

WE SPECIALIZE IN DIFFICULT CHEMISTRIES



DANCHEM TECHNOLOGIES & INNOVATIONS

SOLUTIONS START HERE

[danchemtechnology.com](http://danchemtechnology.com)

## WE ARE DTI



Founded in 1960 as the Research Division of Dan River, Inc., a U.S. textile company, the company expanded into non-textile chemical manufacturing in the 1970's. Today, DTI has built an applications and engineering team uniquely qualified to develop processes to commercialize our customer's products rapidly, provide the needed capacity, and help them reach their target markets quicker. **We specialize in difficult chemistries.**

DTI's unique manufacturing technologies to meet customer needs is a key strength, while our flexible environmental permit gives the company a distinct competitive advantage. Our specially designed reactors produce materials that many competitors are unable to make; our unique agitation capabilities enable us to handle and produce high viscosity materials efficiently and effectively. Our large suite of Littleford® dryers allow us to recover solvents and powders at a size compatible with our customers' demands.

DTI excels at the manufacture of polymers used by blue chip customers for end-markets from paints to electronics. DTI is also FDA registered and can comply with applicable cGMP protocols. In addition, the company is ISO 9001, ISO 14001 and Kosher certified for a uniquely broad range of capabilities that are especially attractive to customers seeking to consolidate outsourcing within a small, manageable group of suppliers.

From its remarkable depth and breadth of technical expertise to its wide range of manufacturing capabilities, DTI clearly has the right chemistry for your future success.

### PROCESS >

Solutions start at DTI.

## ADVANCED TECHNOLOGY CENTER



Our Advanced Technology Center (ATC) is ready to help assist our customers develop their products and processes in conjunction with our engineering staff. The ATC allows semi-works production capacity and DTI to develop new processes utilizing state-of-the-art technology. DTI employs horizontal reactors capable of operating in extremely high viscosity ranges and dealing with liquid state to solid state phase transitions.

Our Advanced Technology Center (ATC) adds capacity and scale-up opportunities to our current Littleford® fleet of 4,200 liter; 6,000 liter; 10,000 liter and 15,000 liter reactors. Primary bay designs, facilitated with engineers and chemists, also incorporate vertical layouts to improve efficiency of solids or slurry handling.

With our GMP background, we have also made the facility capable of supporting cGMP process development and semi-works operations with full analytical laboratory instrumentation support including GC, HPLC and various titrations.

Should your processing needs require horizontal reactors and/or GMP processing, let DTI consultants show you how we can help your company reduce costs and shorten the product development cycle.

### SOLUTIONS >

Rapid scale-up to validate new processes.

## MARKETS WE SERVE

Adhesives & Sealants  
Animal Feed Additives  
BioBased & Renewable  
Chemicals  
Building & Construction  
Coatings  
Cosmetics  
Dental  
Food  
Pharmaceuticals  
Specialty Chemicals  
Transportation  
Water Treatment

## WHY CHOOSE DTI?

With more than fifty years of chemical manufacturing and thirty-five years of chemical tolling experience, our team of experts – chemists, engineers, and operators – offer these key reasons to partner:

### PROCESS DEVELOPMENT EXPERTISE

With years of experience in chemistry and chemical process design, we can work with you to develop any number of custom chemical processes. DTI can handle difficult raw materials and finished products our customers are unable to handle themselves.

### UNIQUE PROCESSING EXPERIENCE

At DTI, we employ Horizontal Reactor Technology to process materials at viscosities in excess of one million centipoise or to completely remove the solvent leaving powdered dry solids.

### STATE-OF-THE-ART ADVANCED TECHNOLOGY CENTER

DTI's cGMP-capable multi-bay pilot works facility assists our customers in their process and product development stages. Specifically designed for process development of new synthesis methods, stainless steel vessels ranging from 15-gallons to 300-gallons are available for your specialty manufacturing needs. Supported with analytical lab instrumentation and facilitated by engineers and chemists, our team of experts is ready to handle your unique processing needs.

### DTI IS READY TO REACT

Whether your business requires immediate outside resources due to growth or even the sudden, unplanned outage, DTI has a strong history of quick response with maximum results. With our deep knowledge of vendors and equipment supply base, DTI will acquire equipment based on the scope of needs and manage it through our NPI stage-gate process.

### PROCESS CAPABILITIES

DTI is an expert at batch organic synthesis and compliments it with knowledge of key unit operations such as blending, drying and crystallization.

