Refrigeration Brazeless Fitting Project
Canada vs Europe

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Introduction

Refrigeration fittings have taken a turn in the last 5 years from the old style copper “sweat” fitting to a more engineered product, such as a “compression” or “press to connect” type. Some of the compression type fittings and “push to connect” have been in use by the plumbing industry with good success, however a refrigeration fitting requires a few more steps in order to qualify. A refrigeration fitting should hold vacuum, stand a higher burst pressure and be able to sustain temperature variation from -40c to 200c.

Fitting materials have also changed in recent years with the introduction of CO2 as a refrigerant. We now see fittings made of either stainless steel or copper-iron blend to be able to hold 2000 PSI working pressure.

The use of CO2 as an evironmentally friendly refrigerant is limited by its high pressure and the skill needed to braze copper-iron alloy or weld stainless steel in the field, should a leak develop. The ability to design a fitting that will allow ease of joining will help promote a natural refrigerant and help the plant get rid of CO2.

The HVAC fittings market is estimated at around $300,000,000 USD.

Brief Project Description

We know that two universities in Europe are working to develop a similar product. We hope to work with UBC to be the first to market with the product. The aim of this project is to design a type of a connection (i.e., Elbow at 90 or 45 degrees, Tee or Couplings) that will not require any heat (sweat or braze) to lock onto a pipe or tube. The connection will have to hold vaccum, and pass burst pressure test, leak test and temperature range test.

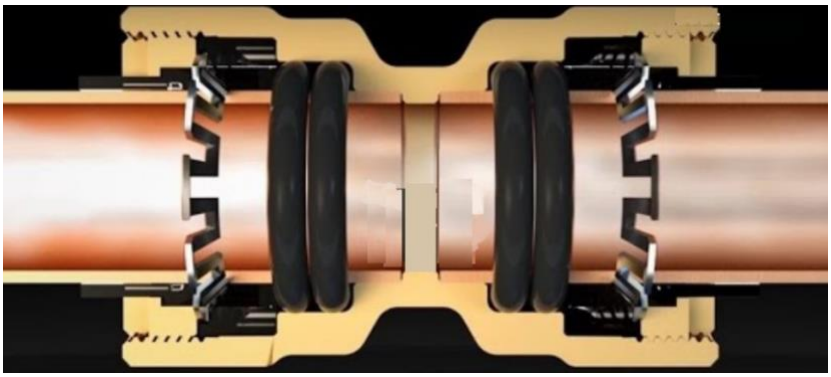
The connection can use both the inside and outside tube wall to hold onto but preferably only the outside should be used to maintain minimal pressure drop due to decreased internal diameter.

Many of the current fittings that are on the market use a type of “jaws” to crimp the fittings on the tube. The jaws are expensive and you are required to buy all sizes from ¼” to 4-1/8”. Rapid

Locking System (RLS) is a patented fitting that uses only the outside of the tube but the large tool that is required to press the fitting is a problem in tight places.

Other fittings that have entered the market require an “insert” to squeeze the tube between an outer ring and insert, thereby limiting the user to a defined wall thickness. An example is the fittings from http://tufflok.com/

The closest fitting we have seen to date that comes close to what we want is Rectorseal and can be seen here: https://youtu.be/8-V_kAYn3VI



Expected Outcomes

NDL is looking to find an effective way to join tube/pipe in the refrigeration industry without the need to braze or preferably without a tool to crimp/press onto the tube. The mechanical connection should be able to work with pipe or tube made of stainless steel or copper-iron blend, such as C194 alloy.

The fitting should be manufactured to be competitive when accounting for the cost of a regular fitting, time to braze and other materials.

Resources Available from the Customer

NDL is committed to supporting the student team. We will make ourselves available to meet in person or by Zoom at any time during the project.

A list of current manufacturers who offer mechanical refrigeration fittings will be made available, as well as several actual samples.

We can provide prototypes of the connection once students have completed the design phase and supplied NDL with a production drawing.

Financial support to gather information such as ASME standards, other research papers, or any 3D printing, tools, etc, will be available as well.

Our R&D department can test metal composition, carry out a burst pressure test, tensile test, etc. We can air freight any samples for testing to speed up the process, as our factory is located in China. If there is a requirement for certain testing that we cannot perform, we will find a local lab to do it.

Customer Requirements

Must have:

1. Can be produced economically.
2. A rated working pressure of 2100 PSI (UL 207 test).
3. Continuous operating temp of -40 to 200 celsius.
4. Vaccum pressure capability of 20 microns.
5. External leak rate < 0.1 ounces of helium per year.
6. Vibration resistance to meet UL 109 test.
7. Approved oils – POE, PAG, PVE and Mineral oil.
8. Size availability from ¼” to 2-1/8”.

Nice to have:

1. Ability to secure the fitting to the tube without a large tool and on the outer tube wall only.
2. A complete “revolution” of the current market designs rather than just improve the existing fittings.