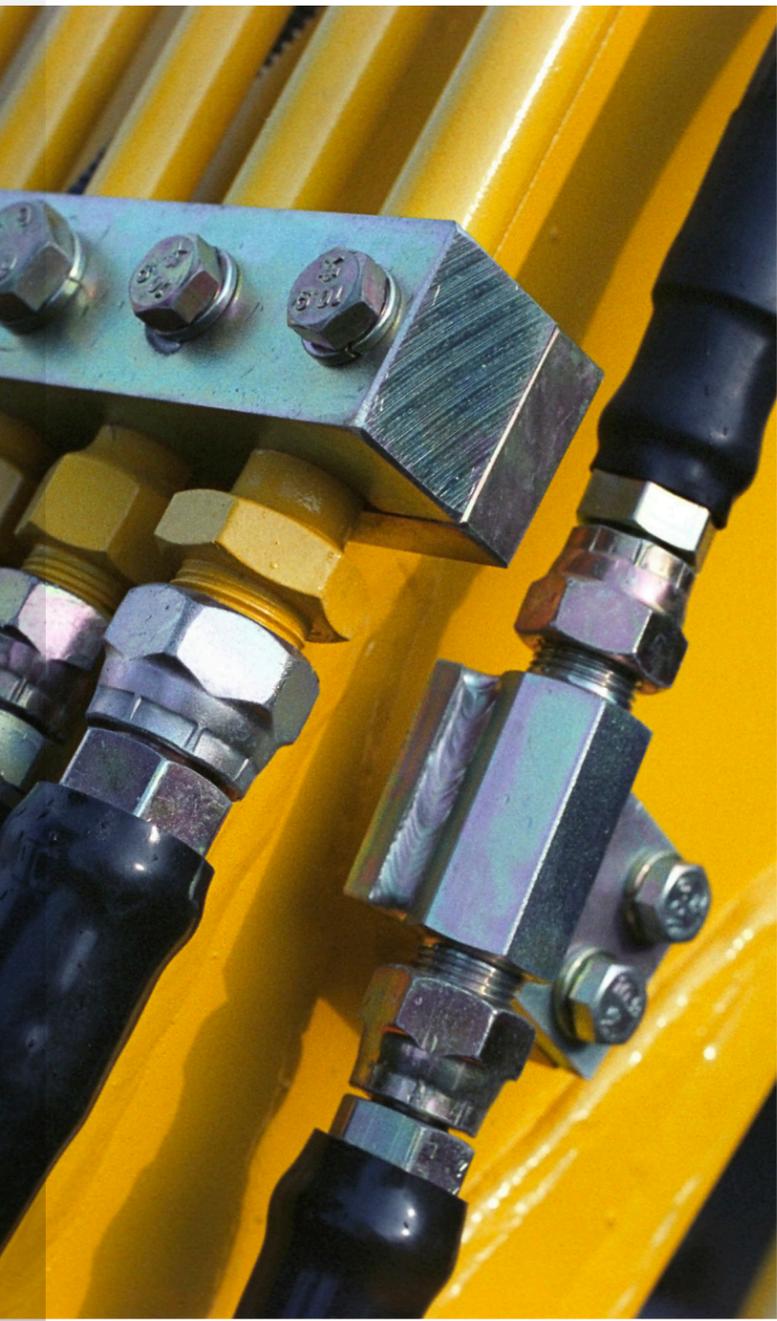




NFPA
Education and
Technology
Foundation

2017

Donor Impact Report



2017-18 NFPA Education and Technology Foundation
Board Of Directors



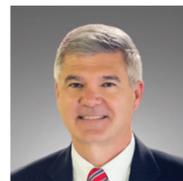
CHAIR
Marc A. Weston
Senior Vice President/CMO
Danfoss



VICE CHAIR
Jon Goreham
President
QCC, LLC



TREASURER
John L. Stenz
President & CEO
FORCE America, Inc.



SECRETARY
Ray Chambers
Chairman, CEO & President
Muncie Power Products, Inc.



PAST CHAIR
Tricia Fulton
CFO
Sun Hydraulics Corporation

Our Mission

In a biennial survey, members of the National Fluid Power Association (NFPA) consistently rank workforce development as the most challenging issue their companies face. This is likely because not enough technical colleges and universities are teaching fluid power to their students.

As a result, NFPA has identified growing the fluid power workforce as one of its primary strategic priorities. It is central to its mission of strengthening the fluid power industry. NFPA seeks to increase the number of educated technicians and engineers embarking on careers in fluid power.

The NFPA Education and Technology Foundation is a tax-exempt, charitable organization, affiliated with NFPA, that is dedicated to meeting this workforce development need. Through the generous support of our donors, we are:

- Creating more educated fluid power technicians by funding student outreach and education programs designed to create a pathway into the fluid power industry; and
- Creating more educated fluid power engineers by funding research and education programs designed to better engage academic faculty in the teaching of fluid power.

Because of your support, our programs are helping to change the talent pool available to our industry. More young people are aware of the fluid power industry. More 2-year technical college and 4-year university graduates have specific training in fluid power. More universities have research facilities and education programs focused on fluid power. And more partnerships between these schools and our industry are increasing access to highly talented candidates.

