

Centrifuge Rotor Life and Retirement

Beckman rotors have a useful life cycle that includes the warranty period, possible use after the warranty period, and then retirement or failure. We want to make clear our policy and recommendations concerning rotor life for all categories of Beckman Coulter centrifuge rotors. The purpose of recommending rotor retirement is to share our rotor knowledge with our customers, to be fair and truthful with them, and to assist them in protecting their investment.

There are three factors that govern the useful life for any rotor:

- Expert design and manufacture
- Proper care and handling during use
- Retirement, when the possibility of rotor damage or fatigue precludes continued use.

Because centrifuge rotors must operate under high forces they also have a useful lifetime limit, past which we do not recommend using the rotor. This useful life is different for each rotor we make, based on the design, the materials the rotor is made of, and the centrifuge model(s) that the rotor is designed to operate in. When a rotor is past its useful life we recommend retirement of the rotor. If a customer sends a rotor to us for repair, which is past its useful life, we will not perform the repair because we do not recommend using any rotor past its retirement age.

Our current rotor retirement policy establishes an age at which we recommend retirement of the rotor. There are several factors that determine the age at which we recommend retirement. Each type of rotor has a different age limit based on these determining factors.

Factors used to determine rotor life:

1. Design life

When we design a rotor we model the design using computer modeling for stress and usage. The resulting design is intended for a certain usage and life expectancy. This design information is proprietary and company confidential information. We can not share these details with customers, only the general information that we do design rotors for a useful lifetime and test the design to ensure the intended lifetime is met.

2. Life cycle testing

New rotor designs are tested by both nondestructive and destructive test methods. In a specially constructed blockhouse, the rotors are repeatedly cycled up to maximum speed to verify their useful life. They are also

intentionally run to destruction. With this information we confirm the rotor's useful life. Again, the details concerning these tests are considered company confidential.

3. Field data

Beckman Coulter tracks rotor repair and rotor failure data. We have a special committee that meets weekly called the Rotor Failure Review Committee (RFRC). The RFRC is a group of rotor experts from Rotor Design, Rotor Manufacturing, Quality Assurance, Rotor Repair, Rotor Metallurgy, Product Planning, and Technical Support. The RFRC reviews every rotor event and keeps records pertaining to these events. We have records that indicate the age, operating conditions, general usage, and other related information for rotors that are involved in any event that results in damage to the rotor. The RFRC has been keeping these records for over thirty years. These databases and rotor history files of information are company confidential.

We use these three factors along with data about how many centrifuge operations each different category of centrifuge user performs in a given time frame to determine a useful lifetime for each rotor model. We recommend retirement dates for rotors based on these factors and information. However, this useful lifetime recommendation assumes proper care and maintenance of a rotor. If a given rotor is not properly maintained then it will not last for the expected useful life.

We provide information about the correct care and maintenance of our rotors in each rotor's manual. Free replacement copies of all of our Rotor Manuals are available if needed. In addition, we recommend periodic rotor inspections to assist customers in ensuring the full useful lifetime. Customers should be made aware of our Field Rotor Inspection Program (FRIP) to help them determine their rotor's present condition and to help in managing its full useful life.