JOURNAL OF ENGINEERING
annals OF
FACULTY OF ENGINEERING HUNEDOARA

THE ATTEMPT TO TRACTION OF THE INSULATION OF THE CABLE LAY-UPS FROM CARS

Teodor VASIU, Adina BUDIUL-BERGHIAN

University Politehnica Timisoara, Faculty of Engineering Hunedoara, ROMANIA

Abstract
The correct operation of the cars is the result of correctness output of the execution and the fitting ensembles, building blocks and the marks components. After make, each among these are submissive of a specific testing which have the fate to confers them a certainty of good operation in exploitation. The cable lay-ups, as components of the electric plant, are submissive of attempts which visa the workstations and the insulation. In this work are analyzed the insulations of a cable lay-ups. The results, obtained abaft their attempts to traction, are processed with specialized software Weibull+ + 7, who permits the determination of reliability parameters of the cable lay-ups and therewith we can do appreciations about material quality used to the manufacture of the coatings and the correctness they were made.

1. INTRODUCTION

The electric equipment of the cars has the role assured the electric energy for the input of electric apparatus as much stationary, quotients and to the movement of the cars.

Component of electric equipment is: the feeder plant, the consumers and the central office with the specific annexes. This rearward contains the contact with spanner, isolators, switches, safeties etc. and the cable lay-ups which do the connection between elements of the electric equipment.

The conductors, as and components ale the cable lay-ups, can be down stress and of high stress. They are made from multiform cupriferous wire, of section and different insulation (figure 1). The conductors who have approximate same direction are made grouped with special par tape and are fixed with staples and metallic or plastic clamping jaws. They are put in places safe from leakages of oils, fuels, water and how much beyond the which part emanates excessive heat (across 100°C).

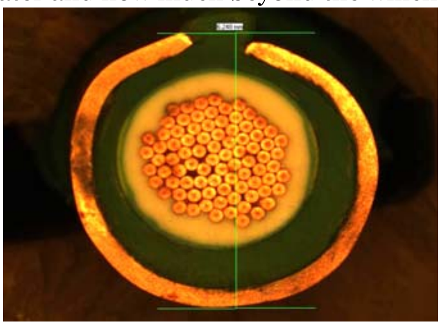

Figure 1. Section through the electric conductor

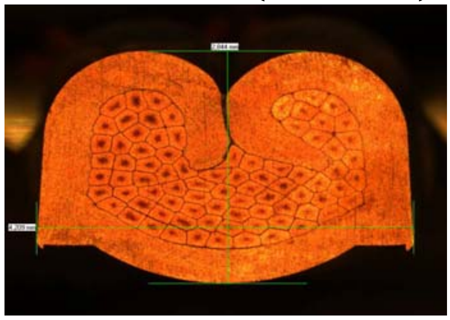

Figure 2. Section through the terminal

The conductor terminals (figure 2) used for the fixation to the elements of electric equipment are made in the shape of mules, clamping jaws (figure 3), clamping ring, clutches from brass latten or bronze. All the terminals are protecting with fittings of rubbers or plastics, of diverse forms.

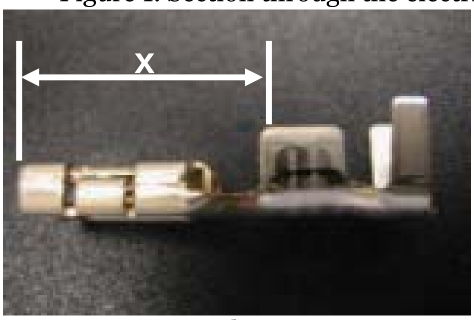

Figure 3. Clamping jaw

2. PROCEDURES OF QUALITY

The quality auditing activity of the cable lay-ups is done in special workspaces for ultimate check, utilizing the documents, the middles and the specific proper methods.

The documents of quality are constituted from: procedures and cautions of specific quality of the place of labor, standards of quality, plugs of measurements and specific registrations.

Used-up middles to the check quality can be: standards, equipments of testing, gauges and check (the tape measure, the ruler, caliper, micrometer and dynamometer) and specific characters (section the thread, color the thread, the bandage type, plan of dusk, numerical codes components).

The quality auditing methods can be: visual checkout, compare to the standards, measure, monitoring and functional testing.

Testing to traction the insulation of the cable lay-ups

In this paper is analyzed the comportment to traction of the insulation cable lay-up with following nominal sizes:

Strip Length (mm):	*6.00*
Conductor crimp height (mm):	*2.80*
Conductor crimp width (mm):	*4.20*
Insulation crimp height (mm):	*6.35*
Insulation crimp width (mm):	*6.36*

A number of 10 of identical cable lay-ups were stretched by a special machine up to rupture the insulations. Is registered the values of the forces (table1) which results the deterioration of the insulations.