This is truly **our** mission – yours and ours – and **it is** working. Your donations will make sure it works for many years to come.

Best Regards,



Eric Lanke

Eric Lanke
President and CEO
NFPA Education and Technology Foundation

Your Gifts at Work

Creating More Educated Fluid Power Technicians

To create more educated technicians, the NFPA and the NFPA Foundation conduct a number of student outreach and education programs designed to create a pathway into the fluid power industry.



MIDDLE SCHOOLS

Fluid Power Action Challenge – a design/build competition for eighth graders that introduces fluid power in a format that is both fun and engaging.



HIGH SCHOOLS

Student Career Connections – orientation programs conducted by NFPA members to provide fluid power plant tours and activities to high school students.

Fluid Power Robotics Challenge – scholarships awarded to high school students that effectively use fluid power in their *FIRST* robots.



TECH SCHOOLS

Teaching & Laboratory Grants – money to establish teaching materials and state-of-the-art teaching laboratories that create fluid power programs at 2-year technical colleges.



FLUID POWER INDUSTRY

Fluid Power Careers Portal – an online portal where students post resumes and fluid power companies post jobs.

Fluid Power Action Challenge

16,000+ Students Engaged
Through events & classroom activities

The Fluid Power Action Challenge is a competition that challenges middle or high school students to solve an engineering problem using fluid power. The students work in teams to design and build a fluid power mechanism and then compete against other teams in a timed competition.

The Fluid Power Challenge has many benefits. It:

- Actively engages students in learning about fluid power.
- Gives support and resources to teachers for science and technology curriculum.
- Creates a learning environment where math and science are fun.
- Encourages students to practice teamwork, engineering, and problem-solving skills.
- Introduces students to careers in the fluid power industry.

Hundreds of individuals in NFPA member companies and education partner institutions have been involved in mentorship, classroom activities, and events related to the Fluid Power Action Challenge, which have engaged more than 16,000 students to date.



Fluid Power Action Challenge Champions

Twenty-two NFPA member companies and education partners from across the country have been recognized as Fluid Power Action Challenge Champions for their efforts in organizing and running Fluid Power Action Challenge events in their local communities. In doing so, they have not only made serious investments of both time and money, but have also helped spread information about our industry and reaped the benefits that come with connecting their organizations to the schools and science classrooms where the industry's future employees are learning fluid power for the first time.

These Fluid Power Action Challenge Champions are:

BENNETT MILLS MIDDLE SCHOOL

1 annual event, engaging 56 total students

CATERPILLAR

3 annual events, engaging 224 total students

CLEVELAND COMMUNITY COLLEGE

3 annual events, engaging 88 total students

COOPER MIDDLE SCHOOL

1 annual event, engaging 72 total students

DAMAN PRODUCTS COMPANY

7 annual events, engaging 604 total students

DELTROL FLUID PRODUCTS

8 annual events, engaging 1,912 total students

EISENHOWER JUNIOR HIGH

2 annual events, engaging 36 total students

FORCE AMERICA

2 annual events, engaging 120 total students

GEORGIA TECH UNIVERSITY

2 annual events, engaging 136 total students

HUSCO INTERNATIONAL & WAUKESHA STEM ACADEMY

3 annual events, engaging 232 total students

JERLING MIDDLE SCHOOL

1 annual event, engaging 165 total students

MASTER PNEUMATIC

3 annual events, engaging 452 total students

MEQUON SCHOOL DISTRICT

1 annual event, engaging 36 total students

MICROMATIC

1 annual event, engaging 20 total students

MILWAUKEE SCHOOL OF ENGINEERING

9 annual events, engaging 814 total students



PARKER HANNIFIN

2 annual events, engaging 44 total students

PENNSYLVANIA SMALL BUSINESS EDUCATION FUND

3 annual events, engaging 372 total students

PRICE ENGINEERING

2 annual events, engaging 112 total students

PURDUE UNIVERSITY

3 annual events, engaging 172 total students

UNIVERSITY OF MINNESOTA

5 annual events, engaging 352 total students

TRITON GIRLS SUMMER CAMP

2 annual events, engaging 80 total students

WOJANIS SUPPLY COMPANY

7 annual events, engaging 692 total students

In total, our Fluid Power Action Challenge Champions have organized **71** events impacting **6,791** students.

Fluid Power Action Challenge Grants

The NFPA Foundation also awards grants to middle and high schools to facilitate hydraulics and pneumatics instruction. Grant awards defray the costs related to the educational aspects of the Fluid Power Action Challenge Program—either for the fluid power kits for classroom use or for participation in the Fluid Power Action Challenge event.

To date, 123 schools have used Fluid Power Challenge materials in their curricula, exposing **7,740** students to fluid power.

Student Career Connections

1,800+ **Students Engaged**
Through company visits & tours

Student Career Connections is a free and flexible program that helps fluid power industry professionals host area high school students at their company facility – giving the students a tour, building a fluid power classroom kit with them, and answering questions about the industry and careers. Many NFPA members coordinate these activities with the extra attention created by National Manufacturing Day.

