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# TECHNICAL BULLETIN #193

## SEALING SMALL LEAKS IN AC&R SYSTEMS

The challenge of effectively locating and repairing small but persistent leaks in AC&R systems has long been a costly and time consuming one for technicians. Various solutions and application methods with varying degrees of effectiveness, safety, and labor intensiveness have come along to address this challenge, which if left unchecked can lead to the need for frequent replacement of lost refrigerant, environmental contamination, increased energy consumption and potential compressor failure.

### Polymer-Based Sealants

A number of methods have been utilized in recent years to address the sealing of small refrigerant leaks, both with regards to the method of action and of injection. Among the most common is the use of polymers designed to interact with oxygen or moisture. In a typical application, large polymer macromolecules are injected into the system and upon coming into contact with atmospheric oxygen or water vapor at a leak site, activate, bonding at the leak site and forming a seal over areas in contact with the air.

However, the introduction of polymers into a system can lead to detrimental and costly problems, including compressor failure. That's because polymer macromolecules are many times larger than the compounds which make up refrigerant, so they create the risk of clogs and reduced flow from buildup while circulating through the system.

Polymers activated by moisture carry additional risks, including plugged capillary tubes and TXVs. They can also damage recovery equipment. The bottom line is that polymer-based sealants, while generally effective at sealing leaks, can create far more damaging and costly problems than they were designed to resolve!

### Injection Methods

All sealants must be injected in such a way as to overcome system pressures to circulate the chemical to all leak sites. One traditional method involves the use of pressurized aerosol cans as a delivery mechanism. Such solutions work if the system pressure is very low – low enough to be overcome by the pressurized aerosol which can then disperse the sealant. Unfortunately, systems must often be pumped down to 50 psi or below for aerosol injection methods to be effective, and the use of a drying agent, vacuum conditions and a number of tools are often required.

With aerosol injection, there is no way to verify through the metal can whether the sealant is dispersed, and often if the can is not precisely straight, some or all of the sealant will remain in the can. As with all pressurized aerosols, safety issues such as flammability and can punctures are always present with such sealants.

Plastic syringe injectors and single use direct inject mechanisms have grown popular in recent years. Constructed of either plastic, glass, or another transparent or translucent material, they simply allow the technician to confirm that all of the sealant has been injected by viewing the injector. Despite this benefit, syringe and direct inject methods share several less desirable attributes with the aerosol variety, including the necessity for low system pressure (typically not above 100 psi) prior to injection. Some service technicians use a caulking gun to get a syringe to overcome system pressure, but this method often results in breakage of the syringe.

Looking at direct inject methods, despite being marketed as “simple to use”, they often require a manifold gauge and the opening and closing of several valves before injection can take place. If the proper procedures aren’t followed, a technician bears the risk of system pressure exceeding that which the injector can safely withstand. Direct inject assemblies can be quite brittle, so if an injector becomes damaged during use it can expose a technician to flammable and possibly carcinogenic agents.

## Cool Seal™ - A Safer, Simpler, High-Quality Approach

Spectroline® Cool Seal is a polymer-free, proprietary blend of lubricants and additives that successfully seals micro leaks formed by pitting, corrosion, loosened fittings or abrasion. When the sealant is exposed to an environment where there is a dramatic drop in pressure and temperature, a scab-like seal will begin to form over a leak. Then Cool Seal continues to collect around the outer perimeter of the leak site until it is fully sealed. It should be noted that Cool Seal will not form a seal internally within capillary tubes or the expansion valve, nor will it work on large leaks, because there is simply too much refrigerant flow for the sealant to effectively collect at a leak site and form a seal.

The Cool Seal injector and hose can be reused many times, with refill cartridges readily available. The injector can overcome system pressures in excess of 450 psi, making it ideal for all AC&R systems, including high-pressure R-410A systems.

Cool Seal is non-flammable and non-carcinogenic, making it much safer for technicians and those transporting the product. Direct injection systems can have flash points as low as 100°F (38°C), a temperature which can easily be exceeded on a hot day and cause combustion even during storage.

Cool Seal has a flash point of 485°F (252°C), over twice the boiling point of water. It can be safely transported and stored in any climate and does not require the safety precautions necessitated by many flammable sealants such as spark-free tools and a fire extinguisher suitable for chemical fires. In conclusion, with an effective, safe formula and a straightforward, proven injection method, Cool Seal becomes the obvious choice for technicians looking to seal leaks in AC&R systems.

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