



Grace's Fine Chemical Manufacturing Services (FCMS)

R&D From Concept to Commercial



Grace’s Fine Chemical Manufacturing Services (FCMS) has the facilities and expertise to support product development at every stage, from contract research through commercial manufacturing. Having the appropriate resources where you need them, when you need them is critical, and our multiple locations and deep experience can help ensure your success.



The Right People in the Right Places

Our R&D group is composed of chemists, engineers, and analytical professionals dedicated to quickly taking projects from concept to production:

- Proven track record of scale-up success, lending confidence and instinctive adaptability to every project
- Seasoned R&D technical group of organic chemists supervising contract service operations across our labs – a talented, efficient, and responsive team with an exceptional problem-solving focus
- A dedicated method development team across our organization
- Process engineering team of chemical engineers work with chemists to translate the lab process to our pilot plant facilities ensuring seamless technology transfer

We serve a wide variety of customer needs through two world-class U.S. facilities:

South Haven, Michigan

11-person professional R&D team operating in a facility that can handle the entire GMP project lifecycle—bench, kilo, pilot and commercial—in one location

Tyrone, Pennsylvania

Our skilled team specializes in scale-up and offers commercial quantities at low capital entry.

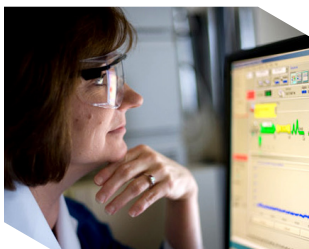
U.S. Kilo Labs and Pilot Plants		
	South Haven, MI	Tyrone, PA
Kilo	• New GMP kilo lab • Up to 100-liter	—
Pilot	• GMP • 50-500 gallon • Glass-lined/alloy	• 50-500 gallon • Glass-lined/alloy • Filters/dryers

Experience and Capabilities Make the Difference

Grace's FCMS brings decades of R&D experience across dozens of industries—from pharmaceuticals to agriculture to electronics—to every project. Our team has evaluated thousands of potential projects and will work with you to determine project economics, problem areas and preliminary economics. From this initial evaluation, we can develop a proposal for the entire project including timelines for development work all the way through commercialization.

At the R&D level, we can work with your technology or use our extensive resources in chemistry and chemical engineering to develop, test and prove efficient new processes. By thoroughly testing your process in state-of-the-art research laboratories, you will save development time and costs.

Our capabilities match customer needs throughout the product life-cycle. From the lab bench to commercial production, we are there to ensure consistent quality, efficiency, and service.



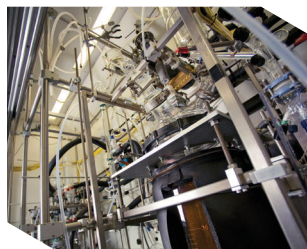
Initial Screening

- Paper studies
- Cost analysis
- Case iteration
- Alternate routes
- Feasibility



Lab Development

- Run the chemistry
- Safety study
- Stretch the process
- Yield improvement
- Scalability
- Batch to continuous analytical development



First Scale-up

- Kilo lab
- Pilot plant
- Operating procedures
- Start-up coverage
- Tech risk analysis



Commercialization

- Process scope
- Technology transfer
- Start-up coverage
- Troubleshooting
- Tech risk analysis

Quality and efficiency are hallmarks of our approach.

Grace's FCMS R&D is experienced in using the principles of Quality by Design to develop robust, scalable processes. Our tools include various multi-reactor automated units that allow rapid data generation, plus the statistical tools to analyze the data and find the operating space for the process.

Running some processes in a continuous mode can improve both the quality and economics at

commercial scale. Grace's FCMS R&D features a dedicated lab for converting batch processes to continuous, staffed by chemists and chemical engineers experienced with this work.

State of the art cGMP kilo lab

- Flexible and fast
- From lab to first scale-up in one location
- Eliminates technology transfer risk



For more information about Grace's Fine Chemical Manufacturing Services (FCMS), visit [grace.com](https://www.grace.com).

We want to be your R&D partner.

Grace's FCMS engineers, chemists and analysts have the experience, facilities, resources and full capabilities of the Grace global R&D organization to solve your development challenges.



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