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The Fatigue Tests for Materials of Plastics Leaf Springs

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Recently, plastic materials reinforced with glass-fiber have attracted notice. The reasons are as follows:

(1) Fiber-glass Reinforced Plastics (FRP) have almost the same strength as metals and unique properties that metals don't have.

(2) The industrial production of FRP has become possible by development of polyester which can be formed at low pressure, because the damage of glass-fibers which may easily occur in the case of phenol resin, the forming pressure of which is high, can be excluded.

Today FRP which have such merits shown above have applied in various fields, for example, to machine members. So the fatigue tests of FRP are required.

In this report, static and fatigue tests mainly in compression were carried out for the following three kinds of specimens; PNF (Polyester), PULF (Polyester reinforced with unidirectional glass-fiber in lateral direction) and PUAF (Polyester with unidirectional glass-fiber in axial direction). Haigh-type tension-compression fatigue testing machine was used. During the fatigue tests, the stress amplitude was kept constant and the reduction of mean stress was measured. The amount of fatigue deformation was calculated from the reduction of mean stress obtained above.

Either compressive strength or tensile strength can not be expressed with only one value. Because those strength are influenced by the testing conditions, for example, by load-rate or by dimensions of specimens. In fatigue tests the properties of PUAF are superior to those of the other two types as well as in static test, and the amount of the fatigue deformation of it is negligible. PULF is inferior to PNF in compressive strength obtained from static tests, but the fatigue strength of it is reversely superior in the region of rather low mean stresses. The amounts of fatigue deformation of both PNF and PULF are pretty large. Especially, mean stresses have great influence over the fatigue deformation as far as PNF is concerned.