ON THE STATISTICAL CONTROL OF THE RACING PROCESS BRACKET CENTER SUPPORT USING THE SIGMA SIX METHOD

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Abstract: *By applying the Six Sigma method, it is intended to calculate the capability reinforcement bracket support bracket process to see if it is stable and to see if the degree of dispersion of values is close to the limits of a normal distribution.*
Keywords: reinforcement, belt, six sigma, control.

1. Introduction

The two-seater car seat consists of three components: 40% rear seat - 40% RS, 60% rear seat - RS 60%, podium.

For the 60% rear seat fitting, various inconveniences and complaints from customers appeared. After making 3D measurements, it has been found that the angle from the belt support is 37 degrees instead of 34 degrees.

It has been proposed to improve the bracket mounting bracket in the welding device so that the belt support bracket can no longer rotate about its axis. It has been replaced by a new mounting bracket that prevents the belt support bracket from rotating.

A new control device has been introduced, which only verifies the reinforcement of the belt support bracket and the position deviations of this component.

Validation of the belt support bracket support bracket was performed using the Reproducibility & Repeatability R&R.

Achieving quality levels to satisfy customer demand is the goal of all businesses. The first point to be considered in a Six Sigma approach is customer satisfaction.

The Six Sigma method is:

- a quality philosophy aimed at customer satisfaction;
- a performance indicator that allows you to know where your business is located in terms of quality;
- a problem-solving method whose goal is to reduce variability and achieve product targets;
- organizing the skills and responsibilities of the people in the enterprise;
- a quality management mode that is strongly supported by project management.

By applying the Six Sigma method, it is intended to calculate the capability of the belt support bracket process to see if it is a stable one and to see if the degree of dispersion of values is close to the limits of a normal distribution.

The capability of the process is the ability of a technological process to produce products with quality characteristics within prescribed tolerances under pre-established conditions.

The capability of a process reflects not only its ability to deliver products with characteristics that fall within the tolerance range, but this should be optimal so that at the limit the defective fraction is null and the centering of the data distribution is as far as possible

$N_{med} = \frac{N_{max} - N_{min}}{2}$, a situation highlighted by capability indices.

2. Application of the sigma six method. Calculation of process capability

To calculate the process capability at the 34 degree angle feature, measurements were made on a sample of 30 chairs that were sent to measurements in the 3D lab.

3D measurements are made following lists of reinforcement features, which contain the most important quotations on the drawing, figure 1.

To achieve the process capability for the 34 degree angle feature, data from 30 seats measured at the belt support bracket angle, table 1, was gathered.

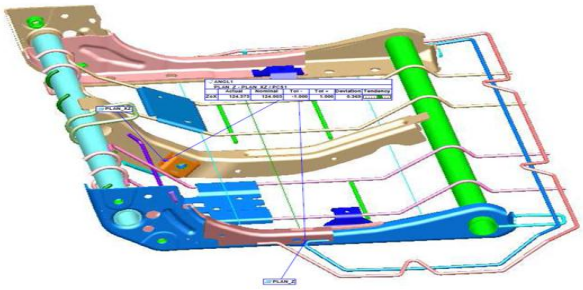

Fig. 1. 3D Measurement for Rear Seat Rear 60%

Table 1 Seat belt bracket angle values for 30 seats

Measurements from 30 tracks	34.32	34.56	34.11	33.74	34.08	34.06
	34.06	34.65	34.26	34.25	33.69	34.35
	34.31	34.67	34.11	34.15	33.97	34.11
	33.95	33.81	34.16	34.23	33.89	34.17
	33.78	33.9	33.99	34.06	34.12	34.09

The tolerance for this angle is ± 1, with values between 33 degrees and 35 degrees.

The capability calculation is done in the Minitab software program, where the company performs all the capabilities. After entering the data in this software we performed the normality test and the capability chart looks like in Figure 2.

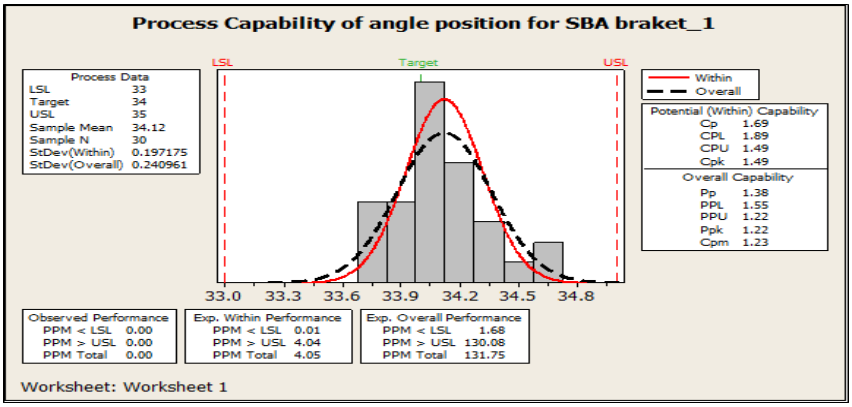

Fig. 2. Process capability chart for the 34 degree angle

From the graph above we can see that the process is centered.

