



Eaton Power-On-Demand Hydraulic System Helps New McNeilus Side-Loader Refuse Truck Improve Productivity and Fuel

With the help of Eaton's exclusive Power-On-Demand hydraulic system technology, THE MCNEILUS ZR SERIES IS PROVING TO BE THE FASTEST SIDE-LOADER IN THE INDUSTRY WITH UP TO 15 PERCENT FUEL SAVINGS.

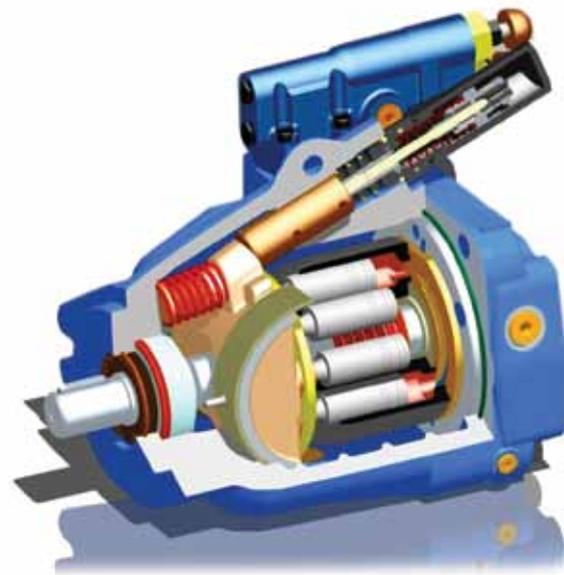
PICKING UP TRASH IN AREAS WITH TIGHT alleyways, narrow streets or overhead interference has long been a challenge for refuse truck operators. McNeilus Truck and Manufacturing Inc., a leading manufacturer of refuse truck bodies, has turned this problem into rubbish with its all new McNeilus® ZR Series™ full-eject automated side loader. The ZR Series features a true “zero-radius” side arm that almost effortlessly grabs hold of 30-, 60- or 96-gallon containers, transports them vertically up the arm, and dumps them into the truck—all without the arm kicking out into alleys or tight urban streets.

Another unique ZR Series feature is its full-eject body that opens the tailgate and, via telescoping cylinders, ejects the load without a body tip up or gravity dump. The body's low center of gravity

makes it much more stable during landfill dumping operations. The McNeilus ZR Series arm and packer are operated entirely by Eaton hydraulic components, including Eaton's exclusive Power-On-Demand (POD) functionality that provides fuel economy by powering up hydraulic pumps and motors strictly to system demands. The POD hydraulic system, designed and supplied by Eaton's Hydraulics Group (Eden Prairie, MN), is being touted by McNeilus as one of the ZR Series' key features.

Challenge

A time-honored Eaton customer in Dodge Center, MN, McNeilus called on Eaton in early 2009 with the need for a complete hydraulic system for the new side-loader using CANbus controls for optimum



Right: The Eaton 420 hydraulic piston pump with hydro-mechanical torque control is intended for moderate-flow, high-pressure mobile applications such as compact wheel loaders, telehandlers, rough terrain forklifts, telescopic booms, sweepers, backhoe loaders and garbage trucks.

Left: Eaton STC® threadless adapters were specified in locations on the refuse truck where hoses move while the body lift mechanism is activated.

Photos courtesy of Eaton Corporation.



McNeilus® ZR Series™ full-eject automated side loader.

performance. McNeilus' initial thought was to equip the system with traditional fixed-displacement gear pumps, and Phil Dybing, Eaton program manager of vocational vehicles, responded by specifying hydraulic control valves to complete the system. After evaluating the performance and fuel demands of the prototype hydraulic system on a side-loader during test trials, McNeilus decided to switch "gears" and equip the truck with a full POD system using piston pumps.

the full-eject body is equipped with large telescoping cylinders that run the packing mechanism, the first challenge was to size the pumps to achieve adequate cycle time for the packer cylinders and to fit behind the transmission without interference. "The packer cylinders traditionally have a slow pack extend and retract cycle time due to the high fluid volume required to extend the packing panel during each packing cycle," Dybing says. "The trucks are designed for 1,000 to 1,500 lift cycles per day, and the pack panel extends and retracts twice for each lift cycle. Consequently, there could be instances during routes with close-knit stops that the packer panel may not stop running. And in some cases, the packer panel might not keep up with the lift circuit, which would increase route time. A large piston pump would provide the flow required, however its bulky size and cost did not make it an attractive option."