To date, the program has given more than 1,800 students a peek into real-world fluid power applications and careers.



Fluid Power Robotics Challenge

75 **Scholarship Applications**
received in our first year

The Fluid Power Robotics Challenge is a scholarship program that launched with the 2016-17 school year. In collaboration with *FIRST* Robotics, one of the most popular high school robotics and STEM competitions in the country, each year the NFPA Foundation offers one merit-based scholarship to a high school student using fluid power in their *FIRST* robot design. The scholarship, set at \$10,000 per year for up to four years, may be used to study engineering at any accredited tech school or university in the United States.

The goal of the Fluid Power Robotics Challenge is to bring an awareness of fluid power options in robotics to high school students and to stimulate increased use of fluid power products in the *FIRST* competition. In our first year, 75 applications were received for our scholarship.



Teaching and Laboratory Grants

2,900+ **Students Taught**
fluid power each year at 2-year technical schools

Through our Fluid Power Teaching and Laboratory Grant Programs, we are helping 2-year technical schools and colleges establish the teaching materials and state-of-the-art teaching laboratories that are needed to embed fluid power into their training curriculum.

To date, 8 schools have received teaching grants and 9 schools have received laboratory grants.

Each teaching element or laboratory facilitates the teaching of fluid power to dozens of students on each campus. At last count, NFPA's 2-year technical school education partners collectively report teaching fluid power to more than 2,900 students.

LABORATORY GRANTS

- Angelina College, Lufkin, TX
- Central Community College, Grand Island, NE
- Cleveland Community College, Shelby, NC
- Eastern Iowa Community College, Davenport, IA
- Hennepin Technical College, Eden Prairie, MN
- Macomb Community College, Warren, MI
- Marshalltown Community College, Marshalltown, IA
- South Central College, North Mankato, MN
- Triton College, River Grove, IL

TEACHING GRANTS

- Central Community College, Grand Island, NE
- Cleveland Community College, Shelby, NC
- Hennepin Technical College, Eden Prairie, MN
- Ivy Tech Community College, Columbus, IN
- Kaskaskia College, Centralia, IL
- Texas State Technical College, Waco, TX
- Triton College, River Grove, IL
- Vernon College, Vernon, TX

Fluid Power Careers Portal

THE PLACE for Students and Employers to Find Each Other

Launched just this year, NFPA's Fluid Power Careers Portal is a tool designed to provide the 2-year technical school students being taught fluid power with information about and employment opportunities in the fluid power industry. Companies that are at least Bronze-level donors in our Pascal Society—whose funding is critical if we are to continue the outreach and education programs that result in these fluid power candidates—can use the portal to search student resumes and post their available positions.



Your Gifts at Work

Creating More Educated Fluid Power Engineers

To create more educated engineers, the NFPA, the NFPA Foundation, and their partner, the Center for Compact and Efficient Fluid Power (CCEFP), conduct a number of research and education programs, designed to better engage academic faculty in the teaching of fluid power.

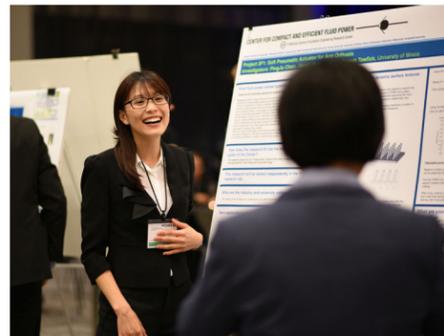


RESEARCH PROGRAMS

Fluid Power Technology Roadmaps - industry-driven consensus documents describing the pre-competitive research needs of the fluid power industry.

Research Projects - industry-selected and guided projects, engaging academic faculty and graduate students in investigating the pre-competitive research needs of the fluid power industry.

Fluid Power Research Summits - events that bring industry and academia together to present and explore the latest fluid power research.



EDUCATION PROGRAMS

Teaching, Laboratory, and Curriculum Grants - grants to create and disseminate fluid power curriculum in mechanical engineering programs. Provides pathway for funded faculty to add fluid power to their undergraduate programs.

Fluid Power Vehicle Challenge - design/build competition that embeds in capstone design course at participating universities. Provides pathway for funded faculty to add fluid power to their undergraduate programs.



FLUID POWER INDUSTRY

Fluid Power Vehicle Challenge Community- donor community where industry supporters review, coach and interview undergraduate students participating in Fluid Power Vehicle Challenge Program.

Fluid Power Careers Portal - an online portal where students post resumes and fluid power companies post jobs.



Fluid Power Technology Roadmaps

Identifying Fluid Power's Pre-Competitive Research Needs



NFPA's Roadmap Committee is the volunteer structure tasked with developing, maintaining, and supplementing the NFPA Technology Roadmap. Its membership includes major donors to the NFPA Foundation, including those at the Gold, Silver and Bronze levels of the Pascal Society.

