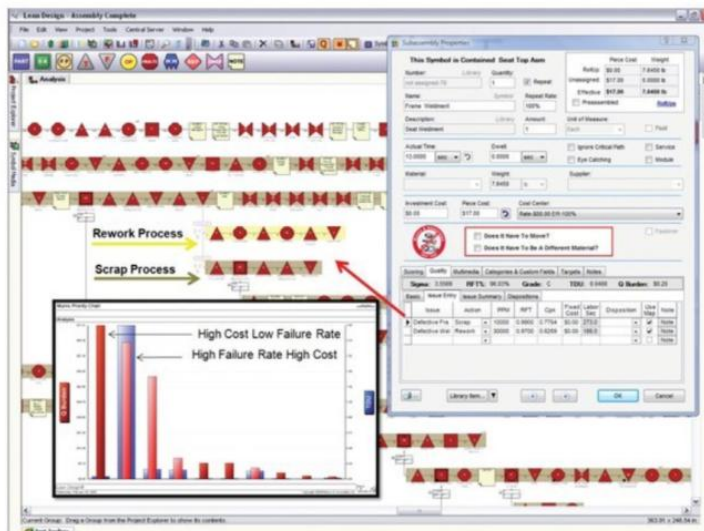


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Wringing Out Every Watt, Ounce, and Dollar

To grow and thrive, companies need to use a holistic approach that examines their products and processes in the earliest product design stages.



The software tracks, analyzes, and scores part and process, before the prototype phase, to create designs that are more efficient.

Enthusiasm over alternative energy opportunities finds balance from constricting budgets and countless newcomers. Add to this the fact that the incumbent energy moguls are not going to hand over any pie without a fight, and blissful desire fades to stark reality. Just because we want cleaner, cheaper, locally produced energy, more energy-efficient vehicles, and an all-electric world, does not make it automatic. Far from it, any company who plans to succeed in the emerging energy fields had better bring its 'A' game.

Fact is that success in alternative energy will require a completely new approach. The old ways will not be good enough. Success will demand an optimum combination of new technology, better design, hyper-tuned systems engineering, world-class error-free manufacturing, perfect supply chain, reliable delivery, and top-notch customer service. From electric vehicles to efficient water heaters to residential geo-thermal systems, you must wring out every ounce of waste across the board to have a chance to compete in this market place.

START EARLY, STAY INFORMED

To grow and thrive, companies need to use a holistic approach that closely examines their products and processes in the earliest product design stages so optimization can occur before investments are made and costs are fixed. By focusing on manufacturing at the product design stage – where 70% of the downstream manufacturing costs are determined – predictive approaches can help manufacturers make huge gains in profitability, quality, and time to market.

Only by considering sustainability, finances, system level energy path tuning, production readiness, and the input of all other stakeholders at the initial design stages, can the product be a game-changer. To accomplish this, metrics must be established, made available to all stakeholders and analyzed in an environment where the total picture can be examined, tuned, and balanced – again, long before production begins.

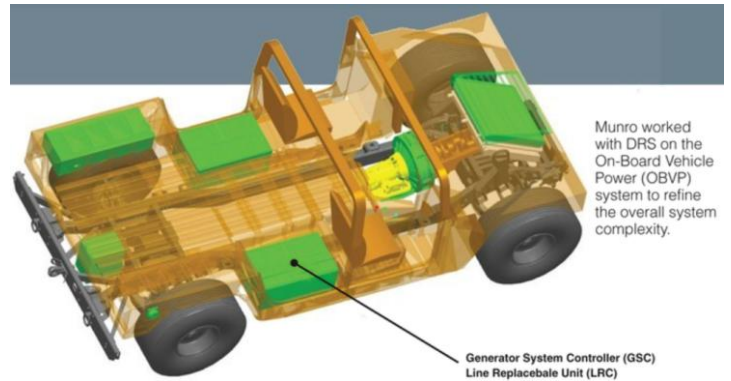
REAL WORLD EFFICIENCIES

As a firm that specializes in using and developing predictive metrics to explore the future, the staff considers technology alternatives, analyzes production and business case metrics, and develops a roadmap that minimizes risk and maximizes profits. Munro has recently applied these tools and methods to several energy-related products through its Munro MAP3 (Manufacturing, Affordability, Producibility, Product,

and Profit) software.

The software tracks and analyzes many metrics, including: piece cost; manufacturing cost; labor; Q burden; weight; carbon foot print; BTUs; kWh; custom fields, and formulas that cus-

tomers can import; and more. Then, through the methodology embedded into the software, challenging and scoring occurs to each part and process in order to identify the opportunities for cost reduction, energy consumption,



future quality issues, and manufacturing problems before the prototype phase. Additionally, parts and processes that are candidates for redesign or elimination are identified and designed out of the process.

