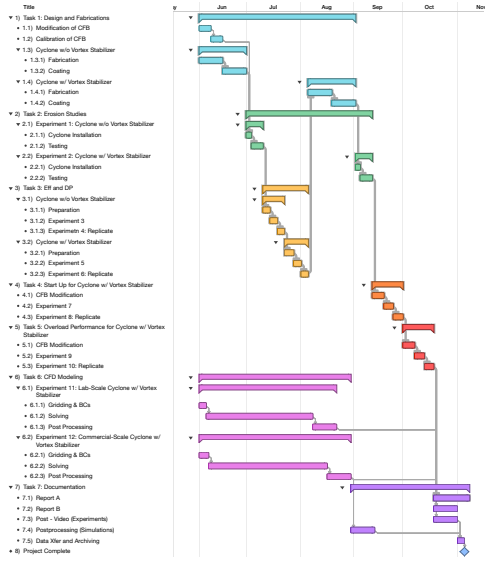
Applying the Fundamentals

PSRI Contract Research and Development

With over 110,000 sq. feet (10,000 sq. meters) of research space, 135 feet (41 meters) vertical height, and over 10,000 SCFM (17,000 NCMH), PSRI has the facilities and infrastructure to study your problem on a commercially relevant scale. Our team is experienced and PSRI can get your experiments or model up and running at reduced cost and less time than most companies can do by themselves. Furthermore, PSRI understands what the challenges are and how to use experiences and fundamental understandings to deliver commercially relevant solutions.

PSRI Particulate Solid Research, Inc.

Applying the Fundamentals



PSRI contract research focuses on solutions and technology and not intellectual property. PSRI does not apply for patents and all contract research intellectual property remains with the contracting company or organization. In short, all ideas, solutions, and the knowledge obtained during a contract research project is the property of the client and held in strict confidence with and only with the client.

As a result, PSRI has done contract research for clients all over the world in a wide range of technologies including:

- Acrylonitrile,
- Biomass gasification,
- Biomass pyrolysis,
- Catalytic oxidation,
- Coal combustion,
- Coal gasification,
- Coal upgrading,
- Chemical looping,
- Dehydrogenation,
- Fluid coking,
- Fluidized catalytic cracking (FCC),
- Hydrogenation,
- Maleic anhydride,
- Oxychlorination,
- Methanol to Olefins (MTO),
- Polycrystalline silicon,
- Polyolefin reactors (PE and PP),
- Reforming,
- Sulfur capture operations,
- TiO_2 roasting via $TiCl_2$, and
- Waste remediation

All of which was performed in our state-of-the-art facility in Chicago with integrated capabilities such as:

- 200 cumulative years of experience in fluidization and particle technology
- Eleven research buildings over 3.5 acres (1.4 hectares) in the heart of Chicago
- 110,000 sq. feet (10,000 sq. meters) of research space with a 135 and 55 feet (41 and 17 meters) tall high bay research labs,
- 2000 sq. feet (186 sq. meter) fully equipped analytical laboratory,
- 500 psig (34 barg) high pressure compressor capacity,
- 5000 SCFM Atlas Copco blowers,
- 2000 SCFM Kaeser compressors,
- 35,000 SCFM (59 NCMH) bag house capacity,
- 4160 VAC three-phase electrical service,
- 90 psig (6.2 barg) natural gas service,
- LN_2 service on site,
- 64 CPU cluster server,
- 3 Titan GPU servers,
- 80 TB file server with redundant backup, and
- Gigabyte network

Applying the Fundamentals

PSRI philosophy for contract research

- Safety first above all else
- Clients own their IP, not PSRI
- The experiments dictate the equipment and the equipment does not dictate the experiments
- Seeing is believing but data are needed for design
- Models and data need to be verified and validated
- Contract research costs are fixed, we have been doing this a long time and we know how much it costs and how long it will take
- PSRI values experienced employees, they get the job done at the highest quality, at the lowest cost and in the shortest time

Within our facility resides world class research equipment for cold-flow, high temperature or high pressure research including

- Four 12-inch (0.3-m) diameter by 70 feet (21-m) tall risers,
- An 18-inch (0.46 m) diameter by 82-feet (25-m) tall riser,
- A 36-inch (0.9-m) by 90-feet (27-m) tall riser with an 8-ft (2.4-m) diameter core-annulus stripper section,
- Six fluidized beds up to 6-ft (1.6-m) in diameter,
- Two high-temperature fluidized beds up to 1500°F (815°C),
- A high-pressure fluidized bed up to 500 psig (34 barg),
- Two 5-ft (1.5-m) diameter semi-circular fluidized beds,
- A 3-ft (0.9-m) diameter modular stripper unit with solids flux capabilities up to 25 lb_m/ft^2-sec (125 kg/m^2-s),
- A 3-ft (0.9-m) diameter fluidized bed unit with varying bed internals,
- Two 5-ft (1.5-m) diameter conical fluidized bed,
- A vacuum fluidized bed,
- Cyclones up to 36-inches (0.9-m) in barrel diameter and an assortment of cyclone trains, and
- Several dilute- and dense-phase conveying loops.

With these unit comes a wide range of probes, methods, tools and techniques including

- 3D Printing,
- Capacitance tomography (in partnership with Tech4Imaging),
- CFD Barracuda® servers (in partnership with CPFD-Software)
- Coulter Counter Master Sizer® particle size analyzer,
- DEM Star CCM+® server (in partnership with Siemens)
- Gamma-ray densitometer,
- Helium and CO_2 gas tracer probes,
- High-frequency pressure response probe,
- Solids velocity Pitot Tube probe,
- PSRI Bubble Hydrodynamic Fiber Optic Probe,
- PSRI Dynamic Force Probes,
- PSRI High-Temperature Erosion Test Unit,
- PSRI Jet Impact Test Unit,
- PSRI Jet Cup Attrition Test Unit,
- PSRI Ultraviolet Fiber Optic Solids Tracer Probe,
- PSRI U_{mf}/U_{mb} and Bed DensityTest Unit,
- PSRI Voidage Fiber Optic Probe,
- Solids extraction probe,
- Sympatec Helios® particle size analyzer,
- Ultrasonic and sonic probes, and
- Vision Research Phantom® v7.2 Color High-Speed Camera with borescope integration and particle tracking.

Applying the Fundamentals

Do you have a new concept, design challenge, operational challenge or scale up concern? We can help. Call Dr. Ben Freireich at +01 773 523 7227 or email at ben.freireich@psri.org.