Q & A: Air-Cooled Condenser
with Microchannel Coil Technology

H-ACCMCX-QA

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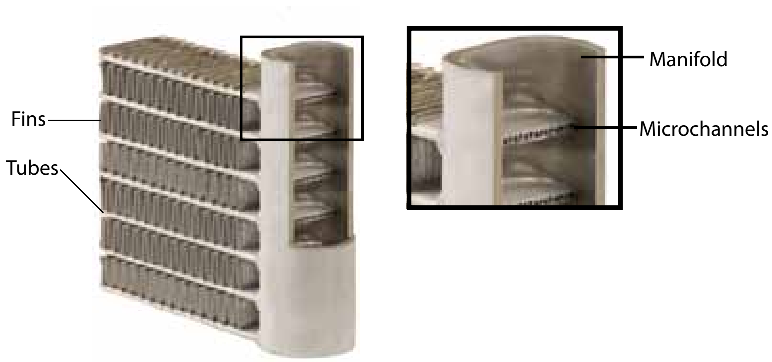
DEFINITIONS

RTPF – Traditional Cu/Al round tube, plate fin coil
E-coat – Generic term for a coil coating that is either electro-deposited or a baked epoxy

Q1. What is microchannel coil technology?

Microchannel condenser coils are all aluminum coils with multiple flat tubes containing small channels (microchannels) through which refrigerant flows. Heat transfer is maximized by the insertion of angled and louvered fins in-between the flat tubes. These components are joined with two refrigerant manifolds using an aluminum-zinc alloy brazing material in a nitrogen-charged braze furnace to make the completed microchannel coil.

Coil circuiting is accomplished by placing baffles in the distribution manifolds to feed the refrigerant through the flat tubes.



Q2. How is the microchannel coil better than an RTPF coil?

Microchannel coils have significantly improved performance over traditional copper/aluminum RTPF coils in a number of areas:

1. Improved Heat Transfer Performance

Microchannel coils' heat transfer performance is 20-30% higher than standard RTPF coils of the same size, enabling comparable capacity to be achieved with a smaller coil.

The higher heat transfer performance is obtained by the flat tubes, which maximize airside heat transfer, and microchannels within the tubes. The microchannels maximize refrigerant side heat transfer via multiple tiny refrigerant channels which provide increased primary surface area. Additionally, the metallurgical fin-tube bond resulting from the braze operation maximizes surface contact and increases the heat transfer surface area, further improving the heat transfer performance of the coil.

2. Reduced Refrigerant Charge

Microchannel coils have a smaller volume, lowering condenser refrigerant charge by more than 70%. As such, the use of microchannel coils provides a more environmentally friendly solution for refrigeration systems to help reduce ozone depletion and global warming.

3. Improved Corrosion Protection

Microchannel coils have been proven to last significantly longer than standard RTPF coils in extended tests.

The corrosion potential with the all aluminum microchannel coils is significantly lower than in copper/aluminum (bi-metal) RTPF coils as there are no dissimilar metals to initiate galvanic corrosion. This makes microchannel coils an inherently better solution for coastal installations, or any application where corrosion may be a concern.

Please refer to Question 7 for more details on how microchannel coils perform in a corrosive environment.

4. Durability & Reduced Leaks
Microchannel coils require only one braze operation versus 100-250 manually brazed joints for RTPF, significantly reducing the likelihood for leaks. Additionally, the flat tubes serve as a fin guard to help protect the fins from damage.

5. Ease of Service & Repair
Microchannel coils are easily cleaned and can be field repaired using a two-part epoxy process.

Microchannel coils are about one inch thick allowing for easy removal of any debris that may be caught within the coil. This is not so with RTPF coils, which are often 2 to 5 inches thick with staggered tube patterns using corrugated fins which make debris removal difficult, if not impossible, in some circumstances. The durability of microchannel coils also allows for pressure washing (using a broad spray pattern), which is not recommended with RTPF coils.

Coil leaks, while unlikely, can also be easily repaired in the field using a simple process.

Please refer to Question 6 for more details on field repair of leaks in microchannel coils.

Q3. Where else have microchannel heat exchangers been used, and why?
Microchannel coils have been used in the automotive industry for over two decades and are now an industry standard. Microchannel coils have replaced RTPF coils in all mainstream automotive air conditioning condenser, radiator and oil cooler applications.

