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Acetylene black or other conductive carbon blacks in HV cable compounds. A historical fact or a technological requirement ?

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Historically acetylene black has been used in semi-con compounds for power cable applications and has to a large extent maintained this position in the High Voltage field. In other non cable conductive composites acetylene black has been replaced by conductive carbon blacks showing usually a better conductivity at lower loading. Acetylene black, commercially produced since the early thirties, was the first high structure carbon black on the market, comparable high structure furnace blacks only appear in the late sixties. Acetylene black immediately was considered as conductive filler when the first polymer based shielding materials were developed in the early sixties. Acetylene black was the only conductive filler fulfilling the major requirements: conductivity at acceptable level, very good dispersion, very low chemical and metal contamination.

Conductive carbon blacks produced by partial combustion processes are an alternative to acetylene black. Conductive carbon blacks produced by the MMM-process are investigated as alternative to acetylene black. Ensaco 250 is a product showing very good electrical performance, high purity and an excellent surface finish. The present paper will summarise the major characteristics of the carbon blacks and emphasise on their differences. The characterisation will cover all major aspects involved in the selection of the adequate conductive filler for semi-cons and more specifically for High Voltage cables.

Furthermore, new techniques have been used to make a description as complete as possible.

Production process

Acetylene black is produced by the exothermal decomposition of acetylene gas. For details about the acetylene production process we refer to the excellent description given in Yvan Schwob's monograph. Acetylene gas is very clean and impurities depend on the origin which can be a ethylene cracker or calcium carbide. Impurities also can be generated from the wear of the equipment and from the additives and the water used in the granulation process.

Ensaco 250 is produced by the MMM-process; It is a partial combustion process: A hydrocarbon is partially burned to generate the energy required to crack the residual hydrocarbon. The process allows the production of low surface area high structure carbon black. The process operates at low speed and does not use any additive neither in the make phase nor in the granulation process. Impurities origin is the hydrocarbon and possibly the wear of the equipment.