	24,72	57,07	5,64	5,56	2,87
		22,16	10,73	24,75	57,14	5,50	5,49	2,92
4	13/4/2009	22,19	10,58	24,70	56,85	5,51	5,48	2,91
		22,10	10,50	24,59	56,95	5,56	5,51	2,90
5	22/4/2009	22,05	10,51	24,70	56,90	5,48	5,56	2,93
		22,01	10,60	24,70	56,85	5,45	5,50	2,94
6	23/4/2009	22,04	10,49	24,72	56,50	5,45	5,58	2,97
		21,92	10,66	24,71	56,88	5,59	5,47	3,13
7	7/5/2009	21,93	10,57	24,75	56,50	5,53	5,46	2,95
		21,97	10,72	24,70	56,80	5,55	5,49	2,99
8	8/6/2009	21,98	10,71	24,53	56,83	5,51	5,48	2,91
		21,98	10,65	24,51	56,77	5,52	5,48	2,98
9	9/7/2009	21,95	10,70	24,70	56,87	5,56	5,45	2,89
		22,10	10,55	24,65	56,59	5,51	5,41	2,85
10	10/7/2009	22,15	10,55	24,71	56,97	5,55	5,41	2,88
		22,10	10,55	24,72	57,07	5,50	5,51	2,68
11	11/7/2009	22,10	10,55	24,76	57,03	5,48	5,44	2,98
		22,05	10,51	24,71	56,95	5,49	5,44	2,84
12	12/7/2009	22,08	10,51	24,70	57,10	5,50	5,46	2,84
		22,15	10,51	24,71	56,98	5,55	5,45	2,84
13	18/8/2009	22,15	10,67	24,58	56,80	5,51	5,51	2,81
		22,15	10,60	24,64	56,80	5,41	5,61	2,88
14	21/8/2009	22,13	10,65	24,68	56,68	5,55	5,63	2,90
		22,07	10,51	24,63	56,80	5,54	5,61	2,89

15	24/8/2009	22,17	10,51	24,59	57,00	5,57	5,58	2,86
		22,18	10,51	24,76	57,06	5,67	5,55	2,85
16	1/9/2009	22,14	10,55	24,72	57,04	5,62	5,52	2,94
		22,07	10,73	24,68	57,08	5,52	5,48	2,87
17	10/9/2009	21,80	10,64	24,75	57,09	5,61	5,64	3,14
		21,98	10,58	24,70	57,07	5,54	5,59	2,88
18	15/9/09	22,12	10,57	24,71	57,02	5,54	5,61	2,78
		22,10	10,67	24,76	57,05	5,57	5,60	2,95
19	2/10/2009	21,98	10,64	24,60	57,10	5,59	5,59	2,84
		22,14	10,59	24,75	57,19	5,51	5,60	2,81
20	3/10/2009	22,14	10,54	24,74	57,11	5,43	5,60	2,76
		22,10	10,52	24,82	57,10	5,48	5,76	2,89
21	5/10/2009	22,05	10,56	24,68	57,10	5,49	5,55	2,86
		22,02	10,67	24,70	57,23	5,46	5,56	2,85
22	6/10/2009	22,00	10,62	24,69	57,10	5,45	5,60	2,85
		21,50	10,60	24,88	57,22	5,59	5,47	2,85
23	9/10/2009	22,06	10,54	24,59	57,05	5,60	5,46	2,73
		22,13	10,51	24,62	57,11	5,56	5,47	2,90
24	15/10/09	22,05	10,55	24,67	57,05	5,48	5,45	2,87
		22,17	10,57	24,75	56,96	5,45	5,41	2,90
25	22/10/09	22,05	10,44	24.69	56,74	5,32	5,65	2,89
		21,55	10,37	24,74	57,04	5,48	5,50	2,88

3.2. Analysis

PT X has establish a standard to check the dimension of part 11005-3S. Standard dimension used for riming output R2 is 22 mm with tolerance ± 02 mm. Standard dimension used for R11 is 10,5 mm with tolerance ± 02 mm. While standard dimension used for R14 is 247 mm with tolerance ± 01 mm. Standard dimension used for CNC2 is 57 mm with tolerance ± 02 mm, while CNC5 is 54 mm with tolerance ± 02 mm. Standard dimension used for drilling output D1 is 55 mm with tolerance ± 02 mm, D2 is 29 mm with tolerance ± 02 mm.

