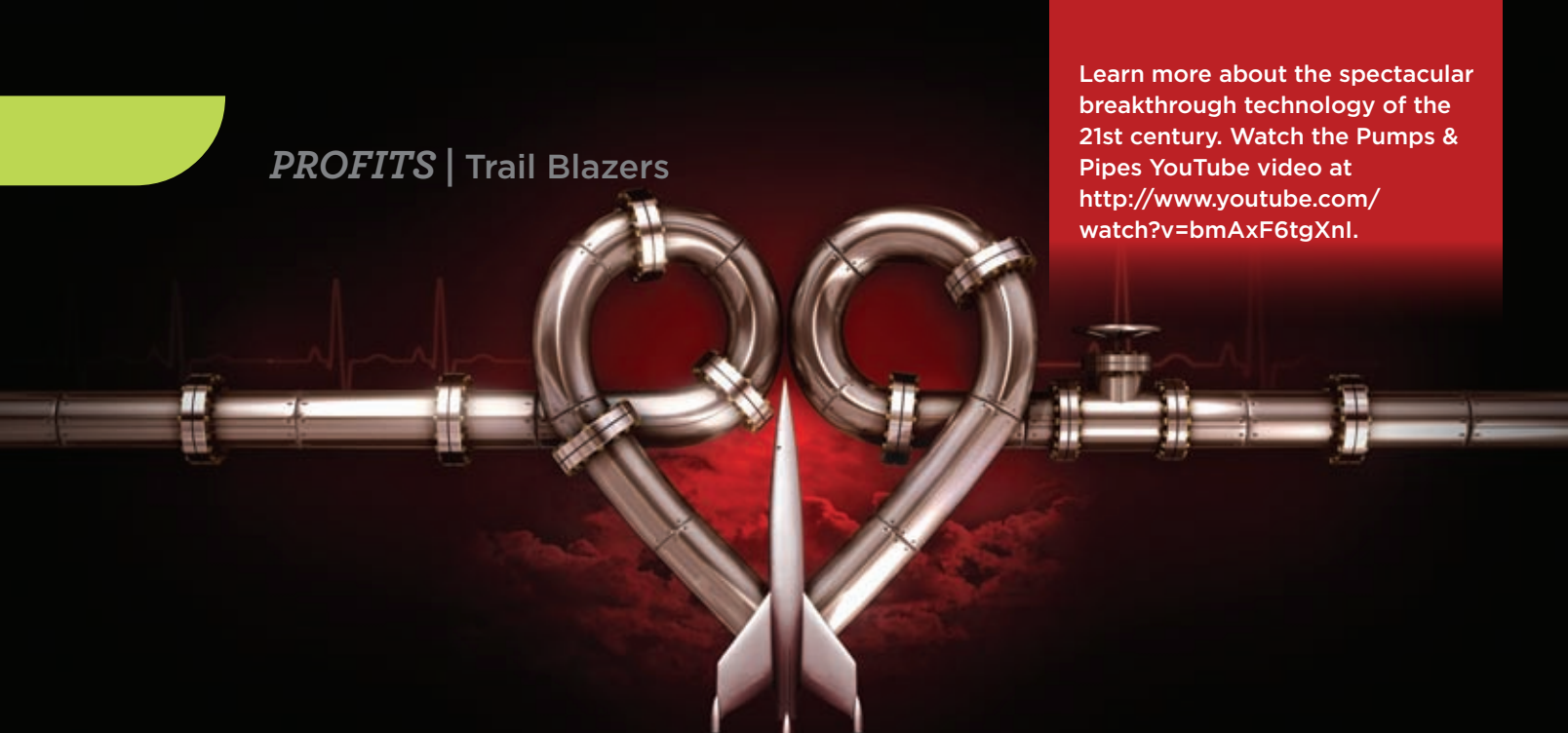


Learn more about the spectacular breakthrough technology of the 21st century. Watch the Pumps & Pipes YouTube video at <http://www.youtube.com/watch?v=bmAxF6tgXnl>.



# PUMPS & PIPES

## Benefit from one another's Toolkits

### Healthcare, petrochemical, and now aerospace industries collaborate to share common technologies

By Kim Morris  
Director, Bay Area Houston Advanced Technology Consortium

Houston, we have a solution. It is Pumps & Pipes, found in the collaboration of seemingly dissimilar industries—healthcare and petrochemicals. The Pumps & Pipes consortium was the brainchild of Dr. Alan Lumsden of the Methodist DeBakey Heart and Vascular Center and Dr. William Kline of ExxonMobil Upstream Research Company. The University of Houston was soon added, and is represented by Dr. Ioannis Kakadiaris.

