

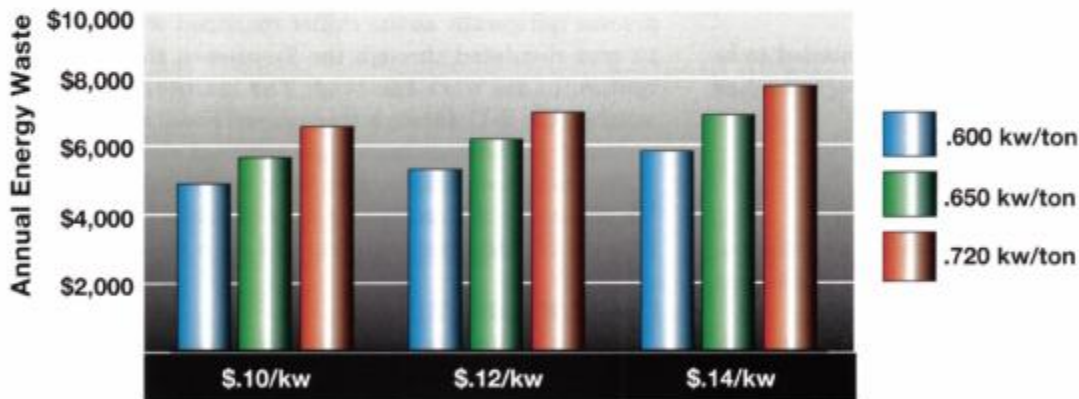
## Excess oil: A major contributor to poor chiller performance

*New technologies can be used to detect and remove oil off-line and on-line. This means you can improve chiller performance without shutting it down.*

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### Cost of operating an oil-logged chiller

500 ton chiller with 4% excess oil in evaporator at various kw/ton ratings



Assumptions: 2,000 equivalent full load operating hours per year; seven month season, \$6/kw demand charge.

### Excess oil decreases efficiency

ASHRAE Research Project 601-TRP sampled refrigerant in 10 operating chillers chosen at random. The study found that all contained excess oil in varying amounts.

The three chillers with the lower amounts of oil had been serviced and had their refrigerant recycled within the last six years, but still had oil levels high enough to significantly reduce performance.

#### Conclusions:

- Excess oil builds up gradually, eroding chiller efficiency.
- Complete refrigerant-side decontamination will restore the chiller to its rated tonnage.
- The energy benefits gained by decontamination will continue for several years. Regular refrigerant analysis will indicate when the service is needed again.

Recent studies have identified excess oil on the refrigerant side of a chiller as a major contributor to reduced chiller performance. And the problem is more widespread than previously thought.

In one study, ASHRAE Research Project 601-TRP, samples of refrigerant from 10 operating chillers were analyzed for oil content. All of the chillers were found to contain excess oil in varying amounts.

The three with the lowest levels had been serviced and had their refrigerant recycled in the last six years, but the amount of oil present was enough to significantly degrade performance (see accompanying article).

Chiller manufacturers recommend levels no higher than 0.5%.

Excess oil in the three chillers ranged from 3% to 7% and in the other seven chillers, from 9% to more than 20%.

Large amounts of excess oil on the refrigerant side is not uncommon. Although an oil accumulation of more than 20% seems unlikely, it happens more often than people would think.

### CASE IN POINT

Recently, Hudson was called in to reclaim refrigerant from a mothballed chiller in a major Boston department store. The service contractor told Hudson's technicians that the chiller had been idled and a new one installed because the old one couldn't handle the load.

Now the store's management wanted it ready to serve as a backup in case the new system went down.

It was soon apparent why the original chiller couldn't perform effectively — the oil level in the refrigerant was more than 20%.

Hudson's technicians used their patented, portable ZugiBeast® reclamation system to remove the oil and other contaminants on-site, while the service contractor did the necessary maintenance on the system.

Soon after the job was done, the new chiller needed to be shut down for repairs. The old system was brought on-line and handled the load with ease.

The problem all along had been the oil buildup.

### THE SOLUTION: REFRIGERANT SAMPLING

With the increasing awareness of how refrigerant-side contaminants can degrade chiller performance, more reclaiming companies now offer refrigerant sampling service.

Hudson Technologies provides customers with a sample kit consisting of a sampling cylinder, detailed instructions for its use, return packaging, and labeling. The client draws a sample into the cylinder and ships it to Hudson.

Once received, the refrigerant is analyzed for contaminants, including excess oil. Technicians enter the results in a database and chart any trends, enabling the client to identify problem areas in advance and plan service for a convenient time.

Of course, if the analysis detects significant amounts of oil or any other contaminant, Hudson is prepared to decontaminate the system promptly.

### ON-LINE OIL REMOVAL

One of the benefits of high-speed, portable reclamation technology is the flexibility it gives the reclaim company.

Recently, the flexibility provided by ZugiBeast technology led to the development of on-line decontamination services.

Hudson had been called in by a major film and fiber manufacturer after one of its chillers failed to carry the process load. After discussing the problem with the manufacturer's maintenance engineer, Hudson technicians determined the source was excessive oil collecting in the evaporator, and a dirty receiver.

"We considered the possibilities," said Chuck Harkins, Hudson's national sales manager. "The standard procedure would be to shut down the chiller, recover the refrigerant, and ship it to our regional facility for reclamation.

"After a day's reclamation, we would ship it back, reinstall it, and bring the chiller back on-line. Typically, that amounts to about a week of downtime."

But the client's production manager pointed out that downtime would cost the company \$10,000/hr in lost production. And the company was running three shifts a day.

The production manager asked if there was any way to reduce downtime. Harkins conferred with his engineers and technicians, and they came up with a way to remove the oil while the chiller remained on-line.

"We told them we had a solution that would enable them to keep their line up and running while we purified their refrigerant," said Harkins. "At first they were skeptical, but that was because they were unfamiliar with portable reclamation technology.

"When we explained that our system could recover and reclaim on-site at speeds up to 6,000 lb per hour, and that we had come up with a way to do it on-line, they gave us the go ahead."

Harkins and his technical team arrived at the client's facility with the ZugiBeast and 200 lb of R-11. They positioned the reclaiming system next to the evaporator and used the additional refrigerant to fill the reclamation system so it would not drain R-11 from the process cooling chiller.

Then they hooked up to the evaporator and began to process refrigerant as the chiller remained on-line. As the R-11 was circulated through the ZugiBeast, the oil and other contaminants were removed. The maintenance engineer watched the R-11 through transparent hoses as it entered the reclaiming system and came out clear.

Hudson's technicians used their analytical on-line testing lab to monitor the refrigerant as it circulated. After 8 hrs, all traces of oil and other contaminants were gone.

### ONE STEP BETTER

While on-line decontamination provides a solution to severe performance problems, the best solution to refrigerant-side problems is a quarterly program of refrigerant sampling and analysis.

With the lost efficiency caused by excess oil and other materials, it makes sound financial sense to use preventive maintenance.

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