The NFPA Technology Roadmap is the industry consensus-based document which identifies the areas of pre-competitive research needed to increase fluid power's competitive position in the marketplace, open up new markets for fluid power, and attract the best and brightest students to the field.

The 2015 NFPA Technology Roadmap identified six areas of pre-competitive research challenge:

- Increasing the energy efficiency of fluid power components and systems
- Improving the reliability of fluid power components and systems (e.g., increasing up-time, reducing maintenance requirements, making fluid power safe and easy to use)
- Reducing the size of fluid power components and systems while maintaining or increasing their power output
- Building "smart" fluid power components and systems (i.e., ones that perform self-diagnostics and troubleshooting and that integrate easily with "plug and play" functionality)
- Reducing the environmental impact of fluid power components and systems (e.g., lowering noise, eliminating leaks)
- Improving and applying the energy storage capabilities of fluid power components and systems

An additional report was also published this year by the Fluid Power Advanced Manufacturing Consortium (FPAMC). That report, and the FPAMC, represents a roadmapping effort, led by the CCEFP and funded by a federal grant from the National Institute of Standards and Technology (NIST), to define a set of enabling manufacturing technologies and the research necessary to better apply those technologies to the manufacture of fluid power components.

Those enabling manufacturing technologies are:

- Coatings
- Micromachining
- Composites and engineering plastics
- Sintered metals
- Additive manufacturing
- Batch free heat treating
- Robotics
- Hybrid manufacturing
- Metrology
- In-process sensing, feedback and control

These two documents describe the pre-competitive research needs of the fluid power industry and are used to guide the selection of the research projects that will engage academic faculty and graduate students in fluid power technology.

Research Projects

10 Projects Helping to Grow Fluid Power on University Campuses

CCEFP's Industry Engagement Committee is the volunteer structure tasked with selecting and guiding the research projects that will engage academic faculty and graduate students in investigating the pre-competitive research needs of the fluid power industry. Its membership includes major donors to the NFPA Foundation, including those at the Gold and Silver levels of the Pascal Society.

Over the previous ten years, the CCEFP has sponsored more than 270 such projects, which helped to add more than 100,000 square feet of fluid power laboratory space to its universities, to increase the number of fluid power advanced degrees awarded by those universities by more than 500%, and to increase the number of fluid power educators on those campuses by a factor of 10.

This year, the NFPA Foundation provided funding for 10 additional research projects, which, as determined by the CCEFP Industry Engagement Committee, were awarded as follows:



CONTROL AND PROGNOSTIC OF ELECTRO-HYDRAULIC MACHINES

Student Researchers: Federico Campanini and Riccardo Bianchi, Purdue University
Faculty Advisor: Andrea Vacca, Purdue University

This project focuses on investigating advanced electro-hydraulic techniques to optimize adaptive control, reduce application oscillations, and conduct hydraulic system diagnostics and prognostics under different operating conditions. It has investigated both hydraulic crane and wheel loader applications for controlling oscillations that occur in those types of machinery.



CONTROLLED STIRLING POWER UNIT

Student Researcher: Seth Thomas, Vanderbilt University
Faculty Advisor: Eric Barth, Vanderbilt University

The project addresses limitations in the current options for power supplied to mobile robots and exoskeletons through the development of a quieter, more energy-dense, compact, and portable fluid power supply using a Stirling device. Such advancements would enable the use of fluid power technology in a variety of military, medical, manufacturing, and construction applications. The Stirling device can use a number of highly energy-dense, flexible fuel or available heat sources to create hydraulic or pneumatic fluid power in an easily scalable design.



EFFICIENT, INTEGRATED, FREEFORM FLEXIBLE HYDRAULIC ACTUATORS

Student Researcher: Jonathon Slightam, Marquette University
Faculty Advisor: Mark Nagurka, Marquette University

This project sets to advance current hydraulic actuator technology by focusing on the use of flexible fluidic actuators and the additive manufacturing methods needed to produce them. It differentiates itself from existing actuation technologies most prominently through the dramatic reduction in component and system weight that comes with producing this new actuation technology via advanced manufacturing methods, opening up many new applications to fluid power solutions.

FOUR-QUADRANT MULTI-FLUID PUMP/MOTOR

Student Researcher: James Marschand, Purdue University
Faculty Advisor: John Lumkes, Purdue University

This project focuses on the design and simulation of digital pumps and motors for multi-fluid operation as well as evaluation of their feasibility. It has built upon existing technology and research by working toward a novel mechanical control for digital pumps and motors in pursuit of making this technology approach more feasible.

FREE PISTON ENGINE BASED OFF-ROAD VEHICLES

Student Researchers: Keyan Liu and Chen Zhang, University of Minnesota
Faculty Advisor: Zongxuan Sun, University of Minnesota

This project focuses on the design, control, and testing of free piston engine pumps for off-road vehicles, a potentially transformational architecture. It has differentiated itself from existing technology approaches by controlling the hydraulic engine, in lieu of variable pumps, to generate the required pressure and flow for the vehicle's hydraulic actuation systems, including both linear and rotary motions. Solutions to improve vehicle fuel efficiency and energy storage while reducing emissions and environmental impact have also been investigated.

