



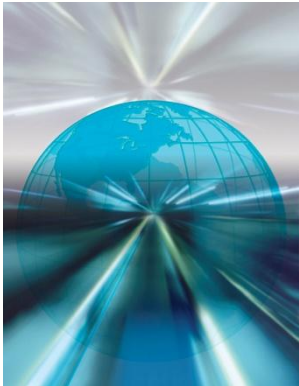
# NineSigma Case Studies

*Leveraging the Global  
Innovation Community*

**NINESIGMA**<sup>®</sup>  
*Accelerating the Innovation Cycle*

# Contents

- Aerospace / Military
- Automotive
- Chemistry
- Consumer Products
- Electronics
- Materials Science (Polymer, Adhesives, etc.)
- Medical Devices
- Packaged Foods / Ingredients
- Processing / Equipment / Engineering



## Aerospace / Military

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# Development of Economic Value of Travel Time – Model and Metrics

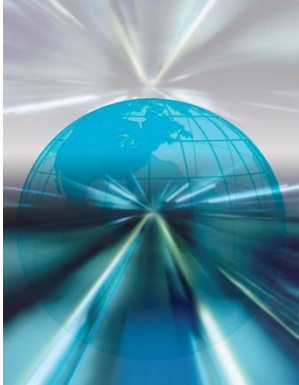
- Client Challenge
  - Develop a methodology for comparing economic factors of why consumers choose various forms of transportation for different situations. How would cost, convenience, safety factor into a business trip from San Francisco to LA, vs. a family vacation? How would these factors differ for a Boston to New York trip?
- 3 Responses Received
  - 10 Proposals - many included academic/industrial teams
- One team included a Nobel Lauriat Economist, groups modeling economic impact of the Kyoto protocol, specialists in analyzing government data related to transportation and safety, etc.
- Development contract initiated with an economics firm specializing in transportation economics

# Counter-Munition Threat Identification RFP

- Client Challenge
  - The government defense agency was seeking technologies for development of a new sensor technology for object detection in counter-munition “proximity fuzing/detonation” applications.
- 6 Responses Received
- A parallel technology request was sent through FedBizOps, and only 2-3 responses were received.

## 3-D Localization Technology for In-Building Structures RFP

- Client Challenge
  - The government defense agency was seeking technologies for development of a 3 dimensional sensor localization system for narrowband, low-power, ad-hoc networked sensors in a multilevel structure.
- 30 Responses Received
- A parallel technology request was sent through FedBizOps, and only 1 response was received. Over 50% of the NineSigma responses were unknown to the government agency.



# Automotive

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# Cordless Sensor Development for Automotive Applications

- Client Challenge
  - The client was seeking new cordless sensor technologies and sensor systems to reduce reliance on wires, and to enable new sense capabilities that are not possible today.
- 37 Responses received
  - A wide variety of sensor expertise, as well as power scavenging capabilities, and wireless communication expertise.
- > \$90,000 development contract was initiated with a UK firm that had wireless torque sensor technologies.

# Improved Stability Control Sensing

Smart Tire Development for Improved Stability Control

Measurement of Wheel Forces for Improved Stability Control

- Client Challenge
  - Two different approaches to see how to measure road surface changes and other forces on the tires/wheels to improve stability control
- 31 total responses received across the 2 RFPs
  - 22 companies (US, Canada, Germany, India, Italy) and 8 universities/research institutions (US and Germany)
- Technologies included torque sensors, tire pressure sensors, energy harvesting experience, wireless sensor communication (Zigbee, Bluetooth), etc.
- Final contract negotiation in process with German company.

# Automotive Heat Pump

- Client Challenge
  - The client was looking for heat pump technologies that could take some heat load off of the radiator in order to reduce the cost of the radiator system. This was challenging because existing heat exchangers could not meet the cost, size, and performance characteristics needed for automobile use.
- 6 Responses Received
- Two contracts (1-US, 1-France) were initiated. The proof of concept demonstrations helped validate that the overall project goal was not realistic, and the development was stopped before expending additional significant resources.