Table 1. Experimental results

Nº	Insulation crimp height [mm]	Tensile result [N]
1	6.350	27.41
2	6.340	29.18
3	6.370	27.77
4	6.370	22.61
5	6.350	17.00
6	6.360	19.58
7	6.350	27.14
8	6.370	25.64
9	6.370	20.94
10	6.370	24.41

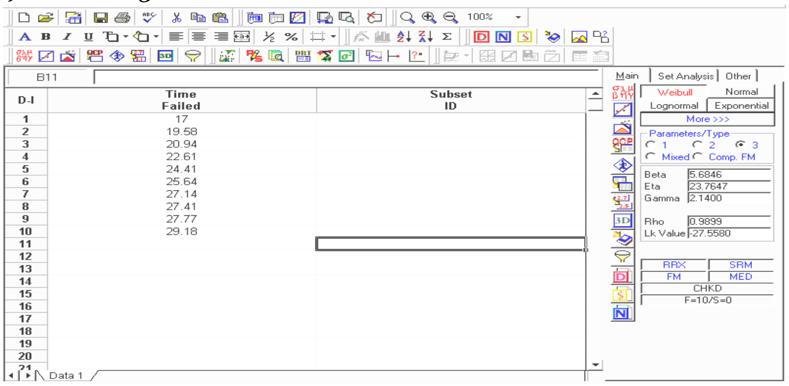

Figure 4 Introducing of experimental data

The insulations of the cable lay-ups are subdued also of a thermal stress which consists to heating of the samples to 120ºC and maintain their 120 of hours, thereto is done just a visual check of integrity of the insulations.

The processing of experimental date

The values of the forces of destruction are entered in the program Weibull++7 of the Reliasoft corporation, just as is seen in the figure 4.

Launching in execution of the program show that the repartition rule values, of forces which destroy the insulations, is Weibull with three parameters: β = 5.6846, η = 23.7647 şi γ = 2.14; which fact is can also see from the Allan-Plait diagram (figure 5).

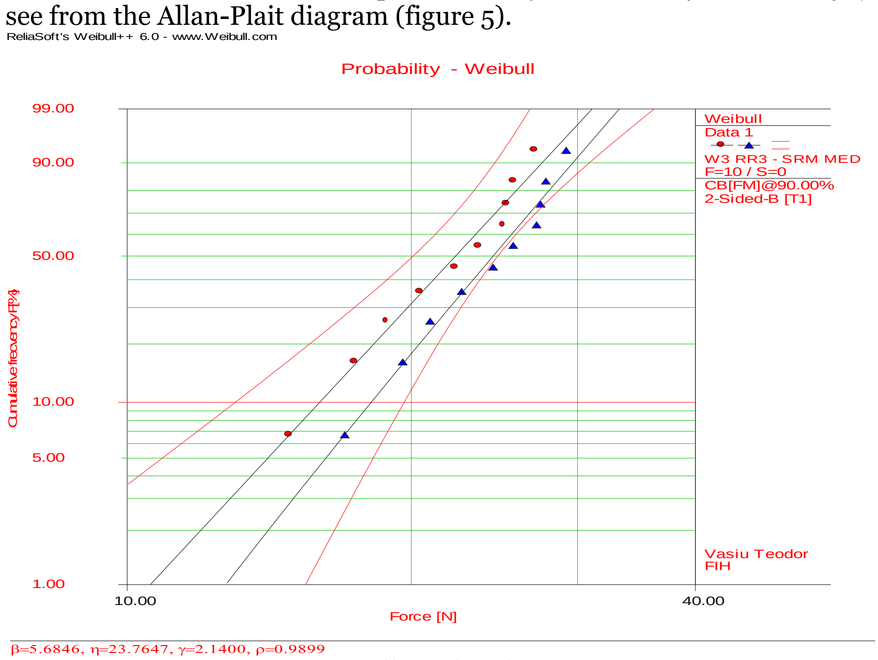

Figure 5 Allan-Plait diagrams

Knowing the rule of repartition it can be traced the reliability of the insulations of the cable lay-ups depending on force tensile (figure 6), the variation accordingly the failure rate (figure 7) and the Likelihood function surface (figure 8).