HYBRID MEMS PROPORTIONAL FLUID CONTROL VALVE

Student Researcher: Nathan Hagstrom, University of Minnesota
Faculty Advisor: Thomas Chase, University of Minnesota

MEMS scale piezoelectric materials to create ultra-efficient miniature proportional pneumatic valves have been studied

by CCEFP researchers for a number of years now, but the manufacturing challenges to overcome have proven to be quite daunting. The purpose of this project has been to accelerate the commercialization potential of this innovative approach by leveraging both MEMS-based and conventional elements in a novel "hybrid" configuration. By doing so, the resulting valve stands to not only decrease the power required to drive comparable pneumatic valves by three orders of magnitude, but also create the fastest responding pneumatic valves known.



INVESTIGATION OF NOISE TRANSMISSION THROUGH PUMP CASING

Student Researcher: Paul Kalbfleisch, Purdue University
Faculty Advisor: Monika Ivantysynova, Purdue University

This project focuses on noise modeling techniques for swash plate type axial piston machines. The optimized models are being validated by experimental results. It will contribute to the existing body of knowledge for how noise is both generated and transmitted through fluid power components.



PORTABLE PNEUMATICALLY POWERED ORTHOSES

Student Researchers: Girish Krishnan, Gaurav Singh, and Chenzhang Xiao, University of Illinois at Urbana-Champaign
Faculty Advisor: Elizabeth Hsiao-Wecksler, University of Illinois at Urbana-Champaign

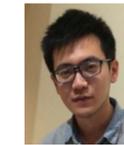
The project focuses on the design and analysis of a soft pneumatic sleeve for arm orthosis. This is expected to contribute to orthotic control mechanisms and clinical treatment strategies, both of which are areas that have significant potential for advancements. The final design will be lighter and more compact than what is currently available and will have enhanced power and performance. In addition to making strides in orthotics, this research will also drive the use of compact fluid power technologies in other human scale devices.

SIMULATION, RHEOLOGY, AND EFFICIENCY OF POLYMER ENHANCED FLUIDS

Student Researchers: Duval Johnson, Uma Shantini Ramasamy, University of California - Merced; Mercy Cheekolu, Pawan Panwar, Milwaukee School of Engineering
Faculty Advisors: Ashlie Martini, University of California - Merced; Paul Michael, Milwaukee School of Engineering

This project focuses on measuring how a fluid's polymer structure affects hydraulic power transmission in pursuit of formulating more efficient hydraulic fluids. It builds upon previous research

by incorporating tribometer testing, high pressure rheology studies, and molecular dynamics simulations into the research methods.



VARIABLE AC HYDRAULIC PUMP/MOTOR

Student Researchers: Mengtang Li, Vanderbilt University; Ryan Foss, University of Minnesota
Faculty Advisors: Eric Barth, Vanderbilt University; James Van de Ven, University of Minnesota

Hydraulic systems today can best be classified as DC, or direct flow, hydraulics. This project investigates the modeling, design, and development of AC hydraulic systems. This project builds upon the existing CCEFP variable linkage piston pump that is both compact and efficient even under low displacement operating conditions. It also greatly expands the existing body of knowledge for applying existing variable displacement pumps to alternating flow AC hydraulic circuits, including multi-actuator systems.

OTHER FLUID POWER RESEARCH GRANTS

In addition to its support of the CCEFP projects, the NFPA Foundation has also funded individual pre-competitive research projects designed to connect graduate students to the study of fluid power and expand the capabilities of their host institutions to research and teach fluid power.

To date, 3 schools have received 4 of these research grants.

Iowa State University

- Dielectric Spectroscopic Sensor Development for Hydraulic Fluid Contaminant Detection
- An Investigation of Dielectric Spectroscopic Contamination Sensing in a Compressed Air Stream

Purdue University

- Design, Simulation and Control of Hydraulic System Topographies with Integrated Energy Recovery