CASE STUDY #1

Munro recently worked with DRS Technologies Inc. on the On-Board Vehicle Power (OBVP) system to refine the overall system complexity. The critical issues were size and cost of the Generator System Controller (GSC). The combined DRS/Munro team began by mapping the complete system from a manufacturing, parts, assembly, process, and quality perspective. After a series of brainstorming sessions, three redesign phases, which identified and eliminated complexity, as well as adding a few alternate technologies, the team reduced the size of the GSC by 45% and reduced the cost by 63%. As a result, the OBVP is more affordable, reliable, and will expand into more vehicles to provide the critically needed electric power to soldiers vehicles in the field.

CASE STUDY #2

Lithium ion batteries are a critical technology for improving electric systems across the globe. Working with A123 Systems, a leading lithium ion battery provider, the aim was to examine opportunities for an emerging market. Using a holistic, predictive approach, the team mapped the process and found

multiple stakeholders, a 13% reduction in weight, a 70% reduction in manufacturing time, and a 45% cost reduction was achieved. These kinds of reductions are essential for introduction into new markets.

ASK THE RIGHT QUESTIONS

Opportunities in emerging energy markets will continue, but only the most efficient companies will succeed. To be successful, companies need to get in early, balance all metrics in a single

opportunities for cost reduction through the methodology and the software's metrics tracking and analysis.

A123 achieved reduced systems assembly complexity by 42% while reducing cost by 19%, demonstrating a total lifecycle cost reduction of 27% for A123 Systems' battery versus competitive products. The approach provides an estimated savings of \$120 million over three years, while also improving quality.

After considering the scope of the project and types of metrics that required analyzing, A123 was able to customize, easily, the software to track metrics important for their needs as a company. Several types of executive reports that reveal areas of concern, as well as cost savings and many other metrics, generate, automatically, by the software, giving a complete picture of the producibility and affordability of a new product. This helps not only with business case creation, but also with cross platform compliance and a comprehensive due diligence.

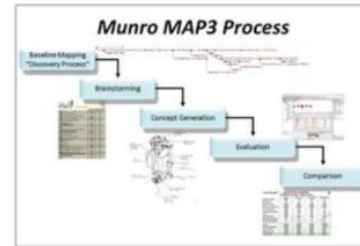
CASE STUDY #3

While electric generators have been around for years, emerging applications require lower cost and weight with higher performance levels. Recognizing that the old ways will not guarantee success in the future, a prominent electric generator manufacturer employed Munro to analyze its generator. By applying its methods and tools that considers multi-disciplinary metrics and

predictive model, and get all their stakeholders involved, engaged, committed, and, most importantly, willing to explore new approaches.

To wring out every watt, ounce, and dollar, engineers need to re-examine,

closely, all aspect of their current product design. Previously, this process was time consuming and costly. Now, with the use of modern tools and methods, evaluating a plethora of scenarios and opportunities has never been easier, or



TOP: Using a holistic approach to design and manufacture, combined with the right tools, allows companies to compete in challenging markets. **BOTTOM:** To compete in the rapidly evolving energy industry, companies must unite all key functions within a company, including management, finance, engineering, and manufacturing, from concept through full production at the earliest product design stages.

more critical to success. Below are a few of the critical aspects to reaching your maximum product potential:

- Metrics beyond functionality and cost must be established early and tracked with greater precision.
- Product engineers need to know assembly costs with associated time and quality for each and every design concept they generate.
- Manufacturing must continually make its experience and knowledge available to the design engineers and accountants for accurate assessment of design options.
- Accounting must be engaged in the 'should-cost' estimating of all design and manufacturing options being considered.
- Executives must be actively involved and informed on readi-

ness and risk to provide clear direction internally and externally.

HOLISTIC APPROACH TO SUCCESS

All functions of the organization – executive, finance, marketing, engineering, and manufacturing – must get involved at the earliest design stages to ensure the product for development are actually developed and meet all requirements. To synchronize and expedite this effort, companies can now employ modeling software, which enables rapid quantification of alternative solutions to optimize readiness and affordability in product design.

If a holistic approach combines with a simulation methodology that uses objective metrics to expose and quantify production issues early and throughout the product development process, a company can instantly understand the ramifications of its design choices and make the appropriate adjustments.

As an example, once populated with data from a company's key areas, the Munro MAP3 software can determine two critical indexes – the Confidence Index and the Producibility Index – that provide an accurate report of the product's feasibility and profit potential, so the company can make informed, critical design choice before they become costly.

- The Confidence Index provides a single, standardized score evaluating the production knowledge used in the design and the related confidence in its assessment. This element evaluates customer needs, specifications, timing, and budget to ensure the design does not go off-track with poor decisions or processes.
- The Producibility Index provides single, standardized score to determine the producibility of a design using pre-established architecture, value, assembly, and quality metrics within the producibility model.

Such information allows companies to understand and develop products

that meet customer specifications with 'should-cost', quality, weight, manufacturability, labor, serviceability, and sustainability all on target. Using predictive modeling software, companies can unlock the true profit potential of energy-

related designs and technologies and succeed in this competitive industry. 🌐

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