



Ingeniatrix

*Microencapsulation for you*

**2011 European Micro-Encapsulation  
Technology Innovation Award**





## Frost & Sullivan's Global Research Platform

Frost & Sullivan is entering its 50<sup>th</sup> year in business with a global research organization of 1,800 analysts and consultants who monitor more than 300 industries and 250,000 companies. The Company's research philosophy originates with the CEO's 360 Degree Perspective,\* which in turn serves as the foundation of its TEAM Research\*\* methodology. This unique approach enables us to determine how best-in-class companies worldwide manage growth, innovation and leadership. Based on the findings of this Best Practices research, Frost & Sullivan is proud to present the 2011 Europe Technology Innovation Award in Micro-encapsulation to Ingeniatrics, S.L.

## Significance of the Technology Innovation Award

### Key Industry Challenges Addressed by Flow Focusing

Currently, encapsulation technologies are gaining more attention in the industry to enable addition of bioactive substances to a matrix. The market need is to enhance solubility, protect bioactive compounds and provide improved release profile and properties. Functionalization of nano/micro particles' surfaces are highly desired in the industry to increase bioavailability that could proffer benefits to health care and cosmetic products. In the case of pharma industry, drug solubility enhancement is one of the most critical challenges where almost 40% of all new pharmacologically potent molecules show poor aqueous solubility, leading to their low-effective concentration in biofluids, and therefore, poor bioavailability, impacting the quality of therapeutic action.

Besides, recent encapsulation technologies are focusing the agrochemical market where long term treatments for different plant diseases using highly versatile controlled delivery systems are in high demand. The agricultural chemicals sector primarily manufactures chemical agents such as insecticides, herbicides, and fungicides. These products are aimed at promoting the healthier growth of plants and can also be used for crop protection. Today's methods for proper agrochemical delivery are facing many challenges mainly related to the controlled drug release mechanisms of chemical agents. In order to ensure a proper release in agrochemicals as well as drug delivery in the health care market, uniform final size of microcapsules is much desired to provide a constant release profile during therapeutic period.

Apart from agricultural and health care applications, food and cosmetics sectors are already utilizing newer encapsulation technologies in its products. On demand controlled delivery systems are also one of the main focuses of the encapsulation technologies that could be applied to in detergent products in home care sector.

In addition to the versatility in market applications of encapsulation technologies, there is a need of a system that could reduce processing costs and simplify in processing methods.

In this regard, Flow Focusing® proves to be a promising micro encapsulation technology that focuses on addressing the above challenges in a more economical and simpler manner. The technology developed possess some unique properties which makes it possible to achieve the desired encapsulation of very small particles with uniform size thereby enhancing overall performance of the products catering to markets such as foods, drugs and cosmetics. The benefits of this process are that; it's a single step process that reduces the processing costs at high production rate and allows for wider range of scalability options maintaining high functionality within existing manufacturing unit.

### **Impact of Technology Innovation Award on Key Stakeholders**

The Technology Innovation Award is a prestigious recognition of Ingeniatics' accomplishments in the field of Micro-encapsulation. An unbiased, 3<sup>rd</sup> party recognition can provide a profound impact in enhancing the brand value and thereby accelerating the Ingeniatics' growth. As captured in Chart I below, by researching, ranking, and recognizing those who deliver excellence and best practices in their respective endeavors, Frost & Sullivan hopes to inspire, influence, and impact three specific constituencies:

- **Investors**

Investors and shareholders always welcome unbiased and impartial third party recognition. Similarly, prospective investors and shareholders are drawn to companies with a well-established reputation for excellence. Unbiased validation is the best and most credible way to showcase an organization worthy of investment.

