

TRAXX an Electro-Hydraulic Remote Controlled Robot

TRAXX is a six (6) degree of freedom robot designed and built by senior mechanical engineering students at the Milwaukee School of Engineering (MSOE). The primary mission of the robot shown in figure 1 is rescue/recovery in collapsed structures and random debris fields. The robot is remotely controlled and the hydraulic system is closed to prevent environmental contamination due to oil spills and leakage.

The arm has a seven (7) foot reach and a total load capacity of 250 LB at full extension. Rotary actuators are utilized in the joints to minimize any protrusions that could snag on random debris items. The gripper has four (4) independent fingers so that it can adjust to random shapes. The gripper can rotate and using a cylinder buried in the stick section of the arm, can also be oriented relative to the stick to provide additional object manipulation capabilities.

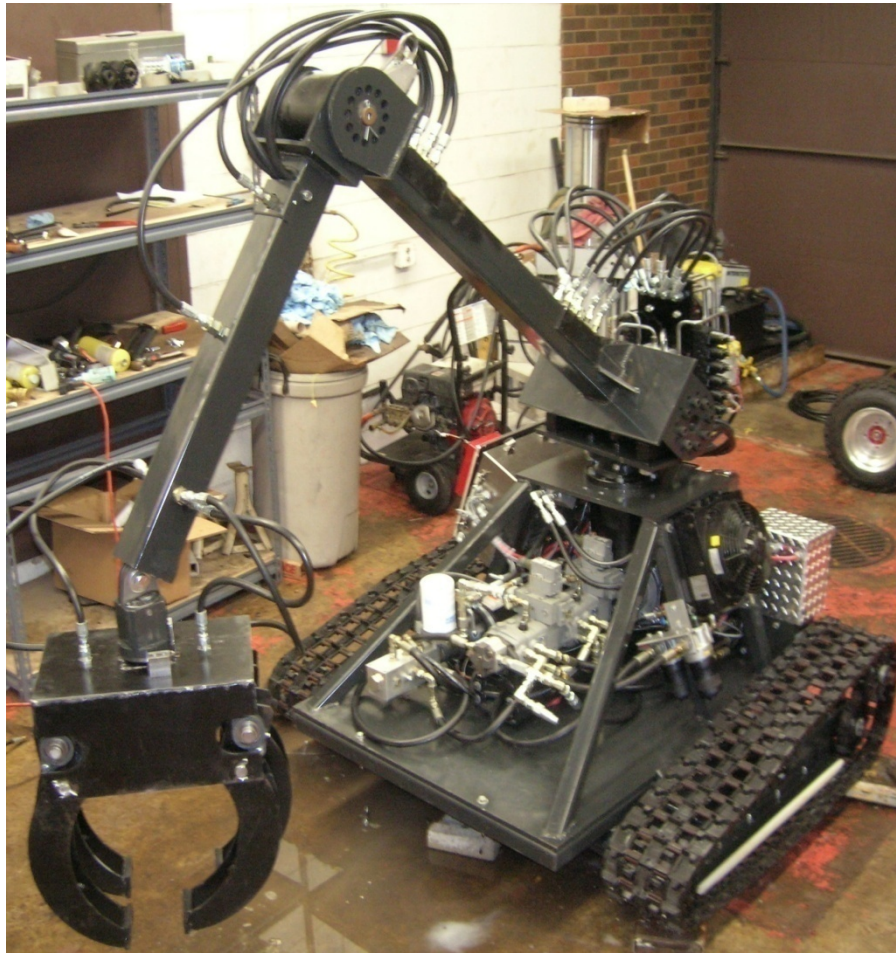


Figure 1 TRAXX Robot

Electro-hydraulic valves provide proportional control of all six (6) degrees of freedom, and software based controller provides adjustable sensitivity for each degree of freedom. This allows the operator to customize robot control to suit the application.

A 15 HP gas engine provides primary power to three pumps mounted in tandem. Two of the pumps are variable displacement, axial piston type, one for each track. The third pump is a fixed displacement gear pump that provides flow for the arm and gripper. The control system is set up with a priority for the arm movements. Hence, the power required by the arm is given priority over locomotion of the robot.

An alternate power source (AC/DC) was integrated into the robot to provide in-doors operations of the arm without the need to run the primary internal combustion engine.

TRAXX was exhibited at IFPE in the spring of 2008 by the design team including full operation of the arm using the alternate electrical power source.

The student design team was composed of six (6) students. Four (4) of the students focused on the update of TRAXX and two (2) worked on the new gripper. Simulation of the hydraulic and control system performance using computer based tools aided in the selection of appropriate fluid power and electrical components.

This project provided the student design team with a real-life design experience in electro-hydraulic systems design and control particularly working on a project that requires multi-discipline capabilities

Construction of TRAXX could not have been accomplished without the support of Enerpac, Fluid Power Institute at MSOE, Gates Corporation, Husco International, Hydro Electronic Devices, Inc., JM Grimstad, National Fluid Power Association, Oilgear, Sun Hydraulics, and Helac Corporation.

A new undercarriage has recently been donated that will allow more reliable vehicle operation and improved tramming capabilities.

TRAXX has been used at MSOE during the summer engineering experience programs as an introduction to fluid power for prospective high school students. It gives them hands-on experience to fluid power technology in an interesting application.

Further information regarding TRAXX and other senior projects can be obtained from Professor Thomas J. Labus (414-277-7284) at MSOE.