A Control charts is a chart used to monitor outputs or input of process. The use of control chart in monitoring process is called statistical process control [1]. They can be used to measure any characteristic of a product. A *control chart for variables* is used to monitor characteristics that can be measured and have a continuum of values. A mean control chart is often referred to as an *x-bar chart.* It is used to monitor changes in the mean of a process. Range (R) charts are another type of control chart for variables. Whereas x-bar charts measure shift in the central tendency of the process, range charts monitor the dispersion or variability of the process. The method for developing and using R-charts is the same as that for x-bar charts. The center line of the control chart is the average range, and the upper and lower control limits are computed as follows [2]:

Range , R= X max- X min.....(1)

Center line of range chart, $R = \frac{\sum_{i=1}^{n} Ri}{n}$ .....(2)

Upper control chart, UCL R = $\overline{R}$ x D4…….……(3)

Lower control chart, LCL R = $\overline{R}$ x D3.....…..(4)

Where D3 = 0 and D4=3.27 for 3 sigma controll level.

Mean of sub group data $\overline{X} = \frac{\sum_{i=1}^{n} Xi}{n}$ .....(5)

Upper control limit, UCL $\overline{X}$ = $\overline{X}$ + A_2 x $\overline{R}$.....(6)

Lower control limit, LCL $\overline{X}$ = $\overline{X}$ - A_2 x $\overline{R}$.....(7)

Where A2 = 1.88 [3]