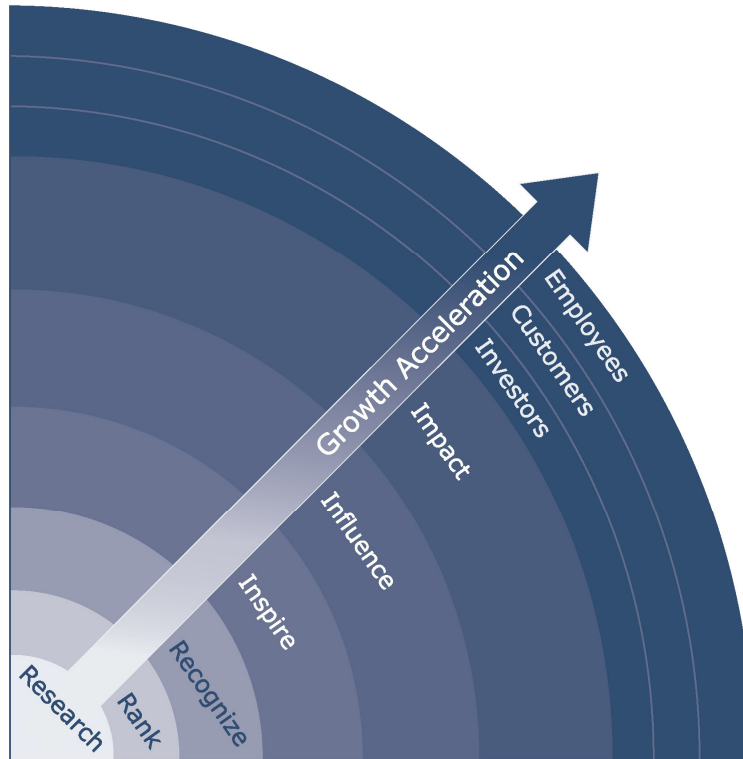
- **Customers**

3rd party industry recognition has been proven to be the most effective way to assure customers that they are partnering with an organization that is leading in its field.

- **Employees**

This Award represents the creativity and dedication of Ingeniatics' executive team and employees. Such public recognition can boost morale and inspire your team to continue its best-in-class pursuit of Technology Innovation in Micro-encapsulation Technology for Ingeniatics'.

**Chart I: Best Practices Leverage for Growth Acceleration**



### **Key Benchmarking Criteria for Technology Innovation Award**

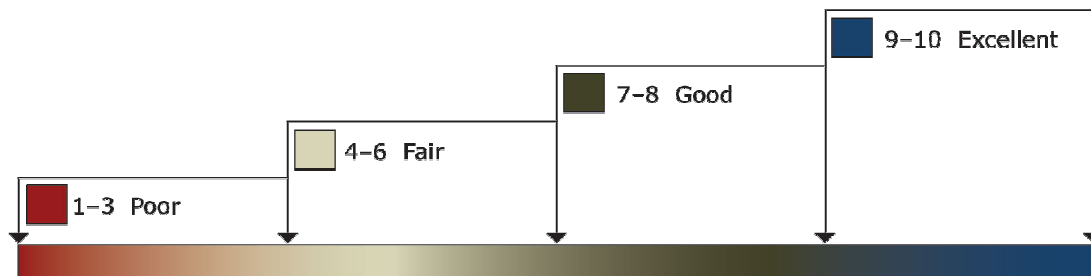
For the Technology Innovation Award, the following criteria were used to benchmark Ingeniatrics' performance against key competitors:

- Uniqueness of Technology
- Impact on New Products/Applications
- Impact on Functionality
- Impact on Customer Value
- Relevance of Innovation to Industry

## Decision Support Matrix and Measurement Criteria

To support its evaluation of best practices across multiple business performance categories, Frost & Sullivan employs a customized Decision Support Matrix (DSM). The DSM is an analytical tool that compares companies' performance relative to each other with an integration of quantitative and qualitative metrics. The DSM features criteria unique to each award category and ranks importance by assigning weights to each criterion. The relative weighting reflects current market conditions and illustrates the associated importance of each criterion according to Frost & Sullivan. Fundamentally, each DSM is distinct for each market and award category. The DSM allows our research and consulting teams to objectively analyze each company's performance on each criterion relative to its top competitors and assign performance ratings on that basis. The DSM follows a 10-point scale that allows for nuances in performance evaluation; ratings guidelines are shown in Chart 2.

**Chart 2: Performance-based Ratings for Decision Support Matrix**



This exercise encompasses all criteria, leading to a weighted average ranking of each company. Researchers can then easily identify the company with the highest ranking. As a final step, the research team confirms the veracity of the model by ensuring that small changes to the ratings for a specific criterion do not lead to a significant change in the overall relative rankings of the companies.