The switch to microchannel coils enabled the automotive industry to avoid increasing the weight of their vehicles and comply with regulations requiring a phase out of R-12 to the more environmentally friendly R-134a. Microchannel coils allowed the industry to maintain the same capacity with R-134a as they had observed with R-12.

Microchannel coils have also been installed in our 1/2-6 HP Condensing Units with very good results and reliability.

Q4. If microchannel heat exchangers are such great technology, why hasn't it been adopted by other industries?
Microchannel heat exchangers have been around since the 1980's in the automotive industry. While the merits of the technology have been known for decades, application of microchannel heat exchangers to non-automotive industry applications were cost prohibitive due to the lower volumes. It has only been recently that the manufacturing advances in microchannel heat exchange have enabled the technology to be priced competitively with traditional RTPF coils in the HVACR industry. However, many microchannel coil suppliers are still not cost competitive for refrigeration volumes.

Q5. This looks like pretty tight fin spacing. Won't this coil clog up faster than our current coils?
At first glance, the tight fin spacing of the microchannel coil does look like it might pose a problem. In application, it is less likely to clog than traditional RTPF coils.

Upon closer inspection of the microchannel coil you will see that the coil is only 1.06" thick, vs. 2.5" to 5.2" thick for typical RTPF coils. The RTPF coil's corrugated fin pattern coupled with its thickness and the staggered tube pattern provide more opportunity for clogging than the microchannel coil.

As a result, the microchannel coil is less likely to clog and is easier to clean.

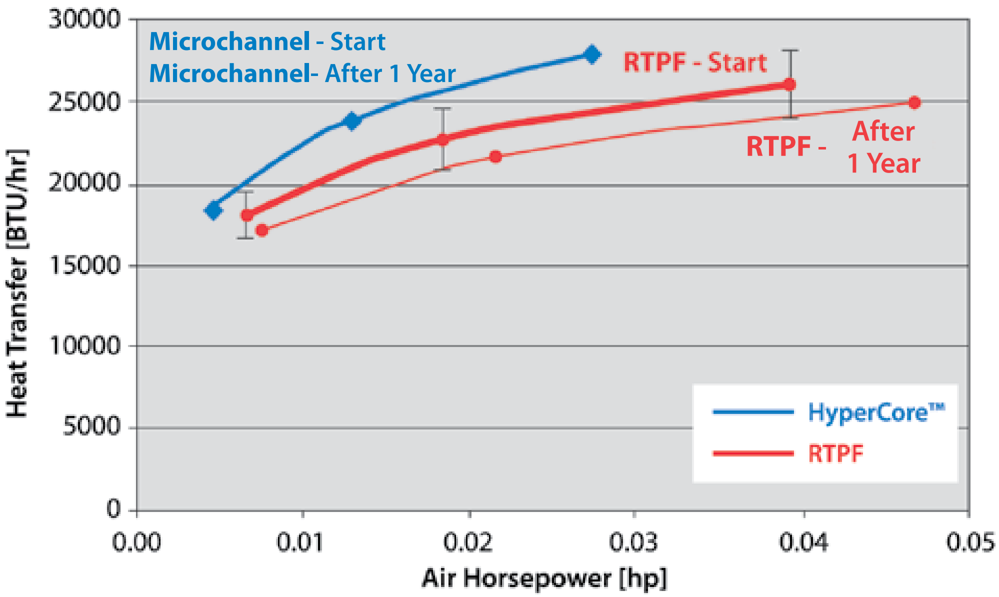
Q6. What can be done about leaks? It has been said repairing leaks in an aluminum coil is close to impossible.

Since there are no manually brazed joints in microchannel coils, and the units are designed with a rigid structure, the likelihood of leaks is dramatically reduced. However, if repair to horizontal tubes is necessary, a simple process using an epoxy based sealant (such as Red Epoxy), a cleaning solution, a vacuum pump, a few simple tools, and a hot air gun is all that is required.

Q7. How do microchannel coils perform in a corrosive environment?

The all-aluminum microchannel coils with zinc cladding perform very well in a corrosive environment. A coastal corrosion test was performed to compare the corrosion resistance of Cu/Al RTPF coils and all-aluminum microchannel coils. After one year, both coils were tested to measure current performance against baseline performance. The chart below shows an imperceptible change in the microchannel performance and approximately an 8% reduction in capacity for the Cu/Al RTPF.