### KEY SYNTHESIS OPERATIONS

Acetylation	Methylation	Amidation	Oxidative Coupling
Condensation	Phosphatation	Esterification	Polymerization
Etherification	Quaternization	Hydrolysis	Oxidation

### KEY UNIT OPERATIONS

Blending	Filtration	Centrifugation	Flaking
Crystallization	Mixing	Emulsification	Drying

## PROCESS >

Fortune 500 companies around the world trust DTI.

## CASE STUDY 001 > HIGH VISCOSITY PROCESSING



Specialty additives and adhesives have seen substantial growth in the past 5 years. This product line requires powerful processing equipment to drive the process through its “phase change” from low viscosity to high viscosity, paste or powder and has shown a strong fit with horizontal reactors. DTI has positioned itself with a number of key manufacturers and emerging technologies to provide a unique solution to this growth segment.

DTI has manufactured specialty materials and products for the dental markets for over 20 years and upgraded our processing equipment and controls to meet rigorous requirements while generating productive solutions for our customers.

**SITUATION >** Product success in new global markets was driving demand and outpacing current manufacturing capacity.

**GOAL >** Increase productivity and efficiency of operations.

**METHODOLOGY >** Implement Operational Excellence and Lean Manufacturing tools to drive process optimization and increase capacity.

**SOLUTIONS >**

- Developed sustainable methods eliminating process waste for long-term yield improvements.
- Created perfect flight scenarios for comparison with historical data to reduce unnecessary time between processes.
- Fostered better communication of the project steps and worked cross-functionally with client's support staff to streamline project effectiveness.

**PROCESS >** Polymerization, drying, particle sizing and solvent recovery.

**RESULTS >** Increased daily production by a sustainable 40% with minimal capital investment.

**SOLUTIONS >**  
DTI increased daily production by 40%.

## CASE STUDY 002 > QUICK TO MARKET



Feed Additives are dietary supplements that are introduced directly to animals to promote healthier development and increase production yields per animal. Feed additive manufacturers are looking for better conversion technology that can process their products in a much tighter controlled environment and at lower temperatures to optimize productivity without reducing the effectiveness of the additive.

Here is just one example of how DTI helped increase production to meet demand and help our customer's business grow.

- SITUATION >** Customer challenged DTI with the need for a large amount of inventory in a short amount of time.
- GOAL >** Increase capacity by several million pounds.
- METHODOLOGY >** Utilize DTI's years of project management experience and processing know-how. Quickly install a new 4,000-gallon horizontal reactor to increase production volume.
- SOLUTIONS >** Completed classroom and hands-on training for the new equipment. Used Operational Excellence and Lean Manufacturing best-practices to optimize output.
- PROCESS >** High viscosity liquids + solids reaction, drying and particle sizing.
- RESULTS >**
- Installed a large reactor within 5½ months and increased capacity by nearly seven million pounds. (300% improvement)
  - The increased production enabled the customer to enter the market 24 months earlier and expanded their internal manufacturing options.

### SOLUTIONS >

DTI installed a 4,000-gallon Littleford® reactor, which increased capacity 3x with no customer capital invested.

## CASE STUDY 003 > PRODUCTIVITY INCREASES



The specialty chemical segment requires dynamic processing situations to meet today's competitive markets. Protected by trade secrets and long application development cycles, these products maintain a high selling price while being able to shield away competitive products that cannot tolerate the application development, testing and qualification cycles.

DTI's primary focus is to develop unique processing solutions to help our customers compete better in this global market. Our fleet of horizontal reactors bring a unique solution to our customers to leverage in their marketplace. Here's how one Fortune 500 company reduced their process and gained efficiencies.

- SITUATION >** Pilot to production – new product with limited production capacity and manufacturing data. Project requires extensive amount of technical coverage.
- GOAL >** Successfully scale-up product manufacturing and optimize process efficiency.
- METHODOLOGY >** Provide good technical scale-up and guidance to validate several optimum process assumptions and bring product to market successfully and on time.
- SOLUTIONS >**
- Developed project parameters to successfully scale-up new process.
  - Provided around the clock technical coverage both in the plant and in the lab.
  - Consolidate a multi-step process in one vessel to further increase efficiency and reduce costs output.
- PROCESS >** Polymerization, solvent exchange and drying.
- RESULTS >**
- Reduced full process from 6 vessels to 2 vessels - One reaction vessel required for synthesis and one intermediate tank.
  - Achieved 300% greater throughput efficiency to meet substantial product launch volumes.
  - DTI confidentially sourced specialty materials prior to scale-up to aid in project time line.

