



BAVERSTAM ASSOCIATES, INC.

Consultants in Advanced Materials

Baverstam Associates, Inc.
70 Walnut Street
Wellesley Hills, MA 02481

Phone: ++1 617 928 3037
Fax: ++1 617 965 66 29
email: info@baverstam.com

Baverstam Associates Sàrl
21, rue de la Fontenette
CH-1227 Genève

Phone: ++41 22 823 24 63
FAX: ++41 22-823 24 64
email: info@baverstam.com

Selection of Manufacturing Process Related Projects

Search for process technology enabling new materials to replace copper in component

A large engineering client uses large quantities of copper in a critical component. The rapidly increasing price of copper in the past 4-5 years has increased the gap versus aluminum. We investigated the potential of substituting the copper component with aluminum, which offers good electrical conduction although not as good as copper. The key objective of the exercise was to look at the possibility of further leveraging the advantage of using Al by looking at more cost effective manufacturing processes that yielded an end-product with the required functionality. This included a novel design of the component, which was not possible in copper: it would simplify the manufacturing and eliminate process steps. We identified a supplier that could potentially develop and process a component with the desired specifications in a single step based on our design concept.

Search for process technology and materials for light weight automotive parts

A leading automotive parts supplier asked us to find a material and a cost effective manufacturing process for an engine component, which was motivated by the ongoing interest in weight reduction in the automotive industry. The parameters included allowing a modest maximum increase in cost along with a minimum target in weight reduction. The component had minimum modulus and stress specifications that made the task challenging. The dimensional tolerances were also very demanding so finishing had to be considered as well. We identified two promising technologies that had the potential to deliver a product with the desired mechanical and weight properties, minimum post-process finishing and potential of meeting the cost target. We also benchmarked a technology and the associated research organization that had independently proposed to develop a product for our client before we were engaged to do the project.

Search for new processing methods for an international chemical company

An investigation and assessment of leading edge technologies in the area of continuous flow processing was performed. For production efficiency and economic reasons, our client wished to move from a traditional batch mode process to a continuous flow method for their production of polymer products, which required very specific process criteria. Our goal was to determine the suitable existing technologies and researchers in this field so that our client could pursue the processes currently available or engage in possible partnerships with the leading developers. We detailed several relevant processing possibilities as well as identified parties interested in collaboration with our client to refine and expand their technology.

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A client is a leading global supplier of a critical engine component in the automotive industry. Emerging markets for automobiles were calling for a very demanding price level for this component and we were asked to determine whether there are any alternative processes that could enable the requisite manufacturing costs while maintaining product quality. We focused our study on manufacturing the product from two basic material (metal) categories and investigated a number of manufacturing processes. We found that one material required an emerging process technology that needed to be brought from the laboratory to commercial production. For the other material we found that processes improvements to a basic technology could possibly deliver the requisite performance with careful development and optimization – we identified a number of commercial equipment producers and institutes that had developed key technology components.

Search for bonding processes

A leading material manufacturer is facing market acceptance problems for its products, as clients are demanding that they are delivered in a useful finished format. The added value of the material is tied to the capability of bonding the proprietary material to a specifically designed support. The technical challenge is a function of the size of the bonding surface area, very stringent bonding operating conditions and bonding quality.

Spring material processing and improvements

Our client, holding key proprietary know-how in the manufacturing of high performance spring material, assigned us the mission to assess severe plastic deformation processes in the context of present developments and future trends. The objective was to define a development path to improve the performance of existing spring material for a certain family of light alloys.

Search for process technology to manufacture large diameter engineering polymer tubes

A client had developed a next generation process that required large diameter, thin-walled tubes made from a specific polymer. This polymer could not be readily extruded at the required tolerances due its properties. We investigated the feasibility of developing an extrusion in parallel with generating other processing ideas. The outcome was that we identified three possible manufacturing processes while predicting that a conventional extrusion approach was not suitable. We identified motivated partner companies that could supply the parts and/or develop the process.

Search for large area microtexturing technology

Our US based client wanted to add a microtexture to a tool in its manufacturing process. Our client asked us to uncover a cost effective solution that could create this microtexture over a large area on a metal surface. We conducted a global search where we identified 2-



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3 companies in Europe that had developed variants of a specific technology. This technology had been used in unrelated industries. This project stands out as a prime example of our ability to cross-fertilize technology across industries.