**Chart 3: Frost & Sullivan's 10 Step Process for Identifying Award-Recipients**



## Best Practice Award Analysis for Ingeniatics

The Decision Support Matrix, shown in Chart 4, illustrates the relative importance of each criterion for the Technology Innovation Award and the ratings for each company under evaluation. To remain unbiased while also protecting the interests of the other organizations reviewed, we have chosen to refer to the other key players as Competitor 1 and Competitor 2.

**Chart 4: Decision Support Matrix for Technology Innovation Award**

Measurement of 1–10 (1 = lowest; 10 = highest)	Award Criteria					Weighted Rating
	Uniqueness of Technology	Impact on New Products/Applications	Impact on Functionality	Impact on Customer Value	Relevance of Innovation to Industry	
<b>Relative Weight (%)</b>	<b>20%</b>	<b>20%</b>	<b>20%</b>	<b>20%</b>	<b>20%</b>	<b>100%</b>
Ingeniatics	9	9	8.5	9	9.5	9
Competitor 1	8	7.5	8.5	7	8	7.8
Competitor 2	7	8	7	7.5	8	7.5

### Criterion 1: Uniqueness of Technology

Flow Focusing technology is a unique microencapsulation platform which makes possible to generate micro-particles of the most variable range of composition, morphology and size. In comparison with its direct competitors, this company presents a versatile tool, in which with the same nozzle configuration selectable sizes with a wide range (900 nm to mm) can be produced.

One of the most attractive points regarding this technology is that active agents are micro-encapsulated in just one single step through a purely mechanical process. Due to this intrinsic property of the process, no smashing, high pressure, electricity or chemical reactions are required. This reduced steps manufacturing process enables the development of a manufacturing system with reduced cost associated with maintenance. High microcapsules production rates can be achieved by using this technology.

Micro-particles generated are mono-disperse and the efficiency of process can be estimated in 100%. Monodispersity are suitable for food engineered products, one of the current most promising market segment and profitable markets. Additionally to the reduced costs associated to manufacturing procedure, there is a high impact avoiding contamination of the final product, since materials are not touched during its processing.

### Criterion 2: Impact on New Products/Applications

Simplicity could be the word that best depict this technology, and one of the main differentiators of this technical proposal in comparison with its direct competitors. The technology has demonstrated that microencapsulation is

carried out in one single step, where there is no need to filtering or grinding operations. For novel product developments and as a complementary tool for existing processes, the Flow Focusing technology offers a simple procedure that enables the proper engineering of microcapsules, offering: protection, better dose control, precise design of delivery profiles, stabilization of bioactive compounds and novel properties assay during the development of innovative microparticles properties.

### **Criterion 3: Impact on Functionality**

The technology proposed could be easily coupled with existing technologies that have important impact in several industry segments: for instance, Flow Focusing could be combined with flow cytometers and spray drying technologies that are important for Biotech and BigPharma sectors. In this case, Flow Focusing could be suitable for drug delivery systems and for the encapsulation of living organisms, mainly applicable for life science research in the development of novel therapeutics and drug compounds. Moreover, nutrition and nutraceuticals is an attractive market segment where Flow Focusing technology is able to encapsulate bioactive oils for the treatment of disease by nutraceuticals delivery. In the case of food functionalization, the encapsulation technologies are also likely to impact positively in flavour encapsulation. Cosmetics and cosmeceuticals are also a fertile market for the application of this simple technology in the generation of on-demand cosmetics delivery systems.

### **Criterion 4: Impact on Customer Value**

The most positive value offered to customers is the cost effectiveness. Since the adoption of Flow Focusing technology, customers has experienced a reduction in time associated to the production due to the less energy needed during non-monodisperse production. It has been evidenced that by the inclusion of Flow Focusing in the production chain, same effect are achieved with much less reagent and atmospheric pressure ionization.

### **Criterion 5: Relevance of Innovation to Industry**

Among the main properties offered by this technology, main aspects on the innovative side of this development are depicted as follows: (1) desired size, for each way of administration from nanometers to millimeters, (2) high accuracy in dose control and in a cost effective manner, (3) high versatility, since there is no current limits on formulation, for any liquid or emulsion and finally (4) a mechanical process able for the encapsulation of living cells and micro-organisms, since it is a gentle procedure and there is non-contact with the bioactive compounds, avoiding contamination of living matter.

