University of Colorado
TECHNOLOGY TRANSFER OFFICE

Efficient, Low-cost Microchannel Heat Exchanger

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IP Status:
Patent pending; available for partnering.

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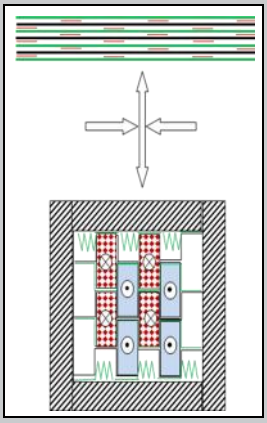
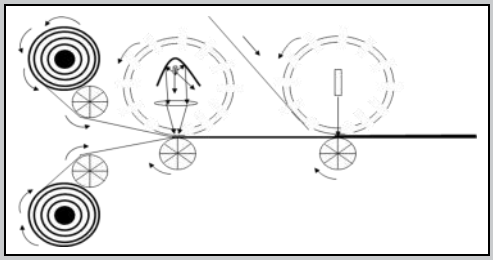
Technology

A research team at the University of Colorado has developed a novel heat exchanger design and accompanying manufacturing technique for creating low-cost microchannel heat exchangers from plastics, metals, or ceramics. The prototype used laser welding (upper red lines at right). Expansion makes "chessboard" counter flow pattern (lower right). The figure below shows mass production, where sheets are added one at a time and welded with a mask and filament (left) or laser (right). The process could also use inkjet printing of adhesives or acoustic welding. After joining, the sheets are cut up into pieces, expanded, and fixed in shape by insulation.





Optimization results for this device indicate that the new heat exchanger will not only be much more efficient, but will also be manufactured at a much lower cost. This novel microchannel counter-current or cross flow design can be used as a replacement for all kinds of heat exchangers including tubular, plate, spiral, plate-fin, tube-fin, heat pipe, perforated plate, and heat wheel. The near term applications would be non-gas (liquid or phase change) heat transfer because these would have the greatest cost advantage.

Additional Advantages

- Lower pumping power required (laminar flow)
- Lighter weight (for vehicles and shipping costs)
- Smaller size (for vehicles and shipping costs)
- Longer life (laminar flow reduces erosion)
- Reduced noise (of heat exchanger and pump)

Near-term Applications

- Vehicles (transmission & engine oil coolers, marine water cooled radiators)
- Buildings (chillers, cooling towers, heat pump water heaters)
- Conventional power plants (condensers, cooling towers)
- Industrial processes (pasteurization, desalination, cryogenics)
- Renewable energy (concentrated solar power, residential solar hot water, geothermal power plants, solar water pasteurization)
- Other applications (liquid-cooled electronics for aerospace)

Microchannel Expanded Heat Exchanger. PCT application filed Dec. 2, 2010.