

The Effect Additives in Avtur for Increasing Electrical Conductivity with Statistical Quality Control Method

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ABSTRACT

The distributing processing Avtur to customers with a good quality according to standards. The parameter quality of avtur such as density, electrical conductivity, colour, and water content. One of them the electrical conductivity was investigated daily operation of distribution avtur if a demand avtur needed for flight operation, because that standard specifications of electrical conductivity Avtur must be good stability. The electrical conductivity value avtur less than standard operation cause static electrical to appear and became causes a fire. For this reason, a strategy is needed to increasing quality of Avtur by using the Statistical Quality Control (SQC) method. The result of analysis of level decline electrical conductivity to avtur using the SQC method has 6.6335 pS/m per day. Therefore, a strategy is needed to increase the electrical conductivity value, and optimalization for adding additive X. However, a facility to adding additives X has not implementation for receiving processing avtur, than suggestion to add additive injection facility. After implementation of additive injection facility, the value of electrical conductivity requires the addition of additives as become to 211.442 cc comparization before add additive is 103,595 cc

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I. Introduction

Quality control is a system of verifying and maintaining the desired product quality level. The parameter quality of avtur such as density, colour, water content and electrical conductivity¹. One of the qualities of avtur is electrical conductivity, which is the ability of one substance to conduct an electric current. Aviation fuel such as avtur, when there is no movement, can contain positive and negative energy charges, which will effectively be neutral. However, if the avtur product is pumped, there will be friction between the avtur and the pipe, which can cause a transfer of charge between the two objects. In addition, the collection of large quantities of electric charges contained in avtur can cause an explosion and fire hazard due to the jump of static electricity charges to other objects.

Electrical conductivity value avtur less than standard operation cause static electrical to appear and became causes a fire. Therefore, one of the problems in the operating unit is a change in the quality of avtur, especially from the value of electrical conductivity. Electrical conductivity is one substance's ability to conduct an electric current, a decrease in the value of electrical conductivity will always occur in Avtur. For this reason, it is necessary to add additives that can increase the value of the electrical conductivity quality that customers can accept following the standards of avtur quality. In addition, stockpiling of Avtur fuel in storage tanks is sometimes unavoidable as the demand for flights from the airport decreases, which causes the stockpiling period of Avtur in the tanks to be longer.

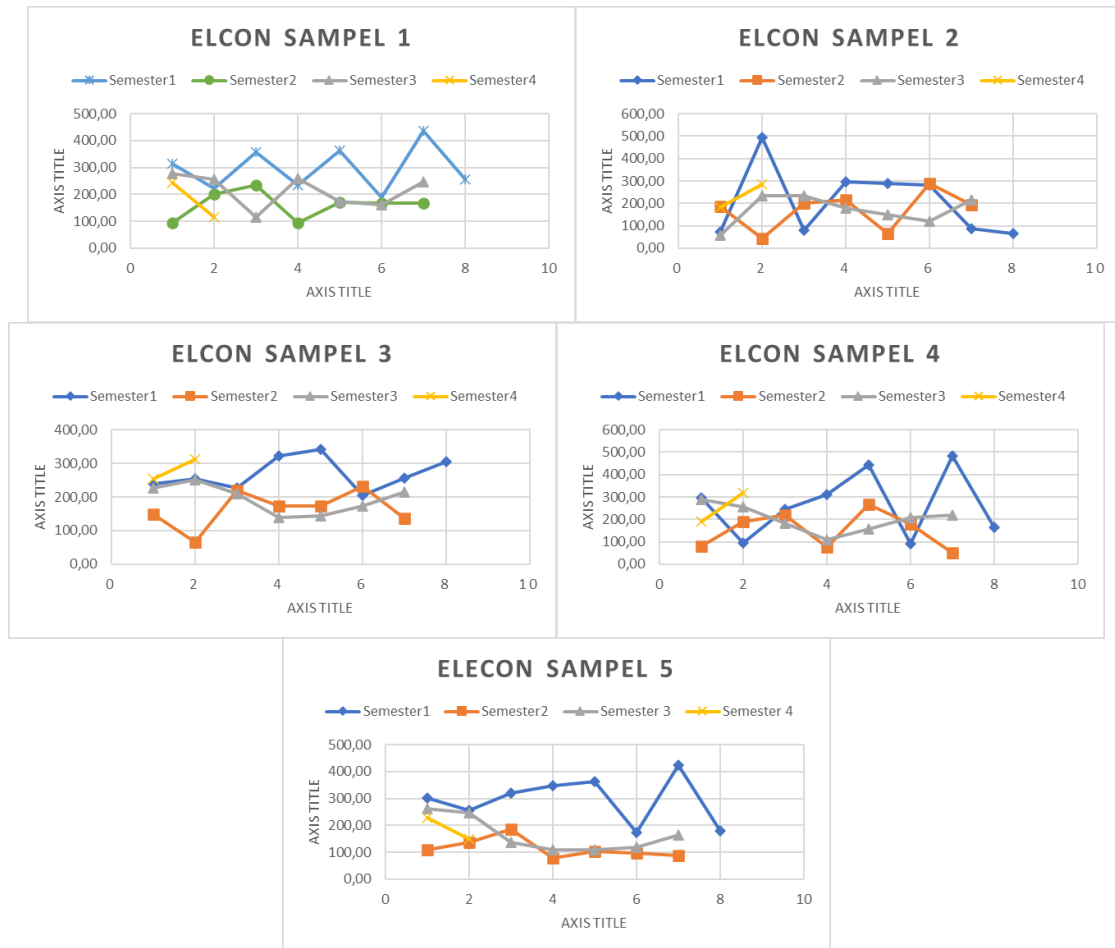
Based on these conditions, the addition of additives is needed to maintain the quality of avtur. Additives can be added if they have adequate facilities. Therefore, it is required to add facilities to increase the value of electrical conductivity.

