

NFPA Small Grants Program

Pneumatic Trainer for hands-On Demonstrations

Project Summary
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Project Description and Outcomes

The purpose of this project was to build a portable pneumatic stand capable of running on a standard 120VAC/15A electrical outlet. The stand needed to have a pump, tank, valve, and actuators with quick connect fittings for hands-on demonstration of several pneumatic circuits. A second goal was to allow operators to choose between manual control and electronic control.

Early in the project the choice was made to initially focus on a micro-excavator since kits available as kids toys were available and it would provide a fun activities for kids of many ages. Younger children could dig and play with the stations while high school students could learn about fluid power, kinematics, and electronics through different learning activities.

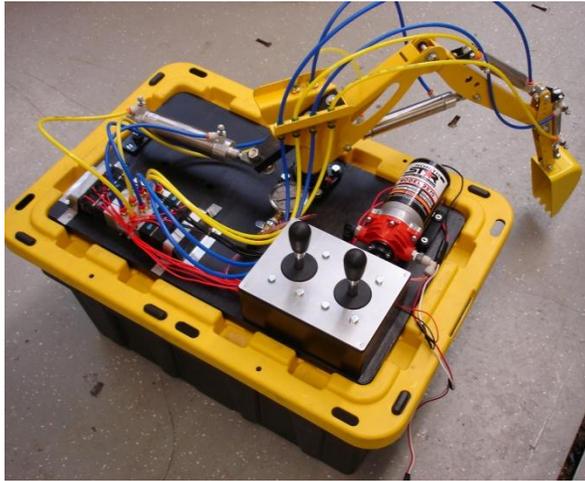
This was one of those seed grants whose results exceeded our initial expectations. Our goal was to use the NFPA \$3100 to design and build a unit for use at Purdue University. However, after the NFPA portion (this project) was completed the project was proposed to the CCEFP for continued development. Educational outcomes have blossomed thanks to the initial grant by NFPA. The pneumatic trainer has been converted to use water or air as the working fluid, can be built for approximately \$700 depending on the options, and can use manual or electronic controls (microcontrollers, PLC, computer with data acquisition card, etc.). Here are some of the achievements of the Portable Fluid Power Demonstrator (PFPD) to date:

- In 2010 Purdue offered eleven pre-college outreach programs. There were 262 participants, of which 147 were female, 109 were female, and 62 were from under-represented ethnic groups.
- In total, Purdue has offered over 20 programs, reaching over 500 students with over 50% of the participants being female and/or from under-represented groups.
- Since the project's inception there have been multiple undergraduate students involved in the design, construction, and delivery (outreach programs), along with REU and RET participation in the summer and high school involvement on a variety of levels.
- Two PFPD kits were built by CCEFP students at the Fall conference in Chicago. The kits were subsequently used at the University of Minnesota's booth at the Minnesota state fair.
- 4-H, FFA, High school, and other groups have participated in programs at Purdue and PFPDs have been used at a variety of community events around the nation.
- A variety of models have been designed to offer an ideal configuration for whatever skill set is to be taught.
- PFPD units have been used at State Fairs in Minnesota and Indiana.
- PFPD units have been delivered to all of the member universities in the CCEFP.
- Two high schools in Lafayette, IN have built their own PFPD units and used them to support fluid power topics in PLTW curriculum.
- Since the unit is portable, several outreach programs will taken place in conference rooms at hotels; the units have also been transported as checked baggage while flying.

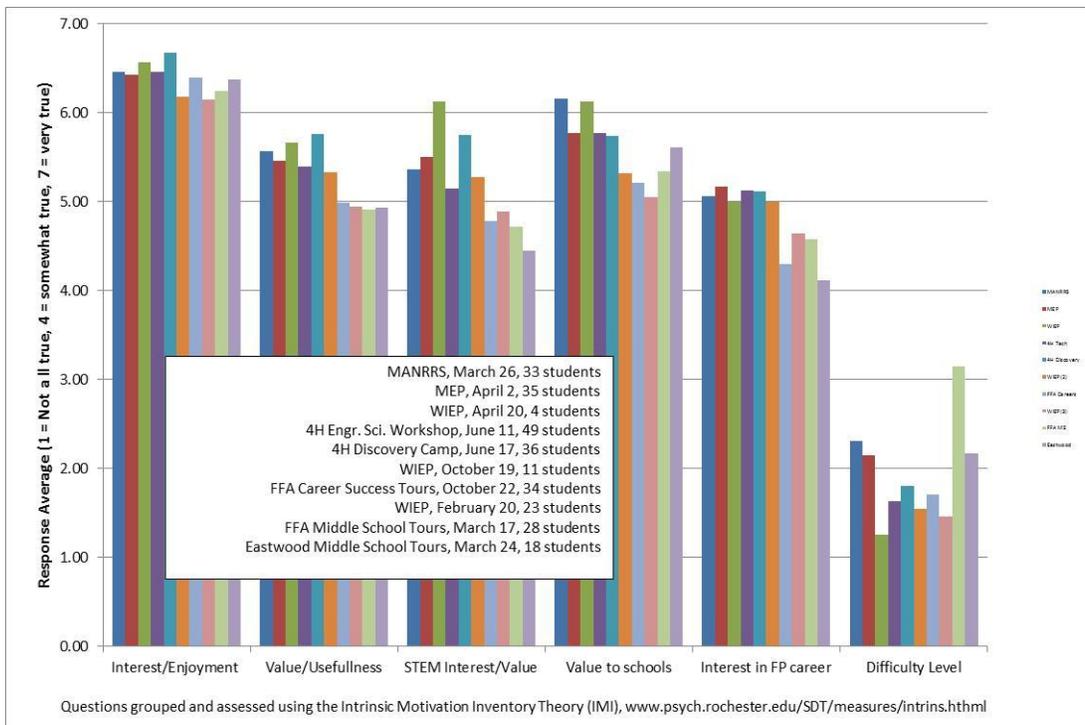
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The Portable Fluid Power Demonstrator (PFPD) was developed for K-12 outreach programs with an initial focus on middle and high schools. The kits can enhance current and enable new activities for organizations that

include PLTW, FIRST Robotics, science museums, and children’s museums. The PFPD is being used to promote awareness and/or increase interest of fluid power education in high school grades 8-12. Through the addition of microcontrollers the PFPD can be used to teach robotics and mechatronics.



Intrinsic Motivation / Enjoyment Surveys have also been given to participants:



Thank you very much for your support.

Sincerely,
John Lumkes