## Parked Vehicle Heat Extraction

- Client Challenge
  - The client was looking for technology to make entering the car cabin comfortable even in high-heat and high-sun environments. The objective of the RFP was to identify partners that could remove heat, reflect heat, capture and “move” heat, etc., from the car.
- 18 Responses Received
  - This topic resonated with and generated results from geographic regions in hot, arid climates (Greece, India, UAE, New Zealand, Argentina).
- The results have caused an internal modeling/study to be initiated to better understand the merits of the unique approaches.



# Chemistry

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# Selective Catalytic Alkane Functionalization Chemistry

- Client Challenge
  - The client was looking for a holy grail chemical problem that has gone unsolved for decades. They put up a couple hundred thousand dollars for the development of the catalyst technology. There is nothing in the literature to address this.
- 10 Responses Received
  - 9/10 were universities (Canada, Czech Republic, Germany, Portugal, South Africa, USA, etc.). One group had data to support that the breakthrough had just been made in their lab.
- Review was very quick – site visit in Europe occurred 1 week after presentation of results. Confidentiality agreements followed within weeks. Contracts completed within 6 months.
- Two academic groups will be funded with > \$100,000 per year each (1 in the US, and 1 in Germany).

## Materials with Novel Optical Properties

- Client Challenge
  - In order to test a theory, the client needed materials with specific properties. The impact could result in a cost performance breakthrough in their field.
- 3 Responses Received
- All three responses were exciting, but one was chosen for testing the theory.
- NineSigma assisted the client in maintaining anonymity through evaluation, initial Q&A, and sample purchase.
- Testing of sample in progress.

## Expertise in Treatment of Marine Ballast Water

- Client Challenge
  - Company seeking consultants and partners with expertise or enabling technology in treatment of marine ballast water prior to discharge from ships
- More than 20 responses Received
  - Responses came from Australia, S. Africa, Canada, India, Germany, U.S.
  - Responses from Industry, Gov't Labs, Academia
- Respondents short-listed and contract likely with at least 1 post-doctoral researcher

## Counter Thermodynamic Product

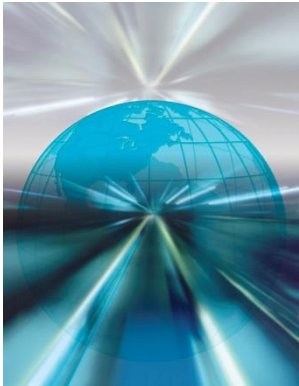
- Client Challenge
  - The client has a “holy grail - unobtainium” that has been unsolved for over 100 years, but is still of interest because the desired product has much greater economic value.
- 11 Responses Received
- Two groups had work that the client was unaware of, but still had a high probability of success based on emulating biological selectivity.

## Micro, Nano and Molecular Modeling

- Client Challenge
  - The client wanted to model and predict surface performance based on both surface composition and coating formulation. The project was difficult because it required the ability to make new measurements of surface performance, because the client's measurement techniques were inadequate.
- 25 Responses Received
- No one proposal had everything, and the client identified two responses that could be combined to solve the problem.
- Client expects to enter into a \$100,000 1-year project initially

## Organic Wood Preservatives

- Client Challenge
  - The client was looking for organic alternatives to existing wood preservatives which are being removed for potential safety issues. The application was for wood decking and related building materials, and has been difficult for the client to find long-lasting and non-leaching chemistries.
- 20+ Responses Received
  - 50% university responses, mostly in Europe.
- The client has downselected to 4 or 5 organizations, and are nearing selection of a top candidate.



# Consumer Products

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## Anti-Odor

- Client Challenge
  - The client was looking for antimicrobial agents that would counteract the effects of microbiological contamination on various surfaces
  - In particular, the client was looking for techniques for targeted antimicrobial delivery on skin and the interaction between hair follicles and bacteria
- 28 Responses Received
  - Proposals received from Finland, Switzerland, UK and U.S.
  - Majority of responses from universities
- The client identified 2 novel technologies that could be developed for the desired application. The client contracted with 2 top-tier universities, one in the UK and 1 in the U.S.