The process is capable of complying with the product specification, which means that

the spread interval equal to 6σ of a process lies within the limits of prescribed tolerances.

Potential Capability (Cp) is an indicator that expresses the accuracy of the process (taking into account the size of the tolerance range, but does not take into account the centering of the process).

The potential capability value (Cp) is equal to 1.69, which means that the capability value is more than sufficient and the process should be maintained under the same conditions.

Capability of the Cpk process is an indicator that takes into account precision (by reference to the tolerance range) and process centering. Process capability requires $1.25 \leq C_{pk} < 1.5$.

The capability value of the Cpk process equals 1.49, which means it falls within the normal limits.

Based on these indices we can say that the process is stable as precision and as regulation.

3. Conclusions

In order to be able to distinguish between the capability of the process in the past and how it is present, the graph of the capability of the process before the improvements will be presented, Figure 3.

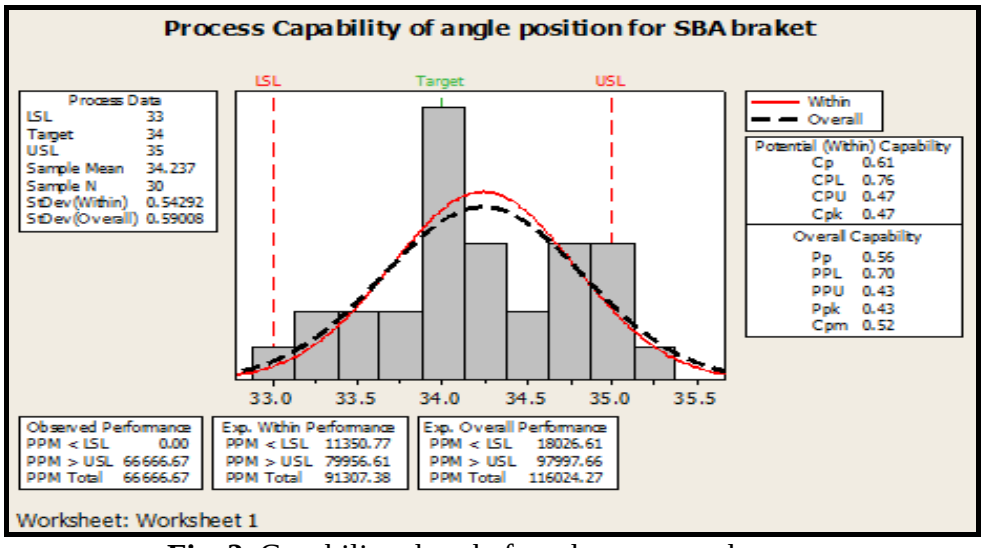

Fig. 3. Capability chart before the process changes

From this graph we can see that the process does not fall within the imposed limits, the capability index (Cp) having a value of 0.61, and the process capability (Cpk) having a value of 0.47.

From the values of these two indices we can conclude that the process was unstable as precision, and produced non-conforming parts.

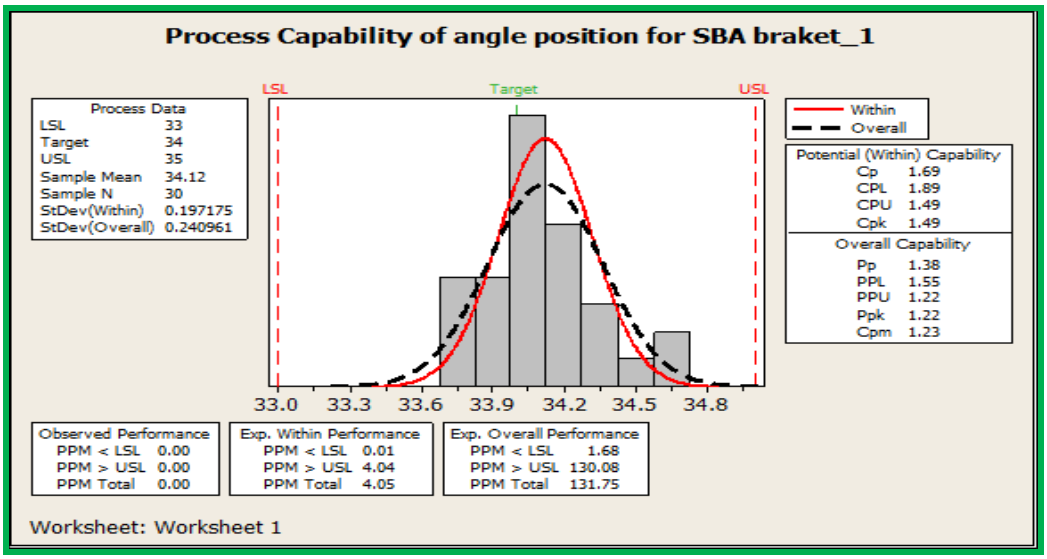

Fig. 4. Capability chart made after the process changes

After analyzing and comparing capabilities before and after making changes to the studied process, we can say that the process is a stable and regulated process that does not produce non-conforming parts.

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