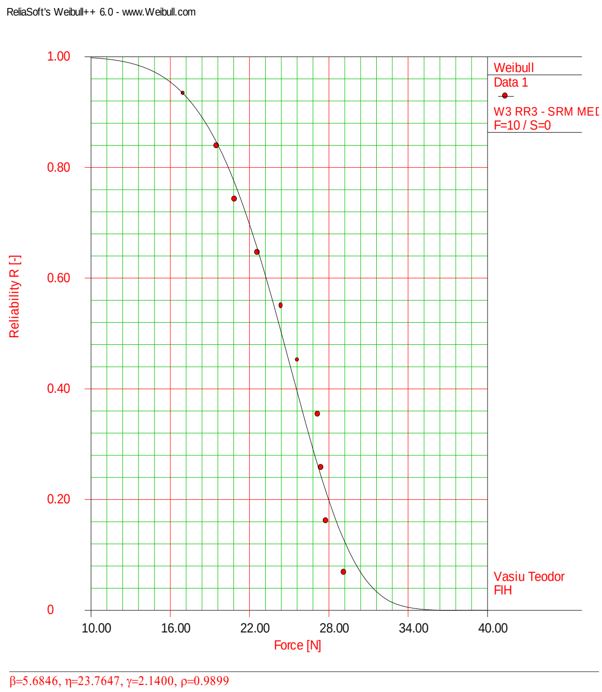

Figure 6 Reliability depending on tensile force

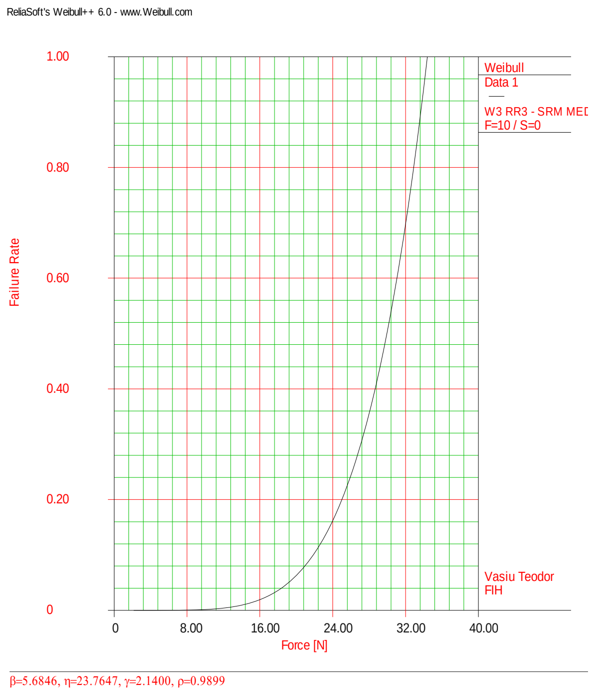

Figure 7 Failure rate depending of tensile force

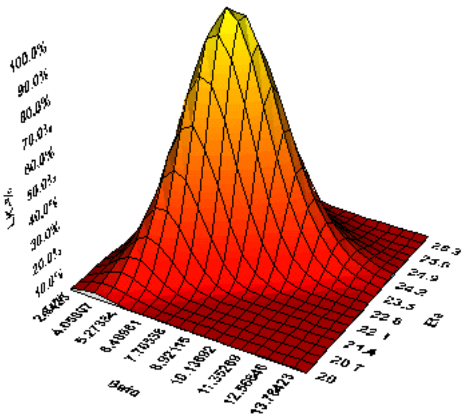

Figura 8 Likelihood function surface

3. CONCLUSIONS

The value parameter β show that insulations are in last period of life (the material from which they are made is olden), in which the ruptures can appear anytime to stretch forces bigger of 2N (γ = 2.14). Between 2 and 8N is estimates that appear just fissures which must be analyzes carefully of the electricians auto. Across 8N (the failure rate grows suddenly opening with this value) can appear detachments of insulations, fact that can produce short-circuits whose consequences are hard to advance.

In other words, is recommended either the carefully leverage the cable lay-ups, either improvement the material from which is executed insulations. Last solution, which presupposes the enlargement of reliability is proves always the viability in time.

REFERENCES

[1] Baron, T., ş.a., *Calitate şi fiabilitate* - manual practic, vol. 1 şi 2, Editura Tehnică, Bucureşti, 1988.
[2] Mihoc Gh., Muja A., Diatcu E., *Bazele matematice ale teoriei fiabilității*, Editura Dacia, Cluj-Napoca, 1976.
[3] Vasiu T., *Fiabilitatea sistemelor electromecanice*, Editura Bibliofor, Deva, 2000.
[4] ***, ReliaSoft Weibull++7 software.