# Etiological Research and Approaches for Reducing the Appearance of Cellulite

- Client Challenge
  - The client was looking for proposals for studying the pathogenesis of cellulite, including development of suitable investigative models, and technical approaches for reducing its appearance
- A small number of proposals received
  - Two proposals demonstrated viable approaches to reducing the appearance of cellulite
  - One university, located near the client's headquarters, was running clinical trials on the effect of weight loss on cellulite
  - A small company proposed certain compounds of interest to the client
- The client contracted with 1 university and 1 company to develop 2 separate approaches to the reduction of the appearance of cellulite

## Wrinkle-Resistant Chemistry/Technology

- Client Challenge
  - The client was looking for techniques to remove wrinkles in cotton shirts through a liquid-delivery product.
- The project was written from a *surface chemistry* standpoint, which enabled other industry experts to evaluate the RFP and provide technology responses.
- The winning response came from a semiconductor researcher that was developing chemistries to alter the surface tension for semiconductor film growth.
- Technology in development for target consumer product.

# Preventing Condensation on Transparent Plastics

- Client Challenge
  - The client was looking for a coating system/solution that would eliminate the ‘fogging’ of transparent polycarbonate lenses
  - The client was interested in technologies that were close to commercialization
- 28 Responses Received
  - Proposals submitted from Canada, Greece, U.S., Germany, Switzerland, and UK
  - Universities, companies and 1 government lab responded
- Through the course of reviewing proposals, the client found one extremely promising early-stage technology and as a result adjusted their focus away from near-commercialized technologies
- Client contracted with U.S. research company to develop this novel technology

## Technology for Warming Skin

- Client Challenge
  - The client had interest to identify viable skin-safe technologies to create a warming sensation. The challenge was that known heat-generating chemicals (that react with moisture) were not safe for skin use.
- 4 Responses Received
- Samples were received, and after they showed promise, client entered into a development contract with a university professor to further develop technology.

## Heated De-Fogging Safety Eyewear

- Client Challenge
  - The client was looking for active heating technology for safety eyewear in high humidity environments. Existing “hydrophobic coating” solutions have been unable to achieve anti-fogging for long times.
- 7 responses were received
  - Responses included Chinese eyewear contract manufacturers, miniature heater developers, and a US-based organization that has developed custom performance eyewear.
- Development contract in place with a vendor that had concepts ready to prototype.

## Powder Dispensing Device

- Client Challenge
  - Company seeking development of a compact granular powder dispensing system for use in high humidity environment (e.g. appliances).
- More than 10 responses received from Canada, India and U.S. incl. a gov't lab
- A promising technology found in a company with candy-dispensing technology
- Contract executed with Solution Provider who has delivered a prototype. Goal is to incorporate new technology into products by end of 2008.

## Microwave Even-Heating

- Client Challenge
  - Fortune 500 consumer products company seeking proposals for technologies that can be adapted to provide even-heating of food in microwave oven
  - Client primarily looking for new material or method that would alleviate uneven heating issue
- Response
  - Small number of targeted responses received from N. America & Europe
  - One very promising solution received from European R&D organization involving a medical application and the processing of biological matter developed for defense application
- Solution provider has submitted a prototype to client for testing.

## Preservation without Preservatives

- Client Challenge
  - The client was looking for innovative new technologies, materials or packaging concepts that could be used to protect water-based consumer products from bacterial and fungal contamination
- 15 Responses Submitted
  - Proposals submitted from academia and industry including respondents from Canada, UAE, Ireland, Italy, U.S. and UK
- Client narrowed down responses to top 4 and has put NDA's in place with all. Respondents have submitted samples for testing by the client. Client team is proposing to management team to fund project.

