

To: Frank Nagy TC3.3 Secretary

Date: 1/15/2014

From: Marc Scancarello

Subject: Proposed Standard; **Title, Purpose and Scope**

TITLE: *Method of Test for the Effects of System Contaminants on Expansion Devices*

PURPOSE: This standard establishes a test procedure to predict the likelihood insoluble chemicals will cause malfunction of HVAC&R expansion devices. Users can apply the method to examine interactions between primary system fluids (oil and refrigerant) and various other system process chemicals (rust preventatives, coil lubricants, etc.). This Standard may also be used to assess different expansion device mechanical designs in terms of sensitivity to system contaminants.

SCOPE: This Standard specifies the procedures associated with sample preparation, testing method, and data collection. It is intended to apply to all existing and future HVAC&R refrigerants and lubricants. Likewise, a broad range of system contaminants, either individually or in combination, can be evaluated using this method. Any type of expansion device may be assessed as well; such as TXVs, orifices and capillary tubes.

Sufficient detail is given to assure consistency between repetitive tests and between different laboratories. However, certain detail about testing conditions and criteria shall remain user-defined. This Standard will be employed to complement other systems chemistry screening tests, such as ASHRAE 97 Sealed Tube, however, this standard mimics a real system more precisely than a static bench test such as ASHRAE 97. The output of this standard is quantitative in nature (e.g., % flow loss or superheat drift, etc.).

BACKGROUND: Expansion device malfunctioning due to contamination has been an ongoing challenge throughout the history of refrigeration and air conditioning. There has not been a standardized test procedure available to assess risk. Contamination may cause system efficiency and capacity losses and even reliability concerns, for example evaporator coil freezing. Most problems arise from either a direct chemical deposition of an individual chemical contaminant or a deposition from a more complex reaction between the contaminant and other chemical constituents, including the sump oil and the refrigerant. The physical design of the expansion device may also play a role in the likelihood of contaminant deposition. The physics at an expansion device (phase changes, temperature and pressure gradients, etc.) combined with the myriad of process chemicals present in a typical HVAC&R system, make it nearly impossible to model or predict the effects of contaminants. Hence, empirical testing is typically required. There is an immediate need for this MOT now because of the multitude of new Low Global Warming Potential (LGWP) refrigerants being introduced into the global market. There will be a critical need to re-evaluate the “compatibility” of expansion devices with the wide variety of system process chemicals currently in use. Minimal safety protocol will also be recommended in this Standard.

Note: This Standard would directly help satisfy the ASHRAE Research Strategic Plan Goal No. 9 (particularly relevant to Technical Challenge #9 and Research Need #10).