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层状球面弹性轴承刚度设计、仿真与试验

Stiffness design, simulation and test of laminated spherical elastomeric bearing

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中文关键词: 弹性轴承 压缩刚度 扭转刚度 球面 橡胶

英文关键词:elastomeric bearing compression stiffness torsion stiffness spherical rubber

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中文摘要:

从理论上推导了层状球面弹性轴承各橡胶层的压缩刚度和扭转刚度计算公式,通过具体算例,将层状球面弹性轴承各橡胶层压缩刚度和扭转刚度的理论计算结果与仿真结果进行了对比分析.结果表明:各橡胶层压缩刚度的理论计算结果与仿真结果基本吻合,最大误差为3.98%.各橡胶层扭转刚度的仿真结果与理论计算结果存在一定偏差,从小接头开始的前半部分橡胶层扭转刚度的仿真结果大于理论计算结果,最大误差为33.3%;后半部分橡胶层扭转刚度仿真结果小于理论计算结果,最大误差为32.8%.压缩刚度对压力变化表现的非线性特性不明显,扭转刚度则随扭转角的增大,其非线性特性变得越显著.但通过理论方法、有限元仿真方法得到的层状球面弹性轴承等效压缩刚度和等效扭转刚度与试验结果吻合良好.

英文摘要:

The computational formulations of compression stiffness and torsion stiffness of every rubber layer of laminated spherical elastomeric bearing were deduced in theory, and the theoretical results and simulated results of compression stiffness and torsion stiffness of every rubber layer of laminated spherical elastomeric bearing were compared through examples. The results show that the theoretical result of compression stiffness is basically in accord with the simulated result, the maximum error is 3.98%. There are some differences from simulated result and theoretical result for torsion stiffness in every rubber layer; the simulated result of torsion stiffness is bigger than theoretical result for the first half of all the rubber layers from the little end, the maximum error is 33.3%; the simulated result of torsion stiffness is smaller than theoretical result for the second half of all the rubber layers, the maximum error is 32.8%. The nonlinear characteristic of compression stiffness is not evident for the alterable pressure, and that of torsion stiffness is more evident with the increase of the torsion angle. But the equivalent compression stiffness and equivalent torsion stiffness got from theoretical method and finite element simulation method are in good agreement with the test results.

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