# Turnkey Solution for Personalized Packaging

- Client Challenge
  - Identify alliance partner providing turnkey approach for creating, manufacturing and distributing products offering personalized packaging.
  - Consumers send information and/or photos to a website and receive custom and personalized consumer goods.
- 7 Responses Received
  - Proposals submitted from companies offering custom fulfillment, internet ordering, digital printing, pallet breakdown and ship/tracking capabilities.
- 3 top candidates identified to provide highly innovative capability to meet emerging consumer demand.

## Automated Biological Sample Collection

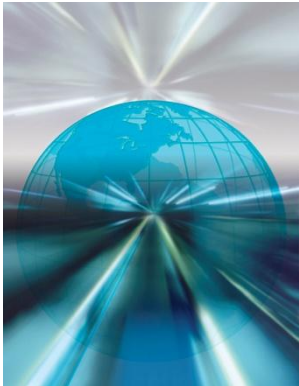
- Client Challenge
  - Client was looking for a system to automate the collection of animal urine for diagnostic testing
  - They needed a system that would improve the efficiency by which samples were collected and enhance information generated
- 10 Responses Received
  - Responses came primarily from industry and 1 university
- One very interesting proposal was submitted from a small U.S. research company that had created similar automated systems for NASA space program
- The client went to contract with this research company and has since expanded their development work with this small company

## Modeling for Air Filters

- Client Challenge
  - The client was searching for models and simulations of non-woven air filters in part to predict air filter performance
  - Specifically looking for models that would address certain criteria and consider dust particle sizes, densities typical of household or industrial environments
- 29 Responses Received
  - Proposals submitted from Africa, Middle East, India, USA, UK and Europe
  - Many modeling approaches of interest were proposed
- Project just closed and client received proposals. Currently in the process of short-listing solution providers for further discussions.

## Aroma Integrator – Composer, Analyzer

- Client Challenge
  - The client was searching for proposals describing the design and development of an instrument to be used to create and evaluate an aroma system online
  - The understanding is that aroma is critical to favorable consumer reception of many products. Current techniques are laborious and subject to analytical uncertainty.
- 6 Responses Received
  - Proposals submitted from companies in Australia, India, UK, U.S., and Austria
  - A UK company had developed an aroma synthesizer for one of the top Fragrance Houses in France
- Client is in discussions with 2 solution providers who demonstrated viable solutions that would meet the client's needs



# Electronics

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# Sub-Sea Wireless Communication

- Client Challenge
  - The client was looking for sensor and communication network technology that would work in an unforgiving environment (i.e., 10,000 ft below the sea surface). In terrestrial refineries, all wired sensors have been replaced with wireless technology, resulting in safer, more reliable operation. Expertise is required in a variety of areas.
  - Client did not want to hold any intellectual property, in order to offer the technology to their entire industry and drive the technology cost down.
  - They offered a drilling platform as a test bed (something that no-one has access to for test purposes).
- 70+ Responses Received
  - 60% of the proposals came from companies (including several in the Fortune 100), 30% from universities, and 10% from government labs, including military contractors and many teamed proposals. Over 20 countries were represented (from North America, Europe and East Pacific responses).
- A panel of 6 experts convened to review the responses, and they were downselected to about 15 responses and they are making a final selection.

# Actively Inducing Features and Textures on a Surface

- Client Challenge
  - The client was looking for technologies to modify the shape and texture on the surface on consumer electronics devices. The technology needed was outside their core expertise, and had already spent >\$200,000 with another consulting firm yielding nothing.
- 20+ Responses Received
  - 4 responses met or exceeded their desired performance criteria (2 from universities, 2 from companies). One proposal included the NASA group that made the foam for the Mars Rover (which can change its shape).
- Client engaged in agreements with 3 of the 4 including Material Transfer Agreements and development agreements.

# Unique Actuator Mechanism for Electronics Printing Application

- Client Challenge
  - The client had a specific design in mind for new printing applications, but was looking for alternative approaches for the actuation mechanism.
- 7 Responses Received
  - 50% companies; responses addressed their technology needs very well, but were similar to their internal approaches.
- State-of-the art responses helped validate that the internal approaches they were pursuing were already further along.