### **SOLUTIONS >**

DTI reduced the full process to two vessels achieving 300% greater throughput efficiency.

## CASE STUDY 004 > RAPID RESPONSE



Companies need contingent supply plans for ever demanding manufacturing requirements. Even in tough economies companies find success and need to expand rapidly to meet large increases in product sales. Contingency planning is critical to every business and DTI offers a confidential partnership to ensure success when our clients need it. In the past three years most of our clients have completed detailed manufacturing assessments to determine their core manufacturing competencies and DTI has become a strong compliment when additional capacity is needed. DTI's primary focus since its inception has been to serve the specialty chemicals market by responding quickly to critical situations.

**SITUATION >** Client's current operations shut down unexpectedly, creating the need for contingency supply to maintain customer supply.

**GOAL >** Supply over 30 different specialty products and meet stringent quality standards for seamless supply transition in a few short weeks.

**METHODOLOGY >** Employ DTI executive focus on project management and expedite project using client's manufacturing experience.

**SOLUTIONS >** The DTI Staff:

- Managed the project using our rigorous New Product Introduction stage-gate process, including a thorough HSE screening.
- Formed immediate partnership between DTI and client.
- DTI modified an internal reactor train and started production within 6 weeks.

**PROCESS >** Polymerization, finishing and specialized packaging.

**RESULTS >** DTI met first pass quality standards and transitioned supply chain to seamlessly maintain client's business continuity.

### **SOLUTIONS >**

DTI met the client's first-pass quality standards and supply chain demands from their customers.

## CASE STUDY 005 > PRODUCT/PROCESS DEVELOPMENT



Scale-up for new products and applying new manufacturing techniques to legacy products is all part of process development. In the past 10 years our industry has seen the critical step of Semi-Works Process Validation disappear from most product launches. The process development path can be streamlined and strategically focused when partnering in developmental projects. DTI brings both process innovation and our new Advanced Technology Center (ATC) to the table. We offer Semi-Work Process Validation and process solutions from a cross functional team including chemists, chemical and manufacturing engineers. Here's how one Fortune 500 company reduced their process and gained efficiencies.

**SITUATION >** Nutritional food value is becoming increasingly important due to heightened consumer awareness. The goal was to deliver new nutritional food technology without compromising taste for the consumer. A customer needed to make sample quantities of a new food additive technology.

**GOAL >** Generate adequate material under cGMP conditions in a timely manner.

**METHODOLOGY >** DTI applied 25 years of regulatory and manufacturing experience of cGMP products.

**SOLUTIONS >**

- Successfully scaled-up new additive process for particle surface treatment into semi-commercial quantities.
- Identified and solved particle classification issues to avoid delays for client's market launch.
- DTI confidentially sourced specialty materials prior to scale-up to aid in project timeline.