## The CEO 360 Degree Perspective™ - Visionary Platform for Growth Strategies

The CEO 360 Degree Perspective model provides a clear illustration of the complex business universe in which CEOs and their management teams live today. It represents the foundation of Frost & Sullivan's global research organization and provides the basis on which companies can gain a visionary and strategic understanding of the market. The 360 degree perspective is also a “must-have” requirement for the identification and analysis of best-practice performance by industry leaders.

The 360 degree model enables our clients to gain a comprehensive, action-oriented understanding of market evolution and its implications for their companies' growth strategies. As illustrated in Figure 5 below, the following six-step process outlines how our researchers and consultants embed the 360 degree perspective into their analyses and recommendations:

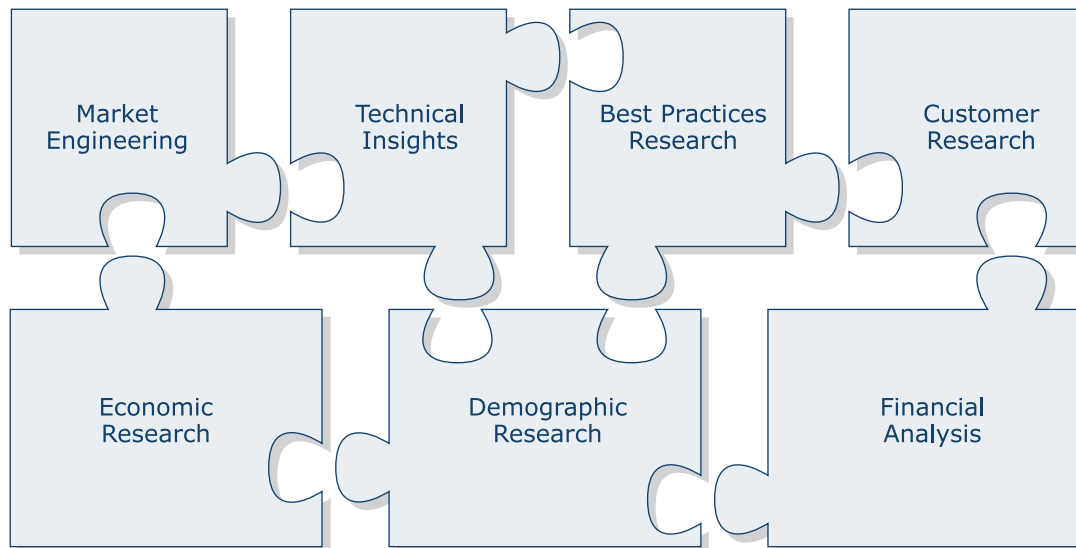
**Chart 5: How the CEO's 360 Degree Perspective Model Direct Our Research?**



## Critical Importance of TEAM Research

Frost & Sullivan's TEAM Research methodology represents the analytical rigor of our research process: it offers a 360 degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Our experience has shown over the years that companies too often make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Frost & Sullivan contends that the successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices and demographic analyses. In that vein, the letters T, E, A and M reflect our core technical, economic, applied (financial and best practices) and market analyses. The integration of these research disciplines into the TEAM Research methodology provides an evaluation platform for benchmarking industry players and for creating high-potential growth strategies for our clients.

**Chart 6: Benchmarking Performance with TEAM Research**



## About Ingeniatrix, S.L.

Ingeniatrix is a Seville (Spain) headquartered technology-based company (TBC), formed by biotech entrepreneurs and researchers from the University of Seville. Founded in 2001, Ingeniatrix offers a technology portfolio based in diversified applications of Technology Platform that comprises a bundle of technologies allows the differential handling of a wide variety of fluids. They have an impacting intellectual property platform with more than 70 international patents.



## About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best-practice models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages 50 years of experience in partnering with Global 1000 companies, emerging businesses and the investment community from more than 40 offices on six continents. To join our Growth Partnership, please visit <http://www.frost.com>.

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