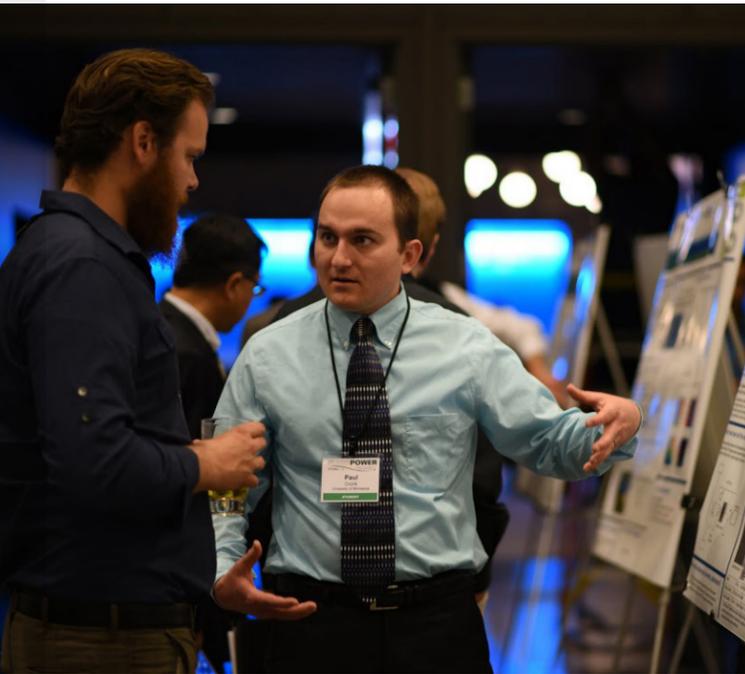
Vanderbilt University

- Pneumatic Exhaust Gas Recovery

Through these research projects, the NFPA Foundation is engaging current and helping to build the careers of future academic faculty who will be in a position to teach fluid power to thousands of undergraduate engineers on their campuses.

Fluid Power Research Summits

Bringing Fluid Power Industry and Academia Together



Fluid Power Innovation and Research Conference (FPIRC)

Hosted by the Center for Compact and Efficient Fluid Power (CCEFP), this conference features collaborative technical breakout sessions, networking opportunities, tours of local research laboratories, and panel discussions on the technologies and workforce skills transforming the fluid power industry.

The inaugural FPIRC was held at Vanderbilt University in 2014, in 2015 the event was held in conjunction with the ASME/Bath Symposium on Fluid Power in Chicago, and in 2016 it was a stand-alone event in Minneapolis. More than 115 industry professionals attended the 2016 conference, seeking connections with the faculty and graduate students advancing fluid power research.



Summits of the CCEFP Industry Engagement Committee

These summits are held each year at universities conducting the fluid power research, providing opportunities for industry members to connect with researchers and students, tour fluid power and other laboratory facilities, and form partnerships that benefit their workforce and technology development goals.

In the past year, a successful event was held at Texas A&M University, attended by more than 30 industry professionals.

Teaching, Laboratory and Curriculum Grants

5,700+

Undergraduate Students taught fluid power each year at 4-year universities

Through our Fluid Power Teaching, Laboratory and Curriculum Grant Programs, we are helping the academic faculty impacted by our fluid power research projects to teach more fluid power in the university setting. These grants help to create and disseminate fluid power curriculum and provide a pathway for funded faculty to add fluid power to their undergraduate mechanical engineering programs.

To date, 16 schools have received teaching grants, 2 schools have received laboratory grants, and 2 schools have received curriculum grants.

Each grant creates curriculum that facilitates the teaching of fluid power to dozens or hundreds of students on each campus. At last count, NFPA's 4-year university school education partners collectively report teaching fluid power to more than 5,700 students.



TEACHING GRANTS

- Georgia Institute of Technology, Atlanta, GA
- Illinois Institute of Technology, Chicago, IL
- Iowa State University, Ames, IA
- Lawrence Technological University, Southfield, MI
- Marquette University, Milwaukee, WI
- Massachusetts Institute of Technology, Cambridge, MA
- Milwaukee School of Engineering, Milwaukee, WI
- Montana State University, Bozeman, MT
- Purdue University, West Lafayette, IN
- Rochester Institute of Technology, Rochester, NY
- University of Illinois at Chicago, Chicago, IL
- University of Illinois at Urbana-Champaign, Urbana-Champaign, IL
- University of Minnesota, Minneapolis, MN
- Western Michigan University, Kalamazoo, MI
- Western New England University, Springfield, MA
- Worcester Polytechnic Institute, Worcester, MA

LABORATORY GRANTS

- Milwaukee School of Engineering, Milwaukee, WI
- Western Michigan University, Kalamazoo, MI

CURRICULUM GRANTS

- Lawrence Technological University, Southfield, MI
- Ohio University, Athens, OH

Fluid Power Vehicle Challenge

9 UNIVERSITY TEAMS Participate in our Inaugural Program

The Fluid Power Vehicle Challenge is a unique engineering design/build competition that embeds in the capstone design course at participating universities. It strives to promote original thinking in a competitive setting by combining two technology platforms that are not normally associated with one another—human-powered vehicles and fluid power.

The first, as exemplified by the bicycle, is recognized as extremely efficient in terms of input vs. output. The second presents more of a challenge in terms of efficiency, especially at low speeds. A fluid powered vehicle, then, presents undergraduate engineers with a familiar yet challenging platform for change. By combining this unlikely pair, the Vehicle Challenge hopes to create an environment that results in uncommon connections and breakthroughs, while supporting learning and the growth of fluid power industry knowledge.

Student teams from 9 universities participated in our inaugural Vehicle Challenge:

- California Polytechnic State University, San Luis Obispo, CA
- Cleveland State University, Cleveland, OH
- Illinois Institute of Technology, Chicago, IL
- Murray State University, Murray, KY
- Purdue University, West Lafayette, IN
- University of Akron, Akron, OH
- University of Cincinnati, Cincinnati, OH
- University of Illinois at Urbana-Champaign, Urbana-Champaign, IL
- Western Michigan University, Kalamazoo, MI

The team from Purdue University won the overall competition, with teams from multiple universities placing competitively in the program's other award categories, including best paper/presentation, best design, best workmanship, and the program's three head-to-head competitions: a sprint race, and efficiency challenge, and an endurance challenge.

