



Growing with Galaxy Magnesium™

Motion, Flight,
Build, Finance, Power,
Life, Green

GalaxyMagnesium.com



The Time has Arrived for Magnesium

Galaxy Magnesium is the world's premiere direct source of magnesium, revolutionizing entire industries with light, strong, versatile, durable and green magnesium – superior in many ways to steel or aluminum alloys.

An international company based in the United States, Galaxy is streamlining global supply chains, offering custom alloys for unparalleled performance and delivering Galaxy Finance — all-inclusive pricing, direct from the most productive mines in the world, and real-time commodity trading.

From automotive, aerospace, energy and construction to pharmaceuticals, Galaxy Magnesium is paving the way to a lightweight future through reasonable, stable cost, guaranteed quality commercial magnesium.

With offices in New York, Atlanta, Geneva, Honolulu, Xi'an, Beijing and Shanghai, Galaxy is well positioned to responsively serve global markets.

Join the **#MagnesiumRevolution**





Galaxy Motion

Galaxy Motion is helping to transform the transportation industry through the use of lightweight, high-strength, flexible, durable, energy-efficient magnesium. Magnesium is light and has a low melting point, so it takes less energy to refine, to move around as part of a vehicle component, and to recycle. It is the green choice for industrial metals.



Galaxy Motion works closely with automotive industry leaders, including Panoz Engineering, Deltawing, and SRO Motorsports America. Our development of magnesium-optimized vehicles for use in competitive auto racing showcases magnesium shows how magnesium can meet the toughest engineering and performance requirements, with no compromise for safety. Together with Panoz, Galaxy Motion has sponsored several highly successful SRO World Challenge GT4 races (at Road America near Milwaukee, at Course of the Americas in Austin, and at Indianapolis Motor Speedway), where Panoz vehicles competed at the highest levels with the best vehicles and drivers in the world.

The Galaxy Motion team, led by president Dan Panoz, provides decades of design and engineering expertise, through large, diversified technical facilities and talented resources centered in Atlanta. Panoz is an experienced automotive development firm with deep expertise -- a complete automotive design, testing, prototyping and low-volume manufacturing operation. Dan is a legend in the automotive industry; he led the effort to adopt aluminum in cars, starting in the late 1990's. Now he has turned his talent to establishing magnesium as the standard for lightweighting: replacing energy-intensive, heavier steel and aluminum alloys from which most vehicles are constructed today.



The resulting projected total weight savings: 20-30%, depending on the type of vehicle and its current metal mix.

Galaxy Motion works across the automotive industry as a supplier of basic magnesium commodities, as well as in original alloy design, testing, specification and supply. This begins with pure magnesium, graduating to standard alloys, then to custom alloys for high-performance options. Galaxy Motion designs and fabricates individual auto parts -- original designs as well as magnesium replacements for factory parts. Finally, Galaxy Motion implements magnesium optimization strategies by focusing on interconnected vehicle subsystems -- for example body panels, the chassis body, front and rear bumpers, seat frames. These coordinated magnesium systems maximize the strength and lightness of all their constituent parts.

Not all elements of a vehicle can currently be made from magnesium; there is an important role for steel, aluminum and even carbon fiber. Galaxy Motion identifies the appropriate role for magnesium in the total ecology of a vehicle's performance, coordinated with other materials.

Through its sister company Galaxy Finance, Galaxy Motion delivers financial engineering as well: long-term, price-stabilized, guaranteed quality and quantity deliveries of magnesium products, direct from the mines to global industrial customers.

Galaxy Motion supports the formation of a non-profit open standards forum -- the Flying Tigers Institute -- which shares the results of its research into magnesium applications, together with ground-breaking work being done by many others around the world.

Galaxy Motion is sparking the magnesium transformation of all elements of the transportation industry, including from bicycles, scooter and motorcycles to passenger vehicles, race cars, vans, sport utility, commercial trucks, bullet trains and freight cars. The design approaches and materials specifications developed in one vehicle type often translate efficiently into benefits for other vehicle types.