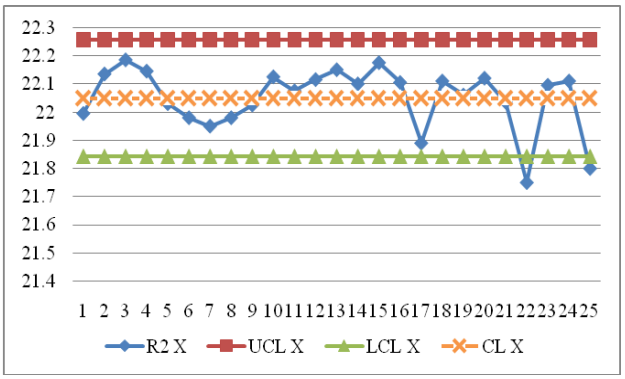


Figure 9: X control chart for R2 *part* 11005-3S

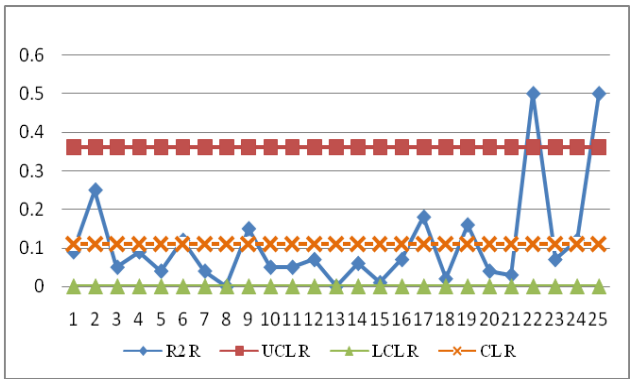


Figure 10:R control chart for R2 *part* 11005-3S

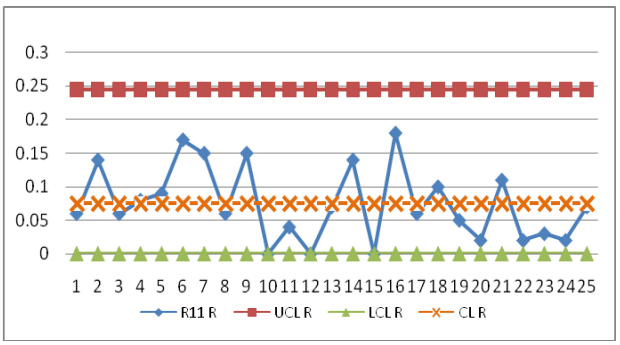


Figure 11: X control char for R11 *part* 11005-3S

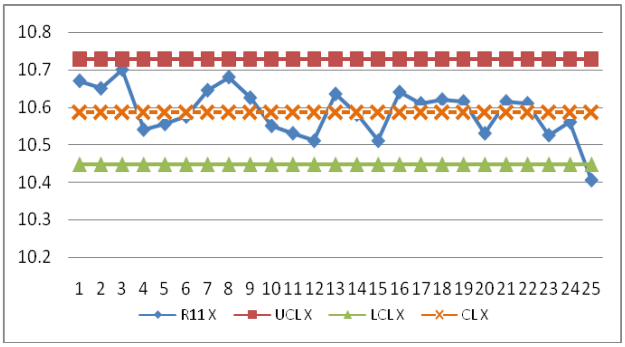


Figure 12: R control chart for R11 *part* 11005-3S

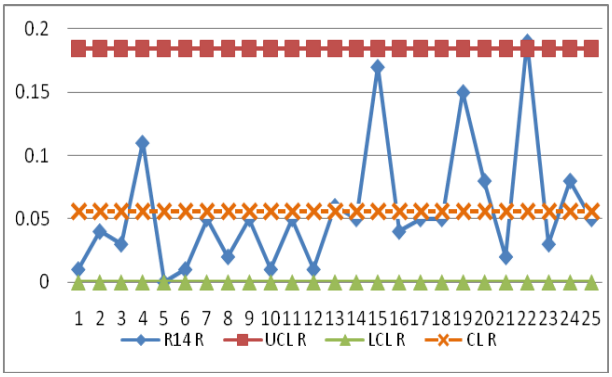
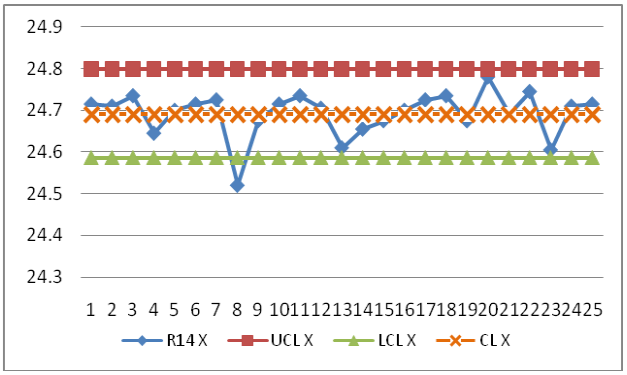


