

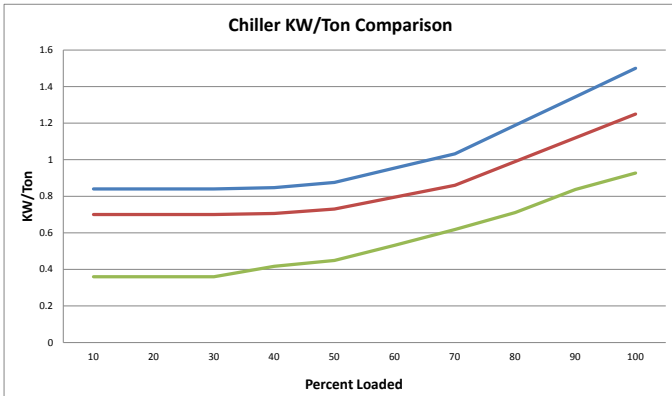
# Solution Study – Life-Cycle-Cost Study



## Background

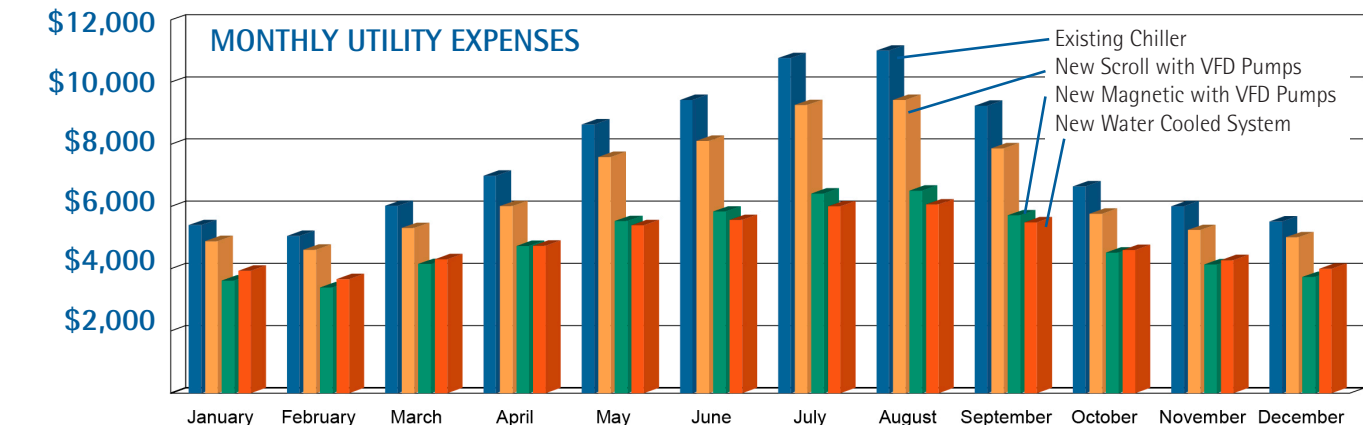
This example LCC study involved a large facility in the hospitality industry and compared:

- The existing reciprocating compressor chiller without compressor, AHU or pump VFD's.
- New Scroll chiller with VFD pumps.
- New Magnetic bearing oil-free chillers with VFDs on all pumps and AHUs.
- New water cooled chiller system.



Data and graphs provided by CDMtek, Austin, TX.

PRODUCT ALTERNATIVES	FIRST-COST DIFFERENCE	ANNUAL SAVINGS	CUMULATIVE CASH FLOW DIFFERENCE	SIMPLE PAYBACK (Years)	INTERNAL RATE OF RETURN	LIFE CYCLE COST ADVANTAGE
New Scroll versus Existing	\$ 70,000	\$ 11,639	\$ 162,784	6.0	15.7%	\$ 44,275
New Magnetic versus Existing	\$ 163,000	\$ 32,462	\$ 486,249	5.0	19.3%	\$ 155,721
New Water Cooled versus Existing	\$ 258,000	\$ 32,706	\$ 396,119	7.9	11.1%	\$ 63,111
New Magnetic versus New Scroll	\$ 93,000	\$ 20,823	\$ 323,466	4.5	22.0%	\$111,446
Water Cooled versus New Magnetic	\$ 95,000	\$ 243	\$ -90,130	No payback	No payback	\$ -92,609