## Materials Science (Polymers, Adhesives, etc.)

## Nanoparticle Halide Salt: Formulation and Delivery

- Client Challenge
  - Formulation technologies for creating nano or micron-sized particles, suspending for transportation, and application/drying techniques for halide salts (particle sizes of interest from 50 nm to 200 nm)
- 3 Responses Received
  - 2 US companies and 1 European University
- The university had already developed a process for continuous production of halide nanoparticles, and already had a spin-out commercial partner that can dip/coat surfaces with these nanoparticles
- Multi-year research and development agreement in place and ongoing

# Crystal Habit Modifiers for Sodium Chloride

- Client Challenge
  - Investigate additives to modify Sodium Chloride crystals to form fragile, dendritic crystals rather than the typical cubic crystal shape; solutions of interest must explore alternatives to Ferrocyanides
- 8 Responses Received
  - 3 Companies (2-US, Italy) and 5 Universities or Consultants (3-US, 1-Germany, 1-Italy)
- A wide range of crystallization experts, techniques and crystal growth experiment approaches were submitted
- Two universities were contacted for follow-up, and a consulting agreement is in-place with a German professor

# Pressure Sensitive Structural Adhesives

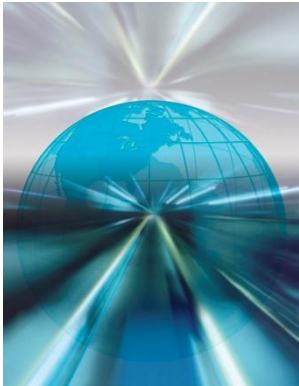
- Client Challenge
  - The client, an expert in pressure sensitive adhesives, had an need to identify adhesive technology to create a structural adhesive. The idea was to enable products that would adhere under initial pressure, but over time, would become more structurally permanent.
- 14 Responses Received
  - Rapid evaluation of results within 2 weeks
- The client performed site visits on 4 of the companies to see their capabilities in person, and contracted with 2 of them.

# Fast Drying and Curing Systems for Coated Steel

- Client Challenge
  - The client expends significant energy to cure paints and chemically-resistant coatings in steel drums. The challenge is to find technologies that can reduce the drying from hours to minutes.
- 32 Responses Received
  - Companies included new technology capabilities, alternative oven manufacturers, and a wide range of possible technologies. Many of the respondents had expertise in combining the capabilities for an improved, optimized solution.
- 3 top companies contacted, which has resulted in a proof-of-concept trial on actual steel products. Eventual outcome could include the purchase of \$500,000+ furnaces for multiple manufacturing plants.

## Adhesive for Polyolefin for Shrink Labels

- Client Challenge
  - The client had interest to identify label technologies that would conform to blow-molded polyolefin bottles. This would enable labels and graphics onto more interesting bottle shapes, making the label look like it was part of the bottle.
- 5 Responses received all from companies.
- Two development contracts resulted.



## Medical Devices

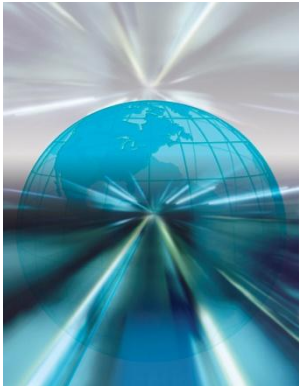
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# Emerging Transdermal Drug Delivery Systems

- Client Challenge
  - The client had a concept to extend their existing business into drug delivery, but needed to have a good idea where the state of the art was, and where it could go
- 30 Responses Received
  - Global response with a wide mix of academic and industrial responders
- The NineSigma Program Manager coached them to broaden their expectation to include experts, groups ready to trial, manufacturing partners in order to be able to consider the complete development and implementation cycle.
- Currently working through consultants found through the RFP.

