

IMPROVE PUMP DIAPHRAGM RELIABILITY USING ANSYS NON LINEAR FEA

Yong (Harry) Wang

Senior Development Engineer, Parker Hannifin Corporation

ABSTRACT

We have dramatically improved T1 pump elastomer diaphragm's fatigue life and the pump reliability via using ANSYS Nonlinear FEA. The elastomer diaphragm is overmolded on an aluminum disc insert, which is connected to an eccentric conrod driven by the pump's DC motor, at the center of the diaphragm. The pump maintained a short fatigue life due to the diaphragm early ruptured near to the edge of the disc. Through stress analysis via ANSYS, we found that the diaphragm peak stress incurred was very high during a cyclic stretching while the pump was running under load, especially vacuum. We have reduced the peak stress and optimized the diaphragm shape using ANSYS to improve the diaphragm fatigue life from average 1000 hours to 8000 hours. It makes the products very competitive.