Auditing innovative laser hybrid machining process

A client with a dominant position in precision surface micro machining commissioned an audit on laser hybrid processes. This included the required steps of technology search, partner selection, and on-site process audit. Independent analysis, cross-fertilizing and appropriate partner selection has shown to provide outstanding benefit to our client. It effectively shortened the research and development projected R&D efforts by a number of years.

Assessing surface finishing and polishing processes

In order to position their strategic research and development efforts a company specialized in luxury goods manufacturing required a global study and analysis of polishing and finishing processes. The study allowed for a comprehensive assessment of the present state of the art and the latest innovations that they could pursue.

Improving atomization technology for powder production

Our client was seeking to lower production costs in their powder production process. We performed a search and assessment of technologies with the capability of producing high yield, thus lowering the cost of production, while meeting our client's stringent quality requirements. We also explored partnership possibilities with suitable companies. We were able to present several solutions to improve the production efficiency in terms of the time-to-market based on the ease of incorporation of new technology in current production process,

Technology search in the field of microfabrication

This project aimed at outlining the latest performances in the area of extremely fine machining and forming technologies for a specific object. Our client had given us shape, tolerances and other specific requirements and we assessed the qualifications of known and emerging technologies that could respond to their expectations. Having interviewed a large number of various experts from different fields we found that "new" technologies are giving signs that could lead to a major change in the manufacturing approach of our client and we could help them assigning the short term leading technology for their need.

Search and assessment for specific solid freeform forming techniques

Our client had identified the interest to modify their processing chain to take advantage of merging rapid tooling processes and technologies. We investigated for them the technological feasibility of their idea that included a technology search for identifying an



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appropriate compatible solid freeform finishing technique. This work allowed us to find an outstanding new process that could be used to satisfy our client's expectations for their future production line. We also identified several partners in this project willing to deliver or execute test samples.

Advanced materials and fabrication methods

A complex metal component used in the fabrication of plastic films experienced high failure rates, and was expensive and time-consuming to fabricate. Using the resources of a local analytical laboratory, we determined the cause of failure and recommended specific solutions to improve service life. In a separate project, we researched alternative materials and fabrication methods for the component. We found solutions that included an inexpensive material with six times the strength to weight ratio, and a fabrication process that could cut fabrication time in half.

Search for air cathode process technology and supplier thereof

A client was interested in finding more efficient mass production methods for air cathodes as they were considering launching the production of devices that use this component. We searched for suppliers that specifically manufactured air cathodes for their application as well as potential competitors that would be willing to consider license or outsource their manufacturing. We broadened the search to include other product families that also use air cathodes and evaluated whether producers of these products would be able or willing to supply our client. We also investigated downstream materials suppliers to determine if they could develop a suitable air cathode for our client.

Improvement in electrochemical manufacturing process

An electrochemical company sought our help in improving their manufacturing process, both in terms of efficiency and capacity. We identified what the current state of the art is in their industry and who the leaders were. We also explored manufacturing processes in several different industries that have synergies with our client's manufacturing process. We came up with some suggestions on how they can maximize their manufacturing efficiency and also identified partners for them to collaborate with in order to improve some of their manufacturing steps.

Assessing production processes and cost of production for competing products

Our client was a major aluminum producer. We assisted them in understanding the production flow for making a competing and finished product made out of steel. The project involved constructing a production flow and cost model for both the aluminum and steel based finished product.



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Manufacturing processes, flows and costs in stainless steel long products

Our client was a French owned US based producer of stainless steel long products. We assisted them in understanding stainless steel production processes, flows and potential cost levels, based on hard to find publicly available information and our own knowledge of the stainless steel industry.

Search for improved materials ingredients and processing for gasket manufacturing

A gasket manufacturer was aware that its competitor was offering a better product. This was attributed to pore formation in the material. In the first stage of the project we performed scanning electron microanalysis at MIT on our client's product range as well as samples from its competitors. In the second stage, we analyzed the processing and the ingredients of the material with regard to the problems we observed in the microanalysis. We generated a list of recommendations with regard to changing the composition as well as acquiring new mixer equipment. The reduction or elimination of hazardous solvents was another goal of this work.

Materials solutions to extend lifetime of metallurgical reactor

A client had developed in a new recycling process in the metallurgical industry. They faced a problem inasmuch the reactor's gas injection chamber exhibited reduced lifetimes. We were asked to develop materials based solutions that could extend the lifetime of the chamber. The potential solutions that we offered included the construction material of the chamber; internal coatings; and protective material inserts. Our prime candidate was a coating process that was developed for the aerospace industry.