

The application of fuses in the electrical systems of trains, trams, trolleybuses, etc. has a history of more than 100 years, so its main interruption difficulties are well known. The working voltages range from 700 V to 1,500 V, with time constants of up to 85 ms in power circuits and up to 1,000 ms in the case of actuator coils. There are numerous fuse schemes adapted to each application, using the concept of filling with substances that generate extinguishing gases [1, 2]. These schemes are moving from direct current to alternating current, which, added to the well-known nature of their problems, reduces the importance of their treatment.

F. Mining

In mining applications, it works with voltages of 300 and 600 V, with fault currents of the order of 35 kA and time constants of up to 30 ms. The main difficulty and the greatest number of problems are found in the interruption of overload currents (200 to 300%) due to the length of the galleries and therefore of the supply conductors, with high time constants. This difficulty has led to the appearance of particular designs for this application, in which means to facilitate extinction are incorporated, the most common being the use of substances that generate extinguishing gases, arranged inside the fuse in quite varied ways, according to the manufacturer [11].

5. Conclusion

It is concluded in the need to deepen the study of these applications in order to achieve specific fuses designs for direct current and not mere adaptations of the traditional alternating current. It is necessary to extend the knowledge of the behavior of the fuse against variable and repetitive loads, causing thermal-mechanical fatigue. The DC arcing process must be improved through the development of more accurate models and the performance of extensive experimental validations, aimed at ensuring the extinction of low fault currents. It is necessary to understand the effect of the presence of transients that were not normal in alternating current uses, generated by new applications, such as the utilization of fuses in electric vehicles. In addition, there are many new applications with a wide variety of requirements, which generates great efforts to solve these needs, which are very limited in application.

References

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