

S2.5.4 THE TRIBOELECTRIC EFFECT IN TANK MOUNTED AND RETURN LINE FILTERS

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Static electricity produced by the fine-filtration of hydraulic oils can damage mechanical and electrical systems of machines. This static charge is generated by the triboelectric effect, which is a transfer of electrons between the fluid and the filter media during contact. Although the triboelectric effect occurs between a variety of materials, electrostatic charge generation can be significantly greater between nonconductive materials, such as synthetic filter media and biodegradable hydraulic fluid. This article presents an investigation of electrostatic charge generation in return line and tank mounted hydraulic filters. Different combinations of filter bowls, end caps, drop tubes and media were evaluated in a hydraulic circuit with a pure vegetable-oil based hydraulic fluid. High levels of static charge were produced by both the return line and tank mounted filters when conventional filter materials were employed, but the use of conductive carbon-infused nylon filter bowls, drop-tubes and media nearly eliminated static charge generation in the tank mounted filter. This strategy was less effective in the return line filter. By analyzing the effects of oil flow rate and comparing filter properties, the conditions required for decreasing static electricity generation were determined. These findings are significant because they provide insights toward the development of filtration systems that resist triboelectric charge generation.