Air conditioners on off-road equipment have their own unique difficulties to overcome. Often the cab is located much further from the engine than in a typical automotive application, leading to long hose runs and possible oil migration. Engine compartments on some equipment are cramped, with little access to service or install components. Long work days and constant vibration wear on all components. Most importantly, operators can tolerate very little downtime on these critical machines.

Refrigerant leak detection can be very time consuming, particularly with hose runs exceeding 20 feet and bundled with numerous other hydraulic hoses and wire harnesses. Less-than-rugged installation of components can lead to early failure of fittings, tubing, and even steel condenser housings. These factors left OEMs, operators, and service companies looking for more durable A/C solutions.

Into this market came air conditioners with hydraulically powered compressors. Hydraulic power allows components to be located close to the cab where they are needed or even all mounted into one self-contained package. Hydraulic powered compressors can be regulated to provide constant performance whether the engine is at idle or at full speed. They are often cleaner, more accessible, and easier to service than engine mounted compressors. Above all, they are very durable.

Vehicle hydraulic systems may seem foreign at first but they operate on principles familiar to us all. The engine drives a pump, not unlike a compressor, but it pumps incompressible oil. That oil travels through heavy duty, steel-wrapped hoses and various flow controls to do work by moving cylinders or (in our case) turning motors. Having done this work, the
oil is now warmer and travels through a heat exchanger and filter before returning to the oil tank.

Hydraulic motors have three ports; one in, one out (to the heat exchanger), and the case drain which goes directly back to the oil tank. Various flow dividers can split hydraulic flow from one pump to go to two or more separate circuits. Relief valves act as a safety to prevent excess pressure from building up. Solenoid valves work to control oil flow or switch it between circuits. A large vehicle may have several hydraulic pumps and dozens of circuits. The whole system is designed to stay within the power limits of the engine and not produce so much heat as to overwhelm the heat exchanger and overheat the oil. Care is taken whenever an air conditioner circuit is added to not upset the hydraulic system's balance.

Oil flow is measured in gallons per minute, and pressure in PSI or bar. Special training is required to service the hydraulic portion of any machine, and you should leave the hydraulic plumbing to the experts. The oil is often very hot (140-180° F) and may be under pressures exceeding 3000 p.s.i.

Servicing a hydraulic driven compressor, or installing one, can be pretty straightforward. The most common type is the hydraulic belt drive.

Belt-driven systems typically use a Sanden or Seltec heavy duty compressor connected to a hydraulic motor by stan-

**Don’t let the word “hydraulic” scare you away...**

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Special vehicles bring special problems. This rail ballast vehicle requires a compact and robust air conditioner that will withstand severe vibration and heavy dust. The self contained, roof-mounted A/C unit uses a hydraulic compressor.