II. Result and Discussion

A. Effect of Acceptance Process on Electrical Conductivity Value

Calculating the effect of avtur acceptance on the electrical conductivity value is carried out to determine the value of the capability process. The data used to calculate the electrical conductivity value is the electrical conductivity value data in the avtur acceptance process for the years 2020-2021.

Figure 1 Elcon of Avtur Sample



The electrical conductivity value of avtur acceptance process can affect the resistance to the electrical conductivity value during the storage process. The control limit value is calculated from electrical conductivity data in avtur acceptance process. The calculation for control limit used X-Bar and R-Chart types, the results of which can be seen in Figure 1

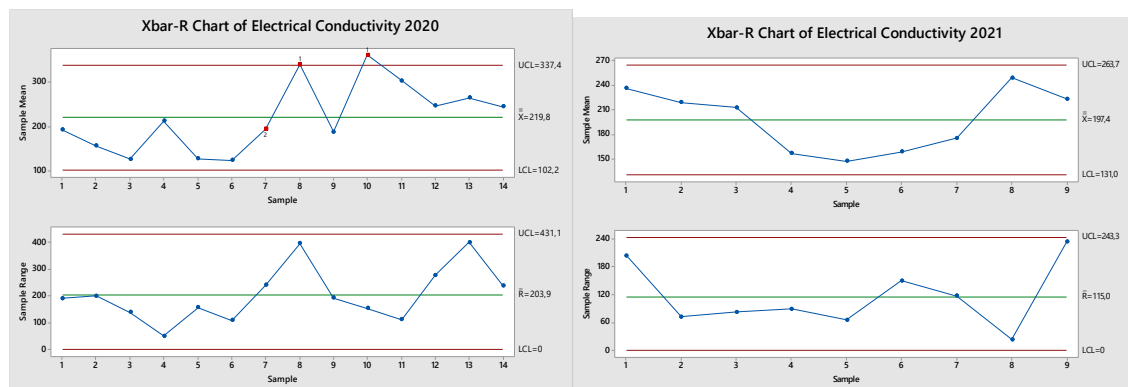


Figure 2 Xbar-Rchart of Elctrical Conductivity

The electrical conductivity values in Figure 1, X-Bar and R Chart, there are uncontrolled data, so testing is needed with further calculation of capability process.

The capability process is one of the methods used to determine the ongoing work process⁷. Capability process of avtur quality in acceptance based on electrical conductivity value, the results of calculation for capability process value in table 1

Table 1 Capability Results

Description	σ	Cp	Cpu	Cpl	Cpk
Semester1	125.59	0.73	0.88	0.58	0.88; 0.58
Semester2	75.07	1.22	1.99	0.45	1.99; 0.45
Semester3	67.39	1.36	2.03	0.69	2.03; 0.69
Semester4	42.98	2.13	2.89	1.37	2.89; 1.38

The results of the Capability process calculation show that the capability process value is not good because the resulting value for capability process is below one. Based on these results, an analysis of the value of electrical conductivity is needed in terms of avtur storage.

B. Storage Effect on Electrical Conductivity

The decrease in the value of electrical conductivity during the aviation fuel storage process in the storage tank occurs daily⁸. Therefore, it is necessary to calculate the changing electrical conductivity value. Avtur sampling for the electrical conductivity value is carried out every day before the Avtur transaction occurs. The result of the calculation is:

Table 2 Elcon Value at Storage Tank

Decrease in The Quality of Each Tank							
T-01	T-02	T-03	T-04	T-05	T-06	T-07	T-08
6.72	6.6	6.7	6.52	6.7	6.56	6.59	6.68
Average Decrease in Electrical Conductivity Value							
6.63 pS · m ⁻¹							

The decrease in daily electrical conductivity value is 6.63 pS/m. Based on this value, it is known that the decrease in avtur in the storage tank is calculated using coverage days, the result is 497.62 pS · m⁻¹.

