Whitestone Report

Service Life Study has Facility M&R Funding Implications

A recently study for the National Nuclear Security Administration found that service lives of mechanical equipment can be substantially longer—twice as long, for some equipment—than suggested in the technical literature. Replacing major mechanical equipment based on the longer life estimates could reduce overall facility M&R costs by 5 percent or more. However, additional study is needed before these findings can be generalized to other facilities.

Done in partnership with Lawrence Livermore National Laboratory (LLNL), this study derived survivor curves for selected equipment from an unusually rich (24,000 records) historical database. Median age at retirement—a typical service life measure—is reported for six equipment types in the following table. As shown, the median values derived from the LLNL data were substantially longer than those published in a popular reference.

Service Life Comparison, Selected Equipment

Asset Description	N	ASHRAE [A]	Estimated [B]
Window or Wall Mounted A/C Unit, 5,000-29,000 BTUH	874	10	25
Self-Contained Heat Pump Type A/C, 1.5-50 Ton	1,270	19	25
Self-Contained Variable Air Volume Type A/C Unit, 1.5-200 Ton	1,147	15	25
A/C Unit Heating and/or Cooling, 5,000-63,000 CFM	1,464	20	41
Circulator Pump, 1-25 HP	684	20	42
Refrigeration Condensing Unit, 1.25-30 Ton	286	20	31

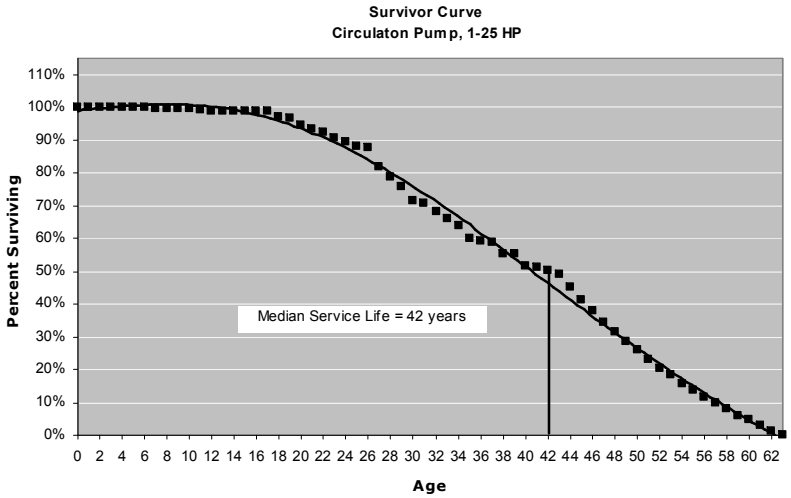
[A] ASHRAE (2003); note Hiller's (2000) criticisim of the ASHRAE estimates.

[B] Median Service Life, the age at which 50% of equipment is still in use. Estimated from LLNL equipment records

The implications of the findings are intriguing. Service life is a key assumption in facility life cycle planning and long term budgeting. Simple experiments using the MARS Facility Cost Forecast System demonstrated that doubling the assumed life of major mechanical equipment could reduce total M&R costs by 5 percent or more for some facilities. However, a number of qualifications must be recognized.

First, the costs of extending equipment service life are not known. There may or not be a positive trade off when additional repairs, diminished equipment productivity, and energy inefficiencies are considered.

Second, LLNL management may accept more risk in their equipment replacement practices. For example, the survivor curve shown below indicates that service life for pumps could be extended to 50 years, if an organization accepts the probability that 75 percent of the pumps will have been replaced before that point. Equipment run to failure rather than replaced on a fixed schedule would arguably have a longer service life, but at a higher risk of interrupted service.



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Third, the service lives found at LLNL may not be applicable to other facilities. The equipment histories at LLNL are the product of work quality, local economic conditions and even climactic factors unique to the location.

Given these qualifications, we feel the LLNL findings are important but cannot be generalized to other facilities without further research. Two types of studies should be undertaken: first, case studies of individual equipment should be done to identify any costs associated with extending equipment service lives; second, corroborating survivor curve studies should be done for other organizations with the requisite equipment histories.

References

ASHRAE (2003), *2003 ASHRAE Handbook: HVAC Applications,* Chapter 36, Atlanta.

Hiller, Carl (August 2000), Determining Equipment Service Life, *ASHRAE Journal*

Whitestone Research (July 2006), *Parametric Estimation of Deferred Maintenance, Additional Tasks*. Completed for the National Nuclear Security Administration, U.S. Department of Energy.