Separating from competition together

DSTI a career opportunity for you?
Top Researchers for DSTI projects

The Dutch Separation Technology Institute (DSTI) is a partnership in which industry, universities and knowledge institutes work closely together to develop breakthrough separation technologies for application in different sectors of the Process Industry. “Together we can take bigger steps, have more impact, and share the risks”.

So far, 45 companies from the Food, Pharmaceutical, Oil and Gas, Chemical and Process Water Industries, together with 8 knowledge centers, have joined DSTI.

Separating what really matters!
High-value components from milk, clean process water, medicines without side effects, energy savings of up to 80%, compact and waste-free production processes.

DSTI offers the best of the scientific and industrial world. You will be working in a project team with top level researchers from industry, universities and knowledge institutes on the cutting edge of Separation Technology. Joining the DSTI research program is exploring the multi-disciplinary network of the Food, (Bio)Chemical, Pharmaceutical, and Oil and Gas Industries. The research program covers all aspects from (fundamental) knowledge generation to technology implementation.

We seek: DSTI is continuously looking for enthusiastic junior and experienced researchers who are interested in a challenging position at DSTI, with a strong career opportunity at one of its partners. Occasionally, we also have positions for technicians and lab assistants. Currently there are about 35 job openings. Visit our website at www.dsti.nl for a list of vacancies.

Functional requirements:
- At least a Master’s Degree in: (Bio)Chemical Engineering, (Bio)Chemistry, Mechanical Engineering, Fluid Mechanics, Materials Science, Applied Physics, Food Technology, or a related field.

Attitude and skills
- Flexible and result-oriented
- Interested in working in a multi-disciplinary team
- Out-of-the-box thinking
- Entrepreneurial spirit
- Hands-on mentality
- Fluent in English

We offer:
- Work in a multi-disciplinary project team with experienced R&D colleagues from industry, universities, and knowledge institutes.
- Work on site with several DSTI partners.
- Flexible temporary contracts at DSTI, with the prospect of a permanent position with one of the DSTI partners.
- Ample opportunities to follow courses and attend conferences to improve your technical competences.
- Support to develop personal and business skills through:
  - A mentor from industry
  - Participation in business simulations
  - Training in project management and communications
- Active support towards your next career step within the DSTI network.

Are you interested in a R&D position within the DSTI program or would you like to have more information please contact us.
Projects

At this moment 24 research projects in 5 industrial sectors have been selected. A list of project titles, and as an example, 12 project summaries are given below.

Current Project List DSTI (February 2007)
Projects marked with * are partly executed as cross sector project

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FOOD

FO-00-002 Mild isolation and fractionation of bio-macromolecules from agro- and bio feedstock*
Highly selective and mild isolation and fractionation of components having high molecular weight (proteins, carbohydrates) from foods or from other bio-based feedstocks will become increasingly important. Many of these components show strong physical or biological functionality and therefore represent a high value as separate products or ingredients. It is therefore relevant to isolate these valuable components from large streams present in our industry (e.g., milk, sugar beet juice, fermentation/hydrolysis fluids). An important prerequisite is the reduction of the large waste streams related to traditional food processes.

FO-00-001 Mild fractionation of suspensions and emulsions
Many bio-based streams consist of a great many different particles and droplets; their composition is often related to their size. Thus, a fractionation of the phases based on size of the domains already gives a fractionation in different compositions. Various techniques are available for this. A recent development is the use of shear-induced migration, which is the usage of hydrodynamic interactions between the various phase domains (suspension particles) in the system. The current project will scrutinize the underlying mechanisms (hydrodynamic or shear-induced diffusion), develop design criteria to make optimal use of the phenomenon, evaluate existing (membrane based) equipment for using this phenomenon, and if necessary design new equipment.

FO-00-003 New separation principles for functional peptides and oligosaccharides based on molecular affinity*
High-purity isolation of peptides (as minor component) and oligosaccharides from large product streams would result in a substantial increase in turnover of several large food industries in the Netherlands. However, presently these high-purity products cannot be made and therefore new technologies are required. Since it is not known which technologies are best to explore, a two step approach is proposed. Firstly a pre-project is carried out to create an overview of the state of the art and to make a selection of the high potential technology options, with a focus on molecular affinity.

Secondly, in the main-project, a technology toolbox is developed which will be applied to the industrial cases brought in by the project partners.

FO-00-004 Mild Dewatering Systems*
Many bio-based food products contain large amounts of water; 75% for sugar beet and 90% for milk are not eccentric. Water reduction is needed for logistics, micro-biological stability or product properties. There are different techniques for dewatering. Finding better solutions for concentrating and drying will have most impact in the sugar and milk industry. The scope is dewatering at 50% of the fossil energy input and at 90% of the operational costs (excl. raw material).
A pre-project of 1/2 year should start with searching alternative technologies by idea generation, application of TRIZ techniques and literature survey. Energy calculations are a part of funnelling the alternative technologies to business solutions. The targets of the pre-project are a roadmap on dewatering in the sugar and milk industry and a proposal for the main-project wherein the developing aspects of the found potential technologies are formulated.