Competitive products equipped on the ZR arm were also causing concerns. A pair of motors on the trolley lift and an over-center valve to control motor movement were generating wasted heat during performance testing. Another problem area was hydraulic fluid leakage due to adapters and fittings that became loose when hoses were extended or twisted during body lift operations.

Solution

While considering pump options, Dybing realized that the arm ran very quickly during the garbage can dumping cycle and then came to a rest as the packer panel was still extending and retracting to clear the hopper. "This meant

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Eaton's Aeroquip® GH493 half-bend radius, high-pressure hose assembly that withstands tight bend radii required on the refuse truck.

that if the arm pump and packer pump could work in tandem while the arm was stationary and the packer was still cycling, the cycle time would improve dramatically,” says Dybing, who selected a tandem 80cc Eaton® 420 Series pump for the application. Applying Eaton’s POD load-sensing technology, Dybing designed a custom Vickers® MCD manifold with the capability to combine pump flows during packer extend and run independently when the arm is required to function, resulting in a dramatic reduction in packer cycle time from 17 seconds to 10 seconds. Included in the manifold assembly are Eaton’s Vickers solenoid valves, proportional valves, flow regulators, check valves, shuttle valves and differential pressure-sensing logic elements.

Controlling the loader arm proportionally and smoothly was another circuit requirement that benefited from Eaton’s POD load-sensing technology. A three-section Vickers CMX 100 electro-hydraulic load-sense valve was chosen to run the arm reach, grabber and trolley lift functions due to its capability to manage flow precisely and proportionally. The valve resulted in faster cycle time with less fatigue on the truck structure, along with improved fuel savings by using full POD technology.

To overcome the excessive heat caused by the motor trolley circuit, Dybing and Tony Montabon, Eaton onsite applications engineer at McNeilus, worked with McNeilus engineers to evaluate the arm performance and chose Eaton 8.0 CID T motors and integrated hydraulics dual over-center valves as replacement components. Also specified were Eaton’s Aeroquip® GH493 half-bend radius, high-pressure hose assemblies that withstand the tight bend radii required as they move in and out during arm reach. The tight-bend radii allowed McNeilus to use larger diameter hose assemblies, resulting in a dramatic reduction in wasted heat, thereby improving the efficiency of the circuit.

Eaton STC® threadless adapters were specified in locations in which hoses move while the body lift mechanism is activated. The selection was based on their swivel capability when not under pressure and the fact that they use a snap ring to connect the male with the female, which seals on an O-ring and results in a leak-free connection every time. “This is McNeilus’ first application for Eaton STC connectors,” Dybing says. “They are providing leak-free performance and are easy for assembly line crews to install.”

Results

The McNeilus ZR Series went into production in May 2010 and is already proving to be the fastest side-loader in the industry. “Packer cycle time is typically a factor in how fast an operator can finish a route,” Dybing says. “On highly dense routes where houses are close together, operators of conventional side-loaders often had to wait for the hopper to clear the loading chamber before loading another garbage can. To date, operators have not had to wait for the ZR packer to clear. They just go from can to can without slowing down.”

During two test trials, the ZR side-loader finished identical routes in about two hours less than other McNeilus side-loaders. The 20 percent improvement in productivity is a direct result of the fast arm and packer cycle times achieved by the Eaton POD system. Based on previous test results of similar trucks equipped with POD systems, the ZR side-loader also has the potential to save up to 15 percent on fuel consumption compared to a conventional fixed-displacement gear pump system. | [WA](#)

For more information on Eaton Hydraulics, contact Phil Dybing at (952) 937-9800, e-mail philipdybing@eaton.com or visit www.eaton.com/hydraulics.