Additional support for this year's program was provided by:

- Danfoss Power Solutions, the program's final event sponsor and host
- LubeTech, the program's official fluid supplier
- Parker Hannifin
- SunSource/Eaton Corporation, the program's official parts supplier

Many student participants admitted that the Vehicle Challenge was their only exposure to fluid power in their four-year engineering curriculum, greatly underscoring the need for this program. In its first incarnation, it achieved all four of its key objectives:

- Stimulate education in practical hydraulics, pneumatics, and sustainable energy devices for motion control.
- Provide students with experience in real world engineering under a strict timeline of designing, simulating, ordering, building, testing and demonstrating their designs.
- Stimulate innovative thinking for designing and testing potential new technologies or concepts integrated into a vehicle platform.
- Provide an industry recruitment opportunity for high potential engineering seniors by engaging directly with practitioners in the field.



N F P A
Fluid Power
VEHICLE
Challenge

Fluid Power Vehicle Challenge Community

CREATING CONNECTIONS to Talented Undergraduate Engineers

The Fluid Power Vehicle Challenge Community is the volunteer structure tasked with mentoring, coaching and judging the student teams participating in the Vehicle Challenge. Its membership includes major donors to the NFPA Foundation, including those at the Gold and Silver levels of the Pascal Society.

Six companies sent representatives to the final event to act as competition judges and to meet the student participants in person.

- Bimba Manufacturing
- Danfoss Power Solutions
- Gates Corporation
- Iowa Fluid Power
- Parker Hannifin
- SunSource



Fluid Power Careers Portal

THE PLACE for Students and Employers to Find Each Other

Launched just this year, NFPA's Fluid Power Careers Portal is a tool designed to provide the 4-year university students being taught fluid power with information about and employment opportunities in the fluid power industry. Companies that are at least Bronze-level donors in our Pascal Society—whose funding is critical if we are to continue the outreach and education programs that result in these fluid power candidates—can use the portal to search student resumes and post their available positions.





The Pascal Society

The Pascal Society is the NFPA Foundation's annual giving society that has raised more than \$2.3 million for fluid power outreach, education, and research programs. Pascal Society funds support the full range of Foundation programs highlighted in this report.

Pascal Society donors combine their financial and volunteer contributions in one concerted effort, developing the resources, tools, and people needed to meet the future technology and workforce needs of the U.S. fluid power industry.

Pascal Society Donors as of **June 30, 2017**



Gold Members

Bimba Manufacturing	Hydra-Power Systems
Danfoss Power Solutions	Parker Hannifin
Enfield Technologies	Proportion-Air



Silver Members

Afton Chemical	HYDAC/Schroeder Industries
Bobcat	Linde Hydraulics
Bosch Rexroth	Lubrizol
Chevron	Moog
Clippard Instrument Laboratory	Netshape Technologies
CNH	Poclain Hydraulics
Daman Products Company	Quality Control Corporation
Deltrol Fluid Products	Woodward HRT
Donaldson Company	
Evonik Oil Additives	
ExxonMobil	
Gates Corporation	



Bronze Members

Alro Steel	Kaman Industrial Technologies
Bailey International	Kawasaki Good Times Foundation
Barksdale Control Products	KYB America
Casappa	KYB Japan
Caterpillar	Lehigh Fluid Power
Concentric AB	Main Manufacturing Products
Czero	Master Pneumatic
Delta Computer Systems	Micromatic
DunAn Microstaq	Moseys Production Machinists
Eaton Corporation	Muncie Power Products
Famic Technologies	National Tube Supply
FasTest	OEM Controls
FD Groups America	PARTsolutions
Festo Corporation	R. T. Dygert
Fluid Power World Magazine	ROSS Controls
FORCE America/Valve Division	Schmalz
G. W. Lisk Company	Simerics
GS Global Resources	Stauff Corporation
HAWE Hydraulik NA	Steelhead Composites
HECO Gear	Sumitomo Heavy Industries
Hitachi	Sun Hydraulics
HUSCO International	The Toro Company
Hydraulics & Pneumatics Magazine	Walvoil Fluid Power
Idemitsu Kosan	Wandfluh of America
IMI Precision Engineering	White Drive Products
Industrial Hard Chrome	World Wide Fittings
Iowa Fluid Power	Yates Industries
JARP Industries	
JCB	

Legacy Builders

The NFPA Education and Technology Foundation extends gratitude to the many generous donors who share our mission of meeting the workforce development needs of the U.S. fluid power industry.

The following organizations have achieved Legacy Builder status – cumulative giving of \$25,000 or more – as of our last recognition year, ending **April 30, 2017**.

CLASS OF 2017

Linde Hydraulics
Lubrizol
Proportion Air
Woodward HRT

Hydra-Power Systems, Inc.
Hydraquip, Inc.
Netshape Technologies
Poclair Hydraulics, Inc.