PHARMA

CS-00-001 Selection protocols and synthesis tools for advanced separation technologies and isolation processes in the Pharma and Food Industries*
In the pharma industry, leading companies generally implement relatively frequently new products requiring new processes. Short ‘Time-to-market’ is a critical parameter for economic success and consequently the speed by which processes can be developed is key. The fast development of processes required in the pharma sector is often conflicting with obtaining the best process in view of yield, environmental impact and process economy. For food ingredients a market pull is foreseen. It is expected that only small increments can be obtained upon improving the current route. For a substantial increment new separation routes must be designed. Therefore, it is critical for future success that the food ingredient industry develops process routes to improve their current ingredient portfolio.
In both sectors there is a clear need for a set of tools which facilitate the conceptual design of a process.
**PH-00-004** Intelligent Observer and Control for Pharmaceutical Batch Crystallization

Batch Cooling Crystallization is the workhorse of the Pharmaceutical Industry when it comes to the final purification step in which the Active Pharmaceutical Ingredient is obtained. The control of the crystallization is currently still done by trial and error, even when seed addition is employed. The objective of this project is to reduce product impurities and to control the crystal size distribution. The main deliverable of the project is a measurement skid + analysis system, expert system and software to control the crystallization, which system is tested and demonstrated in a Pharmaceutical Plant environment (year 3 of the project).

**SPECIALTY CHEMICALS**

**SC-00-001** Intensified selective recovery of highly water soluble components from fermentation broths*

Fermentations of acids, bases and possibly small peptides usually do not have high product concentrations, therefore next to purification also concentration is part of downstream processing. With this project new breakthrough technology aims for 10 times more cost-efficient removal compared to the current industrial state of the art and a suitable for > 10 kton/y selective product removal.

**SC-00-005** Reactive distillation for multi-product continuous plants*

Reactive distillation is a well-known technology for reactive-separation systems close to equilibrium. The integrated reaction and separation holds for many systems clear advantages in comparison with subsequent reaction and separation. The removal of reaction water in condensation/esterification systems is a good example of such a system and has already been extensively studied. However, the current scientific and industrial research is often limited to the optimization of reactive distillation columns for a single product type and/or for relatively large capacities. This makes the application of the outcome of these studies not useful for applying reactive distillation in a multi-product environment with relatively small capacities (such as polycondensations).

In order to be able to apply reactive distillation technology in multi-product environments, new concepts need to be developed which allow the combination of significant increase in volumetric productivity with sharp product transitions while new raw materials and catalyst systems are fed to the reactor and process settings like temperature, residence time and column loading are being adapted.

**BULK CHEMICALS**

**BC-00-002** Heat pumps in bulk separation processes

The main bulk separation processes within chemical and refining industry are distillation, absorption/desorption, and crystallization. Increasing rising energy costs demand improvement of energy efficiencies. Significant reductions in energy consumption are expected by using innovative heat pump concepts for removal and supply of heat from/to a separation process. The research should lead to a fully integrated system consisting of traditional distillation and novel heat pump technology.

**BC-00-004** Immobilized designer solvents for water removal*

Water separations belong to the most costly and energy intensive separations within the sector bulk chemicals. Especially for bulk scale (>100 kt/yr) the state of the art is still mostly distillation, evaporation, absorption through glycol and adsorption. A breakthrough compared to the current state of the art would be the establishment of a generally applicable technology based on specially designed solvent systems that are capable of selective action on the water and not on the other components. Specific solvents and operating systems will be developed for this purpose. Start-up companies may be interested to produce the newly developed designer solvents.
OIL & GAS

OG-00-001 Methane separating membrane
The exploitation of high CO$_2$ containing natural gas fields (50% < [CO$_2$] < 80%) is hampered by the lack of cost and energy efficient gas treating technologies. To make these high CO$_2$ gas fields economically exploitable, novel, low cost and energy efficient technologies are required. Current base case technology is conventional amine scrubbing, which is not economically feasible for such high CO$_2$ gas fields. Novel membrane based technologies aiming at methane removal instead of CO$_2$ removal, would provide a breakthrough in the field of high CO$_2$ gas field production and might have the potential of a total process energy consumption of less than 3 MJ/tonne CO$_2$.

OG-00-004 Development of an Ω²R separator focusing on oil/water separation
Recent developments in the Sector Oil and Gas are calling for the development of breakthrough technologies that will enable recovery of hydrocarbons in areas that are difficult to access (deep sea, arctic) or where hydrocarbons are difficult to produce (heavy oil, contaminated gas). One of the separation technologies that could revolutionise future field developments is in-line separation of oil and water by swirling flow, eliminating the need for big oil-water separator vessels currently in use. The technological objective of this project is to deliver a prototype in-line, swirling, flow separator and design rules, operating guidelines and an operating window. New fundamental knowledge on the combination of swirling flow, coalescence and dense dispersion two-phase flow will be obtained that will strengthen the position of the Dutch separation technology community.
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Separating what really matters