**Study Life: 20 Years**

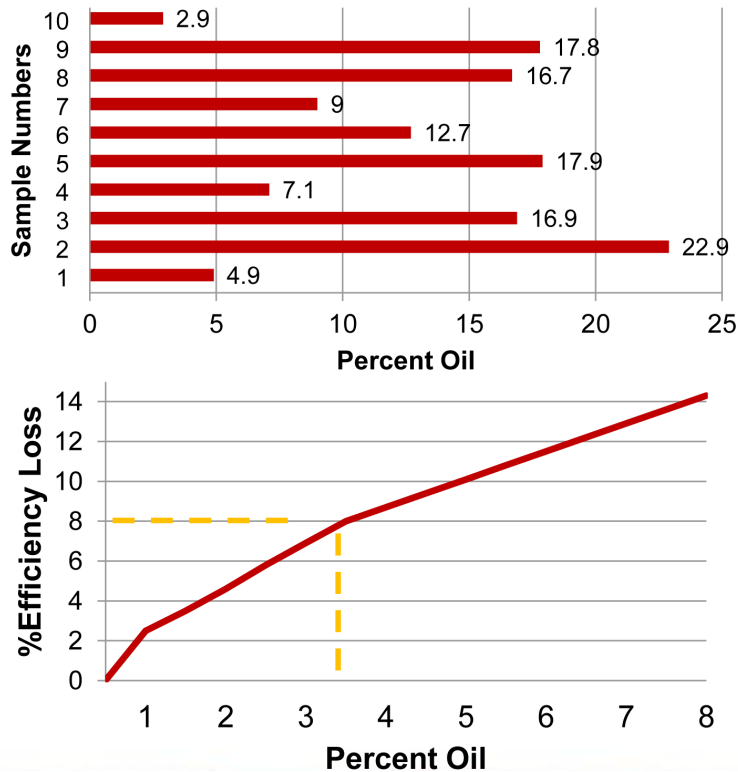
**Cost of Capital: 8%**

**Approaches: Existing, Scroll, Magnetic, Water**

**Analysis Results**

The Trace 700 analysis demonstrated that while the Scroll chillers costs half as much in up-front capital, the Magnetic approach provides nearly three times the energy savings, producing a simple payback in 5 years - a year sooner than the Scroll chillers. The Magnetic bearing approach resulted in a Life-Cycle advantage of more than twice that of any other approach. The Magnetic air cooled chiller produced excellent energy efficiency and resulted in operating costs similar to water cooled systems, and showed a payback in half that of the water cooled alternative.

# The Effect of Oil in the System



“An ASHRAE study determined that the vast majority of installed chillers have an excess amount of oil in the cooling system.”  
*ASHRAE research study 601*

3.5 % of oil in the refrigerant charge reduces system efficiencies by 8 %

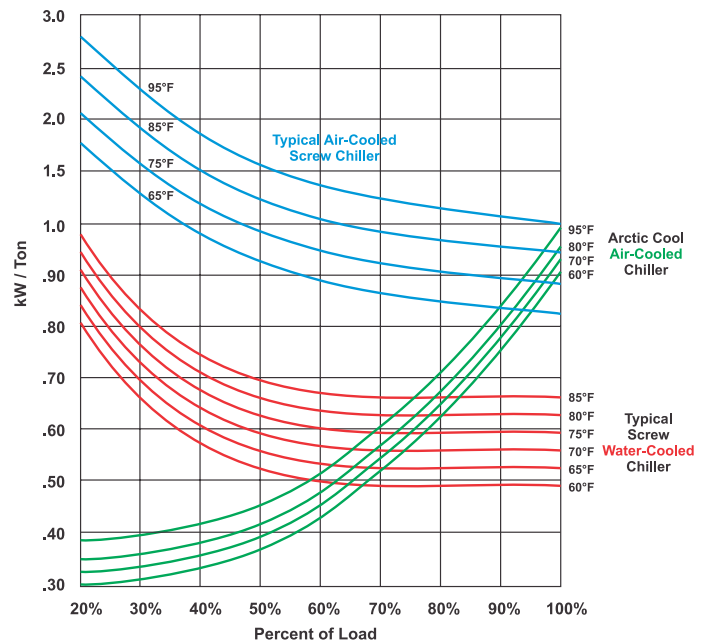
## LUBRICATED CHILLERS ARE NOT SUSTAINABLE

The ASHRAE study stated: “Flow boiling results have been obtained for newer enhanced boiling tubes with R-134a. This enhanced tube shows a decrease in heat transfer with the addition of even a small amount of oil throughout various heat loadings. Even at 1 percent (by weight) oil, the heat transfer coefficient is reduced by 25 percent from its no oil baseline. At higher oil content, a 30 percent reduction has been typically measured.” Losses accumulate over the life cycle.

## AIR-COOLED OIL-FREE MAGNETIC BEARING CHILLERS PROVIDE SOLID ROI

Chart shows the dramatic energy savings of ArcticCool oil-free magnetic bearing *air cooled chillers* compared to traditional approaches. Economies at 70% load and below are achievable.

AIR COOLED - VS - WATER COOLED CHILLER PERFORMANCE



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