C. Effect of Additive on Electrical Conductivity

A low electrical conductivity value can increase static electricity potential when friction occurs on avtur, resulting in sparks' emergence. To minimize the occurrence of sparks on avtur, it is necessary to add additive X. Additive X mixed with avtur can increase the electrical conductivity value. To determine the amount of additive used in accordance with the needs, it is necessary to know the concentration of the additive and water content⁹.

$$\text{Concentration} = \frac{\text{electrical conductivity targets}}{200} = \frac{382}{200} = 1,91 \text{ mg}$$

The calculation of the additive concentration results is continued by determining the volume of the additive.

$$\text{Additive Volume} = \frac{\text{Concentration} \times \text{Avtur Volume to be Added}}{1000}$$

Table 3 Added Aditif

Month	Avtur Volume to be Added	Concentration	Additive Volume
Jan-20	18,915,204	1.91 mg	36,128 cm ³
Feb-20	18,837,270	1.91 mg	35,979 cm ³
Mar-20	7,928,649	1.91 mg	15,144 cm ³

Apr-20	7,911,894	1.91 mg	15,112 cm ³
Jul-20	5,233,536	1.91 mg	9,996 cm ³
Aug-20	19,279,505	1.91 mg	36,824 cm ³
Sep-20	18,005,366	1.91 mg	34,390 cm ³
Oct-20	8,932,209	1.91 mg	17,061 cm ³
Nov-20	3,955,039	1.91 mg	7,554 cm ³
Dec-20	2,702,378	1.91 mg	5,162 cm ³
Jan-21	8,949,478	1.91 mg	17,094 cm ³
Feb-21	5,347,572	1.91 mg	10,214 cm ³
Mar-21	5,936,224	1.91 mg	11,338 cm ³
Apr-21	12,000,497	1.91 mg	22,921 cm ³
May-21	9,944,260	1.91 mg	18,994 cm ³
Jun-21	4,977,395	1.91 mg	9,507 cm ³
Jul-21	2,958,809	1.91 mg	5,651 cm ³
Aug-21	4,124,167	1.91 mg	7,877 cm ³

Based on these two calculations, the results obtained for effect of additive X mixed with avtur, as follows:

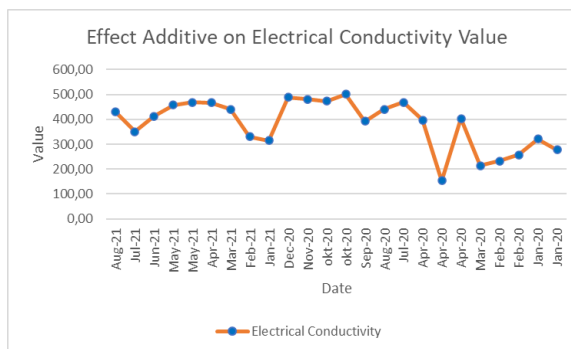


Figure 3 Effect Additive on Electrical Conductivity Value

D. Implementation Additive Injection Tank

The addition of additive X is an alternative to maintain the quality of Avtur from static electricity or its electrical conductivity value. However, to be able to add additives, adequate facilities are needed, so it is necessary to implement additive facilities. The description of the application for adding additives can be seen in Figure 3

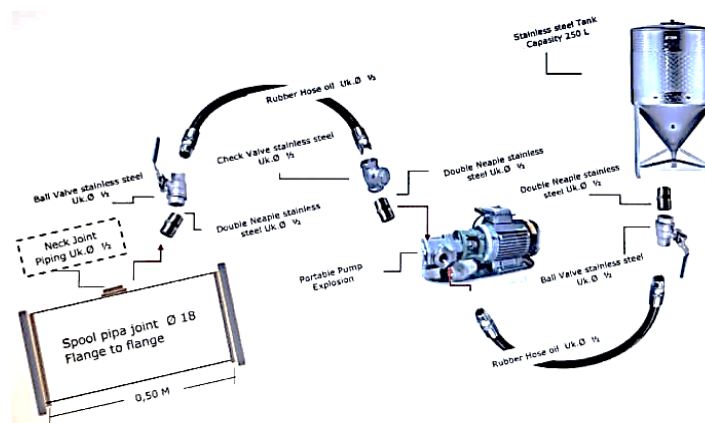


Figure 4 Skeme of Instrumen Injection

From the description of the application of the additive injection tank facility, the components used are:

Table 4 Characteristic of Intrument Injection

No.	Description
1	Stainless Steel Tank 250L
2	Rubber Hose Oil Ø 1/2"
3	Centrifugal Pump
4	Double Neaple Stainless Steel Tank Ø 1/2"
5	Ball Valve Stainless Steel Ø 1/2"
6	Check Valve Stainless Steel Ø 1/2"
7	Neck Joint Flange Ø 1/2"
8	Spool Pipa Joint Flange Ø 8"
9	Elbow 90° Ø 1/2"

The application of the injection tank additive facility does not only pay attention to the application side. Implementation of this facility must be able to pay attention in terms of maintenance, facilities that are continually maintained can maintain the service life of the injection tank additive facility. Maintenance that must be carried out is routine maintenance and preventive maintenance[11][12].

III. Conclusion

The effect of additives X on the electrical conductivity value is that it can increase the decreased electrical conductivity, so that the electrical conductivity value remains within the limits of the avtur quality. Electrical conductivity value in avtur acceptance process based on capability process is below one, which is 0.73. From the results of analysis, it is known that a daily decrease in the value of electrical conductivity in the storage process is with an average reduction of 6.63 pS m⁻¹

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