

Chiller Efficiency: Condenser Fouling

Chillers consume a lot of energy. This is a well-known fact by most facility managers. Additionally, by the inherent nature of their design, chillers foul (especially water-cooled condensers) and lose efficiency over time—consuming excess energy and racking up unnecessary costs. How much is chiller inefficiency costing you?

In many facilities, chillers are the largest energy-using component, and can consume over 50% of the electrical usage during hotter months. The U.S. Energy Information Administration estimates that chillers represent over 25% of the total electrical consumption in Commercial sector, and over \$11 Billion is spent annually on cooling of commercial buildings.

As chillers operate, their water-cooled condensers often accumulate deposits via scaling, sedimentation, corrosion, and biological fouling. These deposits build up an insulating layer on the tube walls, impeding heat transfer and robbing the chiller's efficiency.

By combining data from the Carrier Handbook and from James Piper's *Operations and Maintenance Manual for Energy Management* on the effect fouling has on heat transfer coefficients and chiller efficiency, a calculator can be created for estimating the costs of condenser fouling.

For example, the chart below shows the results for chillers operating 3000 hours a year, with an energy efficiency rating of 0.65 kW/ton and energy costs of \$0.09 / kW-hr. For the 2000 ton chiller, you can see that with light deposit buildup of 0.006 inches, wasted energy costs are \$14,000 per year, but with **accumulation of 0.036 inches (still less than 1mm) wasted energy costs balloon to \$95,000 per year!**