# Build Up Technologies for Precision Fabrication of Ceramics/Composites

- Client Challenge
  - The client was looking for new technologies to leapfrog the state-of-the-art for making small parts to result in larger rapid prototyped unique parts. Significant development funding available to take early-stage technologies through to commercialization. The intended application was hidden in the RFP, and the client was convinced that no one in the world was working on the technology specific to their needs.
- 20+ Responses Received
  - 50% from universities, 40% from companies, 10% from government labs. Global responses included China, Germany, Portugal, Singapore, Taiwan, Canada, US.
- European company and European academic group had already developed the technology for exactly the parts they were looking for! The company was down the street from their European office.
- Site visits have followed, NDAs in place, discussions are on-going.



## **Packaged Food / Ingredients**

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# In-Package Microbial Reduction

- Client Challenge
  - An improved technology or process is needed for the reduction or minimization of the bio-burden associated with aqueous products.
  - Current formulations are processed in clean environments, but some raw materials allow low levels of microbial contamination which must be lowered even further.
- 10 Responses Received
- Contract executed with top research university

## Encapsulation, Masking or Processes for Creating Non-Bitter Caffeine

- Client Challenge
  - Caffeine is bitter which presents challenges in using as an added ingredient to certain food products. The non-bitter caffeine technology is to be used in a well known consumer brand which needs to be rapidly developed in advance of a new product launch in 2008.
  - Encapsulations have difficulty meeting process temperature requirements and do not hold up to shear forces required during blending and manufacturing.
- 18 Responses Received
  - Responses received from 10 countries and included proposals from industry, universities and non-profit research labs. Two near-market ready products available for sample immediately.
- R&D contract signed with \$9 billion specialty materials company

## Encapsulation System for Probiotics

- Client Challenge
  - Client was looking for an encapsulated probiotic that can demonstrate the viability of the organism through the encapsulation process, the potential manufacture of the foodstuff and its shelf life. Needed it to demonstrate stability during processing and storage conditions up to 100°F.
- 14 Responses Received
- Contract executed with Swedish-based institute for surface chemistry with expertise in the fields of spray drying of food, pharmaceutical and probiotic formulations.

## Shelf-Life Extension of Refrigerated Foods

- Client Challenge
  - The client was looking for technologies that would extend shelf life of refrigerated foods up to 90 days under certain conditions. They were looking for an integrated technology that would enable prevention of:
    - Common food spoilage, e.g. inhibition of mold
    - Texture changes, e.g. from moisture migration
    - Color and flavor changes
- 20 Responses Submitted
  - Proposals received from Canada, Germany, India, Italy, S. Africa, and U.S. including academic respondents, government/non-profit labs and companies.
- Client found a very promising solution proposed by an entrepreneur who had developed a technology for the oil and medical industries and was now looking to adapt the technology to the CPG industry.

## Global Packaging Trends Advisory Board

- Client Challenge
  - The client wanted to develop breakthrough packaging that would “leap off the shelf into the consumer’s cart” within 5 years. To accomplish this, the RFP objective was to identify consultants in both global design trend and global packaging trends (within and outside of food).
- 90+ Responses Received
  - Responses from people in packaging, fashion, and design from around the world - Asia, Europe, US, Australia
  - Respondents were categorized into 8 major areas of expertise including sustainability, textiles, home décor
  - Client selected top candidates from each category
  - Through the review process, the key area of focus for the advisory board shifted to “sustainability”
- Client has issued contracts to a number of experts and is finalizing its board of 6-8 individuals

## Development of Pourable Frozen Pasta and Sauce Products

- Client Challenge
  - Identify technologies that can separate pasta-sauce into individual frozen pieces for easy consumer use and preparation
- 5 Responses Received
  - 3 US companies, 1 UK consultant, 1 Research Lab in the Netherlands
- Client initiated short-term development contract with a 1-person technology consultant in the UK who was developing pourable frozen alcoholic drinks
- Once the core technology was identified through the solution provider, the client then sought and found a qualified co-manufacturing partner with the technology, and the product is currently on supermarket shelves

## Anti-Aging Ingredients for Beverage Development

- Client Challenge
  - The client was seeking R&D partners for early-stage investigation into ingredients and compounds that could offer *scientifically proven* anti-aging technologies for beverages.
- 8 Responses Received
  - Almost all were research institutions / universities.
- Initial exploratory R&D investigation in place with one of the largest contract research organizations in Europe. The institution was previously known to the client, but they had not had the capacity to connect directly with the relevant group who responded through NineSigma.

