PY140型摇臂式喷头摇臂碰撞过程数值模拟 Numerical Simulation of Swing Arm Impact Process to the PY140 Impact Sprinkler

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关键词： 摇臂式喷头 碰撞 有限元模拟 动应力

摘 要： 基于显式动力分析软件ANSYS/LS-DYNA，建立了摇臂式喷头摇臂绕轴旋转、碰撞喷体的有限元分析模型，在3种摇臂转动角速度和喷体安装弹性橡胶垫与否的组合工况下，对摇臂与喷体的碰撞过程及动应力分布进行了计算模拟。结果表明，PY140型摇臂式喷头在转动角速度400(°)/s时，计算的碰撞动应力峰值为42.3MPa，与试验值的误差小于0.5%，预测的发生位置距离摇臂转轴中心15cm，与试验结果相同。摇臂各断面的动应力极值和碰撞接触应力均随转动角速度的增加而增大，喷体打击块安装橡胶垫后，3种转动角速度下动应力峰值平均降低了10.4%，但接触时间平均增加了76.6%。 As one of the key parts of the impact sprinkler, the swing arm is exerted by complex dynamic stress in the impact process. Based on the dynamic explicit software ANSYS/LS-DYNA, a finite-element model for simulating the rotation of swing arm around the axis and the impact between the swing arm and the sprinkler body was established. Several cases under three rotational angular velocities and with or without the rubber pad fixed on the sprinkler body’s contact stop were investigated. The results indicate that under the angular velocity of 400(°)/s, the simulated peak dynamic stress of PY140 impact sprinkler was 42.3MPa, with an error less than 0.5% compared with the measured result. The predicted peak dynamic stress was located offset 15 cm from the centerline of the swing arm’s rotation axis, which was the same as the measured data. The extreme dynamic stresses of different cross sections and contact stresses increased with the increase of the rotational angular velocity. After fixing the rubber pad, the peak dynamic stress had an average decrease of 10.4% under three angular velocities, while the contact time had an average increase of 76.6%.

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