Figure 13: X Contro chart forR14 *part* 11005-3S



Fiagure 14: R control chart for R14 *part* 11005-3S

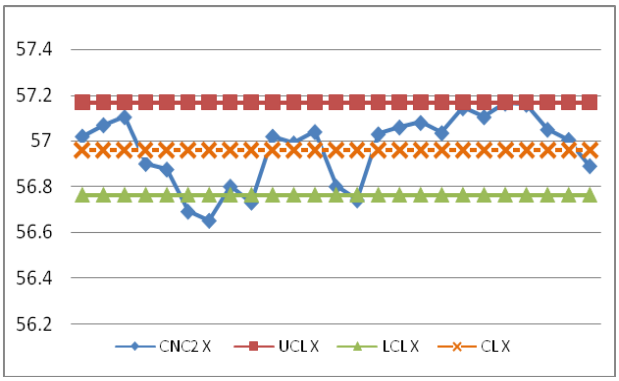


Figure 15: X control chart for CNC2 *part* 11005-3S

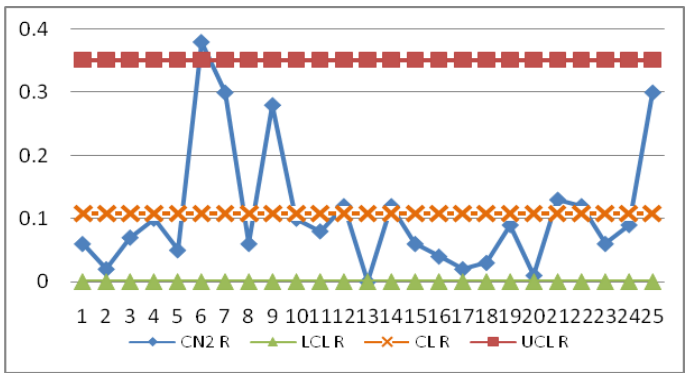


Figure 16: R control chart for CNC2 *part* 11005-3S

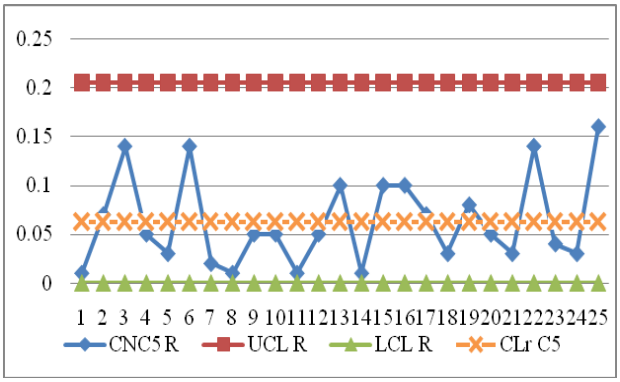


Figure 17: X control chart for CNC5 *part* 11005-3S

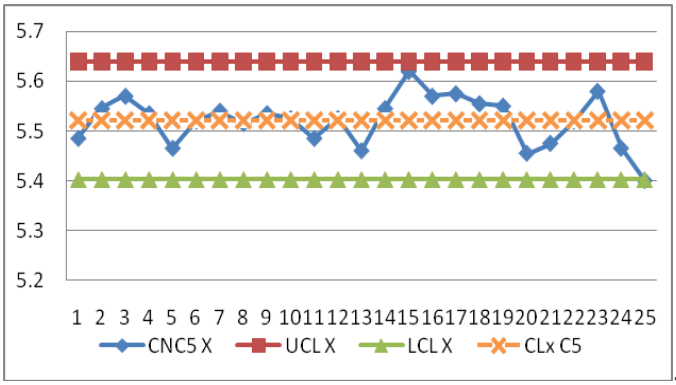


Figure 18: R control chart CNC5 *part* 11005-3S

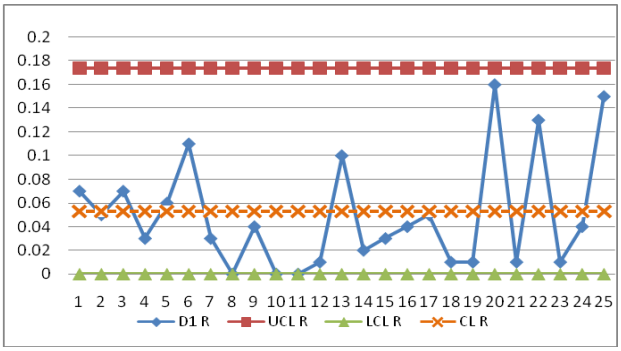


Figure 19: X control chart D1 *part* 11005-3S

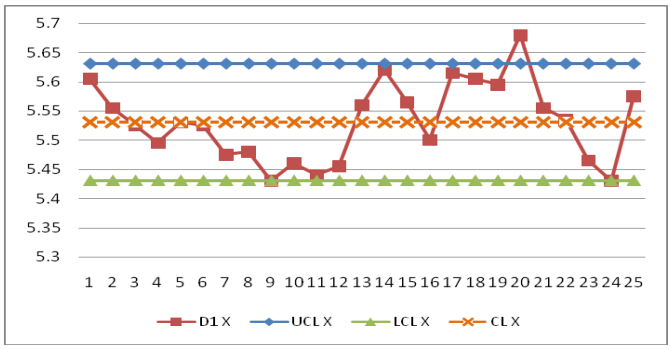


Figure 20: R control chart for D1 *part* 11005-3S

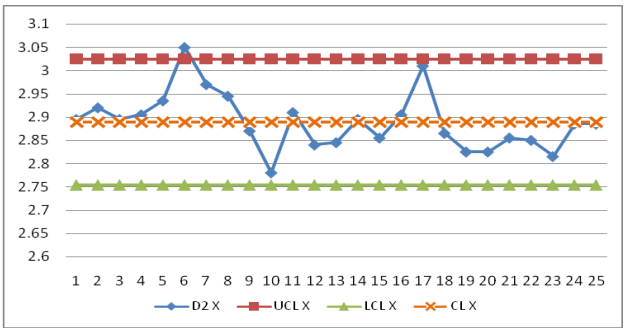


Figure 21: X control chart for D2 *part* 11005-3S

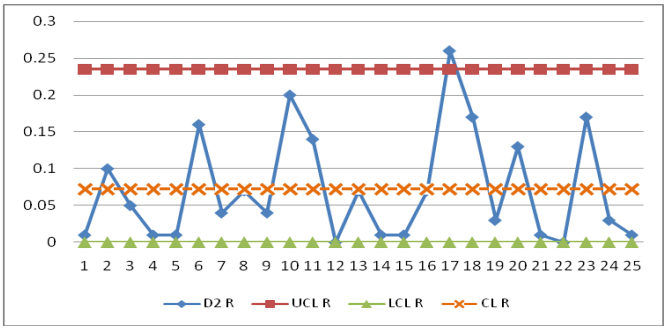


Figure 22: R control chart for D2 *part* 11005-3S

Based on X-R control chart for output from riming machine it is known that for dimension R2 there are many data out of control while for R1 and R 14 all the data in control.
While the output from CNC2 lathe machine show that the data is out of control because there are some data out of upper limit control. But the output from CNC 5 shown the data in control.
The output from drilling machine D1 and D2 show that the data are not in control.
Based on statistical calculation known that the output from riming machine still at 2,727 sigma level, lathe CNC machine at 2,7 sigma level and drilling machine at 3,3 sigma level.

4. CONCLUCION

From data and analysis it can be conclude that the part 11005-3S as the output of 3 type of machining processes is not in statistical quality control because the level of quality lower than 3 sigma.

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