A Revolution in Aerodynamics

HPC4Mfg Industry Engagement Day: Project Impact
About Actasys

• Actasys is developing a patented platform technology based on ‘Active Aerodynamics’

• Located in Watervliet, NY (near Albany)

• Small high-tech company with a core team of 6 employees
The majority of current aerodynamic solutions rely on static designs that poorly adapt to dynamic conditions, resulting in low performance.

Actasys is developing a novel technology that can adapt in real time to dynamic conditions by acting on the way objects interact with airflow and it does so without changing their physical shape.
The shape of heavy trucks (Class 8) is optimized for load and logistics.

The resulting shape has high aerodynamic drag, high fuel consumption, poor handling and stability.

Changing the shape of the truck is not practical or cost-effective.

Break down of consumed energy at highway speed

- Aerodynamic Drag: 53%
- Drive-Train: 6%
- Auxiliary Equipment: 9%
- Rolling Resistance: 32%
The Technology: Synthetic Jet Actuators

Generate high velocity jets of air using very low power

The actuators are assembled using a proprietary patent pending cartridge
The Solution: Active Aerodynamics

- Synthetic Jets redirect the airflow, virtually reshaping the vehicle.
- Already validated and used in the aircraft industry.
- Reduces aerodynamic drag of trucks by 10-36%.
- Potential to reduce CO2 emissions by 55M metric tons in the U.S. alone.
Current Development is Prototype-Driven

Generation 1:
- Cost: $550
- Weight: 1lb

Current Generation:
- Cost: $90
- Weight: 0.1lb

Target
- Volume Cost: $20
- Weight: <0.1lb

More than 100 different configurations and designs tested
Prototype-Driven Development vs Model-Driven Development for Synthetic Jets

- Synthetic Jet actuators performance is strongly impacted by their geometry.

- More than 8 parameters involved in the internal geometry of actuators, and 4 layers of different materials.

- Requirements change significantly depending on the application.

- Prototype-driven approach is sufficient in initial stages of development for proof of concept, but for go-to-market, model-based optimization is required.
Actasys-ORNL HPC4Mfg Project

- Mathematical models of actuators require very complex CFD simulations, needing more than 50M core hrs.

- Simulations will span a wide range of parameters, leading to a range of performances that will be utilized across the targets markets that Actasys is planning to tackle.

- The project will create the basis for a reduced-order model that Actasys will utilize to customize actuator designs depending on application requirements.
Impact of HPC4Mfg Project on Actasys

• Model-based optimization is the next logical step to get to performance and cost level that are required to get to market.

• The complex CFD simulations (more than 50M core hrs) and the expertise required to conduct such simulations makes HPC4Mfg a fundamental and necessary asset.

• The reduced-order-model produced at the end of the program will allow Actasys to perform simulations with resources and expertise that are sustainable.
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