CLASS OF 2016

Afton Chemical Corporation
Bobcat Company
Chevron
Donaldson Company, Inc.
Evonik Oil Additives USA, Inc.
ExxonMobil
HYDAC TECHNOLOGY CORPORATION/
Schroeder Industries LLC

CLASS OF 2015

CNH Industrial
Pall Corporation
Moog Inc.

CLASS OF 2014

Danfoss Power Solutions
Eaton Corporation
Gates Corporation
ROSS Controls



CLASS OF 2013

Bimba Manufacturing Company
Bosch Rexroth Corporation
Caterpillar Inc.
Deltrol Fluid Products
Parker Hannifin Corporation

CLASS OF 2012

Enfield Technologies

CLASS OF 2010

Sun Hydraulics Corporation

Thank You Donors

The NFPA Education and Technology Foundation extends gratitude to the many generous donors who share our mission of meeting the workforce development needs of the U.S. fluid power industry.

The individuals and organizations on the facing page made a donation in our last recognition year – between **May 1, 2016 and April 30, 2017**.

To make a donation, visit: <https://secured.nfpa.com/publicdonation/nfpafoundation/foundationdonation.aspx>



ACE Controls, Inc.
Afton Chemical Corporation
Aggressive Hydraulics
Air Logic
Aladco, LLC
Alagna, Matt
Allied Machine & Engineering Corp.
Alro Steel Corporation
AMETEK APT
ARGO-HYTOS Inc.
ASCO Numatics
Auburn Gear, Inc.
Badestnost JSCo
Bailey International
Barksdale Control Products
Bimba Manufacturing Company
Bobcat Company
Bonavista Technologies, Inc.
Bosch Rexroth Corporation
Brand Hydraulics
Casappa Corp.
Caterpillar Inc.
Central Steel & Wire Company
Certified Power
Chevron
Clippard Instrument Laboratory, Inc.
CNH
Comer Industries Inc.
Concentric Rockford Inc.
Cross Company
Czero, Inc.
Daman Products Company Inc.
Danfoss
Delta Computer Systems, Inc.
Deltrol Fluid Products
Design World
DLH Fluid Power Inc.
Donaldson Company, Inc.
DunAn Microstaq, Inc.
Dura-Bar
Enfield Technologies
Evonik Oil Additives USA, Inc.
ExxonMobil Research and Engineering
Famic Technologies Inc.
FasTest Inc.
FD Groups America
Festo Corporation
Firestone Industrial Products Co.
Flodraulic Group, Inc.
FORCE America Inc./Valve Division
Fordsell Machine Products Company, Inc.
G.W. Lisk Co., Inc.

Gates Corporation
GS Global Resources
HAWE Hydraulik GmbH & Co KG
HECO Gear, Inc.
Hengji America Co., Inc.
Hitachi America Ltd.
Hone, David
HUSCO International, Inc.
HYDAC TECHNOLOGY CORPORATION
Hydraforce
Hydra-Power Systems, Inc.
Hydrotech, Inc.
Idemitsu Kosan Co. Ltd.
IMI Precision Engineering
Industrial Hard Chrome, Ltd.
Iowa Fluid Power
JARP Industries, Inc.
JCB
Kaman Fluid Power LLC
Kawasaki Precision Machinery (U.S.A) Inc.
KYB Americas Corporation
Lanke, Eric
Lehigh Fluid Power, Inc.
Ligon Hydraulic Cylinder Group
Linde Hydraulics Corp.
Lubrizol
Main Manufacturing Products, Inc.
Master Pneumatic-Detroit, Inc.
Micromatic LLC
Moog Inc.
Mosey's Production Machinists, Inc.
MP Filtri USA Inc.
Muncie Power Products, Inc.
National Tube Supply Company
NetShape Technologies
OEM Controls, Inc.
Ortman Fluid Power
Parker Hannifin Corp.
PARTsolutions
Penton Media, Inc.
Plymouth Tube Co.
Poclair Hydraulics, Inc.
Precision Associates, Inc.
Price Engineering
Proportion Air, Inc.
QCC - Quality Control Corp
R & J Cylinder & Machine, Inc.
R.T. Dygert
ROSS Controls
Sapa Extrusions
Schmalz Inc.
Shell Lubricants

Simerics Inc.
Starcyl Cylinders Inc.
Stauff Corporation
Steelhead Composites
Stucchi S.p.A.
Sumitomo Heavy Industries Ltd.
Sun Hydraulics Corp.
Swiss Automation Inc.
The Toro Company
Thomas Magnete USA, LLC
Triad Technologies
Twin Disc, Inc.
Walvoil Fluid Power
Wandfluh of America, Inc.
Wanke, Thomas
Wendel, Marti
White Drive Products, Inc.
Wojanis Supply Co., Inc.
Woodward HRT
World Wide Fittings Corporation
Yates Industries, Inc.
Zinga Industries, Inc.



NFPA
Education and
Technology
Foundation

NFPA Education and Technology Foundation

6737 West Washington Street, Suite 2350

Milwaukee, WI 53214

(414) 778-3344

www.nfpa.com