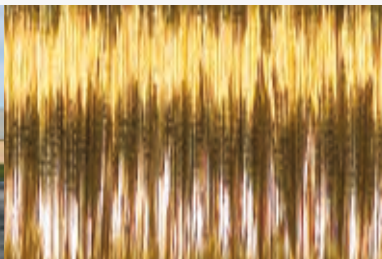


HERRINGBONE CROSSHATCH™ (2V-XH™) High Performance Tube

Luvata HERRINGBONE CROSSHATCH tube (2V-XH) is a proven effective high performance condensation tube for A/C and refrigeration systems. The unique surface is made using Luvata's state-of-the-art "roll-and-weld" process. The 2V-XH tube is compatible with traditional heat exchanger manufacturing equipment.



About Luvata

Luvata is a world leader in metal fabrication, component manufacturing and related engineering and design services. We are committed to partnering with our customers to help them increase their competitiveness. Our products and services enable our customers to improve operational efficiency, improve products and reduce tied-up capital. Because we focus on our customers' results and are unfailingly reliable, we are the partner on which our customers base their future development.



Development History – Enhanced inner tube surfaces

Luvata started development of enhanced tubes in the early 1990's, beginning with enhanced helical (H) tube. This was followed by axial (A), shallow CrossHatch (SXH), deep CrossHatch (DXH), lightweight helical CrossHatch (XHH), and finally Herringbone CrossHatch (2V-XH). We are constantly striving to develop tubes with higher heat transfer performance. Global requirements for energy efficiency in air conditioning systems are becoming more stringent. Luvata is leading the way through continuous development of tube surfaces.

High Performance Tube – Reasons for increased demand

Raw material costs drive Luvata to work continuously with our partners to make more efficient heat transfer systems. This work has led to the development of many enhanced inner tube surfaces, including 2V-XH. Increasing the heat transfer performance of our tube allows the size of heat exchangers to be minimized. This reduces unit footprint, raw material cost, and total cost of ownership.

2V-XH – Production and Availability

Luvata currently produces millions of pounds of 2V-XH annually. It is currently available in 7mm, 5/16", and 3/8" tube sizes. This tube is packaged in Luvata's revolutionary "tube-in-a-cube™" (TIAC™) package.

2V-XH – How the enhancement works

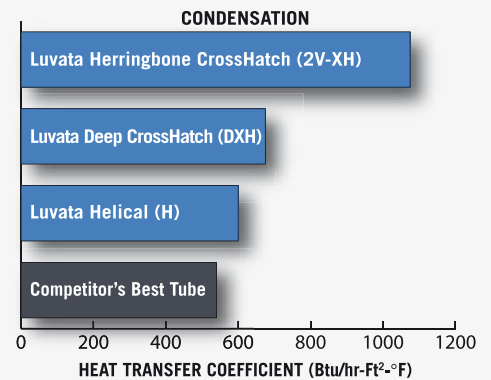
The V shaped grooves are embossed on the inner surface along the longitudinal direction of a tube. The refrigerant liquid layer flowing in channels converge at the top of a V-channel. The channels created by CrossHatch (XH) collect refrigerant condensate and lead it to move forward. The CrossHatch channels also reduce the flow resistance on the inner surface causing lower pressure drop. The heat transfer enhancement is due to the thin film layer created by the surface tension and continuous disturbance in the thin refrigerant liquid layer by our unique surface structure. Luvata herringbone CrossHatch tube is patent pending.

Success Stories – Suggested applications

In a light commercial application, the standard production tube was replaced with Luvata herringbone CrossHatch tube in a condenser for a rooftop unit. The switch reduced the number of coil rows from 3 to 2.

In a refrigeration application, Luvata herringbone CrossHatch was applied to refrigeration condensers. Test results show that the new system had the equivalent performance with a 16.7% reduction in raw material costs.

In a residential air-conditioning application, condensers were redesigned using Luvata herringbone CrossHatch tube. Compared with the baseline units, the new systems were 20% smaller in size, 30% less in raw material costs, and 40% less in refrigerant charge.



Luvata has worked internally and externally in cooperation with a leading 3rd party lab for performance testing. 2V-XH was found to be at least 2 times more effective than the best competitor in condensation heat transfer coefficient.