strength in the same way that corrugation adds so much strength to cardboard. This means aircraft could be designed with the roll bond used for stronger structural members and solve the problems of heat at supersonic speeds by carrying coolant at the same time.

The new method, according to Massachusetts Institute of Technology, brings solar heating of houses closer to reality. There are three problems in solar heating — trapping the heat, storing it, conducting it through the house. MIT reports that a roof made of roll bonded sheets is the most efficient means yet found for trapping the heat of the sun. Water within the tubing is heated by the rays of the sun. Hot water is then drawn through the house within the passageways of roll bonded walls, ceilings and floors.

Tomorrow's automobile radiators may be much smaller because roll bond eliminates the need for solder or other nonconductive materials that trap heat within a conventional unit.

Air conditioning units can be made smaller, at lower cost, and more efficient. Refrigerated trucks and railroad cars of the future could be cooled by evaporator plates, in which the collant is stored and conducted — with no chance of leakage, with the use of less parts.

It is in the refrigeration industry that the process has really been tested and proved. During the past 18 months, Olin Mathieson has been producing roll bonded evaporator plates for a major refrigerator manufacturer. They have been made in a small pilot plant at the Western Brass Mills in East Alton. More than 250,000 are already in use in homes throughout the country.

HOW THE PROCESS WORKS

Here's how a refrigerator evaporator plate is produced by the new roll bond process at Olin Mathieson's East Alton plant:

The flat pieces of aluminum or copper are cut to size and cleaned. With the silk screen process, the pattern that will become tubing and other passages is applied to one of the flat sheets. The "paint" used to apply the pattern is a stop-weld material that prevents a surface painted with it from bonding to another piece of metal under heat and pressure.

The stop-weld material is applied as a painter applies paint to a stencil — squeegeed onto the metal by a rubber roller.

The two sheets are placed face to face to form a metal "sandwich." These are spot-welded to keep them together in the proper relative positions.

The "sandwich" is heated and rolled. The first hot rolling produces a complete bond. Subsequent cold rollings reduce the now homogeneous sheet of metal to proper thickness.

Rolling operations elongate the pattern several times. The key to the success of the operation then, is to pre-plan a silk screen pattern, which, when elongated, will result in perfectly proportioned patterns.

After roll bonding, the fused material is annealed. Everything bonds except the area where the stop-weld pattern has been applied.

After annealing, one end of the new elongated metal plate is trimmed. This bares the lead-in end of the stop-welded pattern. A needle, much like that used to inflate a football, is then inserted into the bared end of the stop-welded pattern.

The next step is to place the bonded plate between two heavy platens — flat plates of metal — in a hydraulic press. Hydraulic pressure is then applied to inflate the non-welded design. Areas where stop-welding has been applied become passageways. These passageways are an integral part of the material.

Passageways are then flushed out and cleaned to remove the stop-weld. It is then thoroughly dried internally.

The result is a labyrinth of dilated passageways which correspond exactly to blueprint specifications.

COMPLETE CONDUCTIVITY

Since the sheet and tube are homogeneous, they provide maximum heat conductivity. Old methods of braze welding or soldering pipes to an evaporator plate create air spaces between tube and plate. This very greatly reduces conductivity, since heat cannot be transferred any more efficiently than the welding material's ability to transfer heat.

The bond of metal is as strong as the original metal. There is absolute fusion of the metal with complete grain growth. This means the metal fuses together as if it were one original piece of metal.

Tensile tests under extreme pressure prove the strength of the bond; when pressures are increased to a breaking point, it is the tube which ruptures — never the bond.

COST REDUCTION

Real cost reduction with the new process lies in the radical design changes it makes possible. It is now possible to build the header or accumulator right into the design. This eliminates the cost of a separate attachment and the necessary brazed, stop-welded bonds. The evaporator back as well as a secondary circuit plate can be incorporated into the design and contains parts of the refrigerating system.

The same results in bonding can be obtained with any metal that can be rolled bonded — including copper, high copper alloys and stainless steel.

The Metals Division of Olin Mathieson Chemical Corporation maintains sheet and strip brass mills at East Alton, Illinois and New Haven, Connecticut. These mills produce 40 different copper and copper base alloys — brasses, bronzes and nickel silvers. Each mill has a fabricating department specializing in the finished and semi-finished processing of metals.