Pumps & Pipes was formed to solve technical problems commonly found between these two industries, to develop common solutions that can be applied to product development, and to explore crossover ideas and technologies with the potential to revolutionize key sectors of the local economy.

What do the oil and gas industry and heart surgeons and researchers have in common? Believe it or not, plenty. Both deal with fluids that have similar properties and flow through a network of pipes controlled by pumps and valves. Both deal with issues of corrosion and blockages within these pipes. Both experience malfunctions in extremely hard to reach places. Both deal with failures of pumps and valves that

can prove catastrophic. Dr. Kline notes, “Heart and vascular surgeons have much in common with oil and gas engineers in that we are in the flow-assurance business.”

#### Why collaborate

Obviously, these two industries have much in common from a purely technical perspective. However, can heart surgeons and oil and gas engineers actually collaborate with positive results? The answer is definitely yes. Dr. Lumsden says, “It is exciting to work with people who do similar, but fundamentally different, procedures.

The solution to my problems can be found in someone else’s toolkit...and by those who will have completely different concepts in how to address a problem.” For the past six years, these two industries have collaborated through Pumps & Pipes to help one another solve technical problems and

develop such products as the Greenfield Kimray filter, a device developed from a pipeline filtration system and now used in heart patients; a computer interface to run a heartbeat simulator on an oil well linear actuator pump, which doctors now use to test heart valves; and the

**What do the oil and gas industry and heart surgeons and researchers have in common? Believe it or not, plenty.**

visualization of well flow through a gravel pack resulting from a 3D model of flow direction generated by a Methodist Heart and Vascular Center MRI machine.

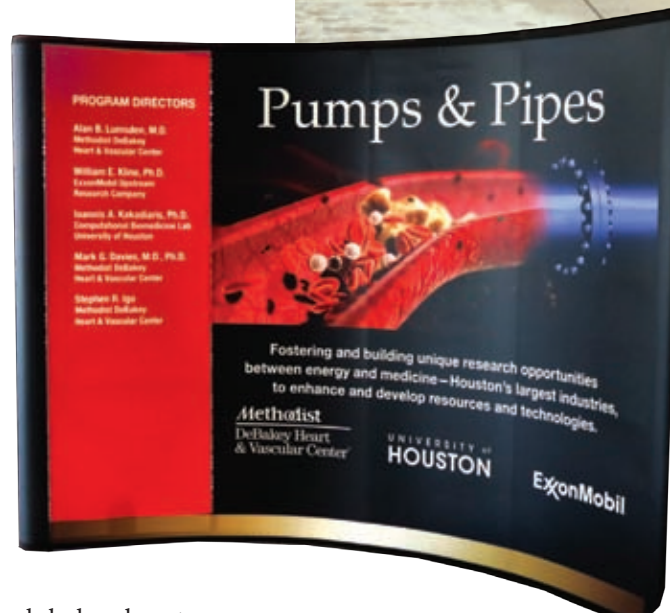
### Pumps, Pipes, and Aerospace

For Dr. Lumsden, the next logical step for Pumps & Pipes was to expand the collaboration into other disciplines, and the aerospace industry held the most promise. In May 2012, the Bay Area Houston Economic Partnership (BAHEP) hosted a meeting in which Dr. Lumsden addressed a group of aerospace executives and invited Houston’s aerospace community to join the unique Pumps & Pipes collaboration. This group of aerospace executives then toured the Methodist DeBakey Heart and Vascular Center in June 2012 and engaged in discussions with physicians from that hospital and the Texas Children’s Hospital to learn of potential areas of collaboration in which aerospace technologies might be used in medical applications. Crossover technologies that were identified involved miniature high resolution 3D cameras and lighting to fit within a 3 to 4 mm port, smaller endoscopes, vibration isolation of work platforms, underwater adhesives for the treatment of Spina Bifida in unborn fetuses, and improved simulation capabilities.

Following this meeting at the Methodist DeBakey Heart and Vascular Center, BAHEP, the Bay Area Houston Advanced Technology Consortium (BayTech), and Jacobs Technology took the initiative to organize and mobilize aerospace industry participation in the Pumps & Pipes collaborative.