**PROCESS >** Encapsulation, mixing, drying and particle sizing.

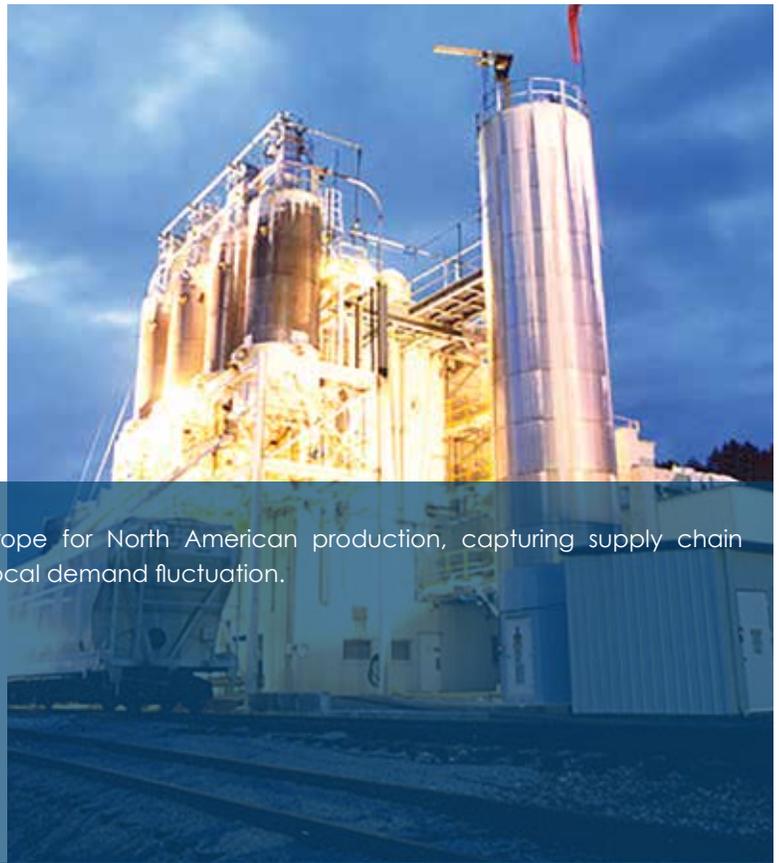
**RESULTS >**

- Successful product launch including global sales.
- Unique supply-chain for specialty ingredients providing completely stabilized finished product to support market growth.

### **SOLUTIONS >**

Supply chain stabilized to support global sales and market penetration.

## CASE STUDY 006 > U.S. MANUFACTURING



Technology transfer from Europe for North American production, capturing supply chain economics and reactivity to local demand fluctuation.

- SITUATION >** Product manufactured in EU for NAFTA market supply. Supply logistics hurt product stability and slowed response to demand fluctuations.
- GOAL >** Successfully meet increased demand in short time frame, developed a more efficient process using horizontal reaction technology.
- METHODOLOGY >** Formed long-term supply agreement. Initiated lab and pilot scale process trials followed by full commercial production.
- SOLUTIONS >**
- Established long-term supply contract.
  - Sourced and installed dedicated processing equipment within DTI.
  - Localized raw material supply chain to North America capturing additional cost and logistics savings.
- PROCESS >** High viscosity liquids, wet milling and packaging.
- RESULTS >**
- Secured "just-in-time" and long-term supply solutions to enable quicker response to shifting market demand.
  - Reduced customer's logistics and working capital costs.

### **SOLUTIONS >**

DTI increased batch yield 3.5 times.

DTI reduced solvent usages by 60% and improved cycle-times by 75%.

Increased yearly output ten-fold.

## EQUIPMENT & TECHNICAL INFO

PROCESS EQUIPMENT	Littleford®	130 liter FV, 100 psig, hot oil
	Littleford®	1,200 liter FV, tempered water
	Littleford®	4,200 liter FV, tempered water
	Littleford®	6,000 liter FV, tempered water
	Littleford®	10,000 liter FV, tempered water
	Littleford®	15,000 liter FV, tempered water
	200 gallons	316L SS, FV, 75 psig internal
	2,000 gallons	316 SS, 50 psig internal
	2,000 gallons	Pfaudler glass-lined, 100 psig internal
	2,500 gallons	316 SS steam-heating, water cooled internal coils
	2,500 gallons	316 SS steam-heating, water cooled internal coils
	3,000 gallons	316 SS, FV, 100 psig internal
	3,000 gallons	316 SS, 100 psig internal
	4,000 gallons	316 SS, FV, 75 psig internal
	4,000 gallons	316 SS, FV, 50 psig internal, hot oil

### AUXILIARY EQUIPMENT

Centrifuges - 36" and 48", Class 1 Div 2	Union Process Dry Mill
Blend Tanks - 5,000 - 6,000 gallons SS	Filters - Sparklers, FSIs
Compressed Air - 100 psig	Bulk Storage for Flammables
Steam Boilers - 100 psig	Nitrogen Generation
3 x Wyssmont Dryers	Fulton Hot Oil Furnace
Bulk Storage Tanks - 3,000 - 20,000 gallons	60 T Toledo Truck Scale - Certified
Water Chillers - 80 - 100 Tons	Filter Press (2)
Warehousing - 50,000 sq. ft.	Hockmeyer Wet Mill
Ribbon Blenders	Centrifuges, 3 x 32"

### LABORATORY & ANALYTICAL EQUIPMENT

HPLC	GC	Atomic Absorption
UV Spectrophotometer	FTIR	Kjeldahl Nitrogen Analyzer
Karl Fisher	Flashpoint	Brookfield Viscometers
Muffle Furnace	Vacuum Ovens	Microwave Moisture Analysis
GPC	Ion Chromatography	Autotitration
Colorimeters	Gardner Color	Sieve Analysis

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