## Ultra Fast Drying Ink

- Client Challenge
  - The client has a “holy grail” ink jet printed food application where the ink “beads up” onto a shiny, non-porous surface. Drying in 1 second difficult to achieve with current ink supply partners.
- 6 Responses Received
  - 6 companies with UV curable technology, RF drying (that would not otherwise heat the food product), specialty company developing inks for NASA and security inks, etc.
- None of the results were further along in development from their other partners. However, one group had unique UV curable ink which (while not approved for ingestion) was an exact match for another packaging project under development
- \$90,000+ development contract initiated with UK company

## Systems to Suspend Inert Particulates (e.g., Cocoa) at Low Viscosity

- Client Challenge
  - Cocoa is a large particle (~ 75  $\mu\text{m}$ ) that settles over time in a low viscosity, high solid content syrup solution; what are some ways to grind or suspend the cocoa in the syrup?
- 11 Responses Received
  - 6 companies (4-US, Ireland, Spain) and 4 Universities / Labs (2-France, 1-Poland, 1-Turkey, 1-US)
- A wide range of results came back, include companies with ready-to-demo equipment using cavitation and other sonic mixing; expertise in aqueous emulsions for cosmetic/drug applications, and nano paper encapsulation technology that could be applied
- Follow-up is in-progress

# Foreign Object Detection in Food Processing

- Client Challenge
  - The client was looking for inspection technologies to assure that each packaged food product from free of contamination (such as plastic, bone, metal) that occurs during food processing. The key challenge was being able to differentiate between plastic foreign objects, and the plastic packaging.
- 8 Responses Received
  - Companies and universities were working on this topic outside of food (e.g., medical imaging, ultrasonic techniques)
- The client has initiated contact with one respondent, and has interest in potentially expanding the technology to be made available to others in their industry, to improve overall food safety.

## New Sealant for Dairy Cup Foil Lids

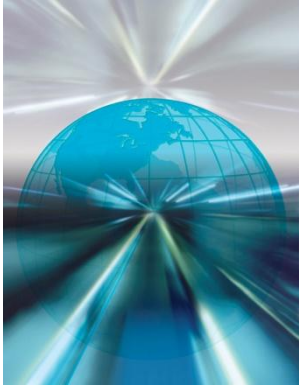
- Client Challenge
  - The client was developing lower cost aluminum lidding solutions for a dairy cup product. However, the sealants could not create an acceptable seal between the lid and cup using high speed manufacturing process (typically 600 lids per minute). New development partners were sought.
- 6 Responses Received
  - Responses included small companies with frozen tray lidding experience, sealant/polymer development companies, and Fortune 500 manufacturers (polymer company and packaging solution company), including alternate ready to adapt and test sealants for food packaging applications.
- The Fortune 500 polymer company was engaged and performed development and samples. Many rounds of development and testing were accomplished (at no cost to the client), however, no solution was able to be found that was satisfactory.

## Natural Ingredients Providing “Energy” for Beverages

- Client Challenge
  - The client was looking for new partners with the capability for discovering and analyzing new natural ingredients that could provide energy for use in sports drinks. “Natural” additives are crucial and must not have been produced through manufactured or biotechnological processes.
- 5 Responses Received
  - Responses included academic studies and investigation, as well as new approaches for analyzing plant extracts for nutritional benefit.
- The client engaged all 5 respondents in initial discussions, and engaged in a > \$200,000 development contract with a US company with promising natural botanical extract analysis capabilities.