In addition to the performance testing, before and after photographs of the coils show a marked difference in the two coil types.



Source: Modine Manufacturing Company

RTPF

Figure 1 – RTPF Coil with No Exposure

Figure 2 – RTPF Coil with 1 Year of Exposure

Microchannel Coils

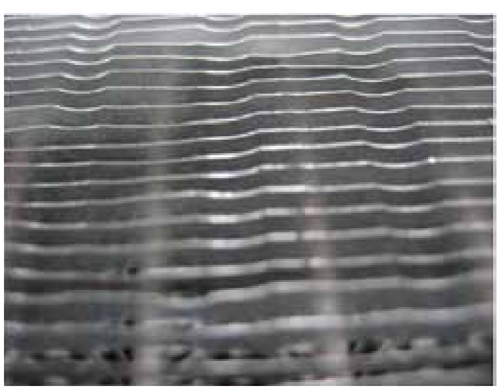


Figure 3 – Fins with No Exposure

Figure 4 – Fins with 1 Year of Exposure

Source: Modine Manufacturing Company

Q8. How will the aluminum coil be joined to the copper tubing in the unit?

The microchannel coil will have a stainless steel transition joint brazed onto the aluminum header connection. One end of this transition joint will have copper plating where the unit tubing attaches. Because the copper and aluminum do not touch, there is no chance for galvanic corrosion.

Q9. The channels are very small, won't these plug up?

In two separate tests to evaluate situations that could lead to clogging of the channels, Heatcraft Refrigeration Products did not observe any change in performance or internal coil plugging. The first test using multiple units with microchannel coils had the compressors go through a slow burn out to obtain a worst-case burn out situation. In the second test, miscellaneous debris (copper, flux, moisture, dust) was added to the refrigerant. In both cases there was no change observed in performance or internal coil plugging.

Our supplier performed a similar test to simulate compressor burnout with the same results; no degradation of performance or indication of internal coil plugging.

Q10. How much refrigerant charge reduction will I be able to achieve with microchannel coils?

The amount of refrigerant charge required by the condenser is reduced by more than 70%. The total system charge will depend on the system arrangements, connection manifolding and the length of the liquid line.

Q11. Can these coils be replaced if damaged?

We can anticipate that the structural rigidity of the coils coupled with the elimination of manually brazed joints and improved corrosion resistance will significantly reduce the likelihood of coil failure. However, if a coil must be replaced, these units have been designed to facilitate a very easy replacement process. Replacement microchannel coils will be available through Interlink™ Parts. Interlink™ Parts can be reached at (800) 686-7278 or www.heatcraftrpd.com

Note: At time of original installation, customer should allow sufficient room to access and replace coil.

Q12. Is there a maximum design TD for these units?

These units are optimized for operation at or below 15° T.D. Operation above 15° T.D. may result in excessive pressure drop.

Variable Speed EC Motors (VSEC)

Q1. What is an EC motor? How is this better than a standard PSC motor?

Electronic commutation (EC) and sometimes referred to as brushless direct current (BLDC), allows for more efficient control over the speed of the motor. The motor speed of an AC motor is determined by the number of poles in the motor winding; increasing the number of poles will decrease the motor speed. In an AC motor, that speed is determined by the frequency of the alternating current. Of course, an AC motor is not limited to just one speed, but it does mean that AC motors are designed to operate at a particular speed. The efficiency of an AC motor (such as a PSC motor) drops significantly as the motor RPM deviates away from the design motor speed.

Q2. What is the Variable Speed EC Motor?

The speed of an EC motor is governed by the switching of electronics. This means that the ability to control speed is automatic in an EC motor. It also means that an EC motor runs at near full efficiency whether it is at start-up, full speed or any speed in between. An EC motor offers up to 50% greater efficiency than a shaded-pole motor, and up to 35% greater effciency than a PSC motor. This is not the case for motors controlled by variable voltage controls, inverters, or wave choppers, especially at hte low speed range.

Overall, a variable speed EC system provides a more stable system, improves product integrity, improves compressor durability and reduces energy consumption.

Since product improvement is a continuing effort,
we reserve the right to make changes in specifications without notice.

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