The aerospace industry made its debut with the Pumps & Pipes collaboration at its sixth annual conference held Dec. 3, 2012, titled “Pumps & Pipes 6 – Opportunity Now,” held at The Methodist Hospital Research Institute in Houston. The first Pumps & Pipes conference was held at the University of Houston five years ago and attracted less than 100 attendees. The conference has now gone global with the introduction in 2011 of the first international Pumps & Pipes conference, sponsored by ExxonMobil and the Qatar Science & Technology Park, held in Doha, Qatar. Now, with the inclusion of the aerospace industry, the December 2012 Pumps & Pipes conference enjoyed an attendance of 300 persons with another 500 joining virtually thanks to a live global webcast.

The Pumps & Pipes 6 conference was kicked off by viewing a spectacular video, produced by Jacobs →



Above: Dr. Alan Lumsden (left) with the Methodist DeBakey Heart and Vascular Center and Dr. Ioannis Kakadiaris with the University of Houston first conceived of the Pumps & Pipes collaboration. They are shown standing in front of the NASA Lunar Electric Rover on display outside the Methodist Research Institute in the Texas Medical Center. The Rover, a 12-wheeled all-terrain prototype vehicle designed to house small teams of explorers for long excursions across the moon or rugged Martian landscape, may offer solutions to challenges faced by the petrochemical industry. Left: Pumps & Pipes welcome display in the lobby of the Methodist Research Institute conference facility.



Technology, which explains the importance to Houston of the Pumps & Pipes collaboration and introduces aerospace to the partnership. This was followed by a heartfelt address from then NASA Johnson Space Center (JSC) Director Mike Coats titled “Houston, We Have an Opportunity.” While explaining the importance of collaborations, Mr. Coats said, “We’re all about humans...to succeed we must learn to communicate and collaborate across industries.” To further highlight the aerospace debut at the Pumps & Pipes conference, the aerospace industry featured displays, tours, and photo ops of NASA’s Lunar Electric Rover, a 12-wheeled all-terrain prototype vehicle designed to house small teams of explorers for long excursions across the moon or rugged Martian landscape; NASA’s X-1, a human exoskeleton derived from Robonaut components to help astronauts carry heavy loads as they hike across planetary surfaces, and a NASA prototype robotic hand display designed with the ability to operate the same tools used by astronauts.

In a keynote address titled “Space Cowboys: Roping an Asteroid,” Dr. Robert Ambrose, chief of JSC’s Software, Robotics and Simulation division, discussed NASA’s work in robotics and outlined some of the possibilities for collaborations in this field including how the Lunar Electric Rover and its spacesuit ports, which permit astronauts to exit quickly for spacewalks, could become the model for an effective emergency response vehicle



NASA robotic hand prototype on display at the Pumps & Pipes conference. NASA’s work in robotics offers possibilities for advancement in other major industries.

capable of rescuing injured workers isolated by fire, toxic spills, nuclear radiation exposure, and other disasters. He demonstrated how the X-1 Exoskeleton, with its rigid lightweight frame and interconnected motors and sensors, could help those confined to wheel chairs walk again, or how it might help workers scale oil rigs. Dr. Ambrose also highlighted the Active Response Gravity Offload System, a specialized crane developed to simulate varying



Dr. William Kline with Exxon Mobile immediately saw that solutions would be evident within the crossover of ideas between healthcare and petrochemical industries.

forces of gravity for astronauts training to explore asteroids, the moon, and Mars, which might aide stroke victims in their recoveries. In a live satellite link to Palmer Station, Antarctica, former astronaut Dr. Scott Parazynski, Chief Medical Officer & Director, UTMB Center for Polar Medical Operations, discussed medical research being conducted in the harsh environment of Antarctica, including telemedicine.

To say that the Pumps & Pipes conference organizers were impressed by the aerospace industry participation in their annual conference would be an understatement. As a result, the aerospace industry’s partnership in the Pumps & Pipes collaboration has been secured.

So Houston, we really do have a solution. The aerospace community’s partnership in the Pumps & Pipes collaboration should pay dividends to the Bay Area Houston region as innovative product designs and business initiatives are created and new revenue streams are generated for those organizations participating in this very unique, very Houston, collaboration. ■

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*Before becoming director of BayTech, C. Kim Morris had retired from a 27-year career with Honeywell International. Thirteen of those years were spent at Goddard Space Flight Center in Ground Network / Space Network management activities. NASA Johnson Space Center became his home for the remaining 14 years, where he had multiple responsibilities. Morris holds a master’s degree in business from Johns Hopkins University.*