## Biodegradable Packaging

- Client Challenge
  - Identify alternative materials to oil-based plastics.
  - Limitations of new “environmentally friendly” materials include cost, high WVTR and restricted processing conditions.
- 9 responses Received
  - Responses came from five countries and four continents. Top candidate was a research institution in Spain who was selected for joint development. They demonstrated a viable approach to the client’s challenge and had an experienced development team.
- Client signed an initial development contract with Spanish research organization for \$50K.



## **Processing / Equipment / Engineering**

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# Heat Waste Recovery

- Client Challenge
  - The client was looking for new waste heat process technology for smelting and melting furnaces. They lose 60-80% on these processes – grossly inefficient. The objective was to find as many experts and R&D partners with relevant technologies.
- 35 Responses Received
  - Global response with a wide mix of academic and industrial responders
- Three projects have been funded as a result, with the objective that a couple will drop out in order to continue the most promising ideas.

## On-Line Seal Integrity Inspection in Heat Sealed Pouches

- Client Challenge
  - The client was seeking non-destructive techniques for inspection of the seals areas of heat-sealed pouches. The objective was to replace visual inspection with a more precise technology that could detect small defects for high-speed (60 pouches per minute) and high volume (> 50 million pouches per year) production.
- 16 Responses Received
  - 14 companies and 2 research institutions.
- Two contracts were initiated, both for ready-to-demonstrate equipment technology, and a development contract for a new ultrasonic technique that had the potential to see the seal as it is being made. Initial plant trials have shown success.

## Development Partners for Specialized Prototype Equipment Design

- Client Challenge
  - The client was seeking expertise in product delivery equipment; this capability was not core to the company's capabilities, and needed fast turn-around and complete ownership of all the intellectual property developed.
- 11 Responses Received
  - All companies – 5 different countries.
- 4 site visits (in 3 continents) were initiated within 1 month to evaluate the capabilities in person. One was selected and contracted within 3 additional months. Over \$1.5 million has been spent so far to design and build the equipment of interest.

# Sterilization Technologies for In-Line Container/Bottle Processing

- Client Challenge
  - The client was seeking technologies that could enable cleaning and sterilization of rigid packaging materials without chemicals. This is a particular challenge, because in many cases, the water used to clean containers can be more than the water used in the bottled product itself. This is a big concern in geographic regions with sparse water supply.
- 7 Responses Received
  - 6 companies and 1 university, with a wide range of UV, ozone, plasma, etc. technologies presented.
- Contract with a German group was initiated that had developed the technology for recharging automotive catalysts. Phase 1 demonstration was successful, and Phase 2 advanced development towards scale-up is in progress.

# Laboratory Instrument

- Client Challenge
  - The client knew of existing equipment that was not for sale that could accomplish a key consumer product formulation step. The RFP objective was to acquire equipment that could duplicate and extend the capabilities of the known instrument.
- 6 Responses Received
  - Austria, Australia, India UK (2), USA
- Located the hidden engineering firm that made the *original* equipment, which had been announced under an entirely different company name.
- Negotiation nearing completion for building the instrument. Potential project funding could exceed \$500,000.

# Quality Assurance Instrumentation

- Client Challenge
  - Existing instrumentation took far too long to deliver the desired analytical results. The RFP objective, therefore, was to identify a developer to integrate the expected capabilities (in hardware and software) to meet the analysis time objective.
- The Program Manager, while searching for potential respondents, found a high-probability contact, and immediately initiated dialog between the solution provider and the client *prior to RFP launch!* The negotiation is in progress.

## Large-Scale Column for Testing Packings and Distillation Trays

- Client Challenge
  - The client had an interest to identify large scale process equipment in order to separate extremely low boiling point gases. They were unable to perform this on expensive production equipment, but needed a better more cost effective way to do closer to lab-scale.
- 5 Responses Received
  - Responses came from Bulgaria, India, US
- The client contracted with a company in India that had exactly the column product to meet their exact requirements. Initial contract was 6-months \$65,000; ongoing contract expected.