Galaxy Motion is committed to the advancement of energy-efficient vehicles that are responsive to the green power needs of the post-Covid-19 environment, both economically and environmentally.

Magnesium in motion, everywhere.



Galaxy Flight

Since the mid-1970's, the fields of commercial aircraft, defense, automotive and space flight have relied upon carbon fiber to create specialized surfaces and structures that are lightweight, stable, and strong. The challenge with carbon fiber is its cost. Aluminum is the leading metal alternative, and is much less expensive than carbon fiber -- but aluminum is 20-30% heavier. So carbon fiber is used only in settings where lightweighting is essential, and high cost can be justified.



Galaxy Flight, created by Galaxy Magnesium, is resolving this challenge and taking lightweighting to new heights, at reasonable cost -- through the targeted application of custom magnesium alloy technologies.

Magnesium is similar in weight to carbon fiber – within five-to-ten percent of equivalent carbon fiber when it is layered and finished – but it costs much less. A lightweight helicopter rotor, for example, may cost \$60,000 if made with carbon fiber. Its magnesium equivalent may cost less than \$10,000.

Today's most advanced magnesium alloys provide many features in addition to their primary lightweighting benefit. Galaxy Flight custom-designs magnesium alloys for a variety of missions, working with the top magnesium alloy laboratories in the world. Compared to steel and aluminum, a magnesium part can be designed to exhibit superior strength, greater resistance to torque and stress forces, better vibration damping and noise reduction, increased electromagnetic resistance, remaining stable at very high and low temperatures with fast transitions, with lower corrosion.

Bringing new materials to an industry like aerospace, with such precise tolerances, takes time, exacting research and validation. Galaxy Flight is committed to this course for the long term. Through our alliances with the Institute for Metals Research, Panoz Engineering and DeltaWing, Galaxy Flight specifies and produce magnesium alloys that are precisely matched to the most challenging mission.

The skies are not the limit.



Galaxy Build

Technology in the construction industry is stable and mature; new materials and techniques can take a long time to be adopted. New buildings and structures have been built with concrete, copper, aluminum and steel for generations. Galaxy Build has developed alternatives to steel, aluminum and classic Portland cement that can help architects, engineers and construction companies realize significant productivity gains: through tough, lightweight magnesium.



Galaxy Build is implementing magnesium in structural materials, including both vertical and horizontal beams used as primary structural support. Standard steel reinforcing bars embedded in concrete (rebar) can be replaced with more lightweight, corrosion-resistant magnesium.

Reducing the gross weight a building supports can increase the life cycle and durability of the entire structure, the cost of construction, and the useful height, dimensions and overall mass of a building.

Roofing, internal walls, ceilings, heating and cooling equipment, interior ducting, internal features such as rails, shelving and stairs are all candidates for a critical design review, given the greater weight of steel (50% or more) and aluminum (20% or more) compared to their magnesium counterparts.



Magnesium

Water piping, made today with copper or variants of plastic PVC (polyvinyl chloride) can be made more efficiently, with environmental, energy and cost advantages, when fashioned with magnesium.

Lighter, more durable, corrosion-resistant magnesium maintains a stable form over time compared to steel. Even the forms used to pour concrete -- made today from wood, plastic or cardboard -- can be made more durable with magnesium.

Magnesium supplied by Galaxy Build can be comparable in cost to steel and aluminum, because the alloys are sourced, refined and produced right at the mine and provided direct to manufacturers. Long, inefficient supply chains of buyers, dealers, brokers, wholesalers, agents and distributors are being replaced with Galaxy's simplified, streamlined model.

Portland Cement is made primarily of limestone, chalk, sand, clay and iron ore, all of which are resource-constrained. Galaxy Build has access to plentiful supplies of magnesium that are economically available. Substituting a magnesium compound for some of the elements in cement gives you Galaxy Cement – a new, denser cement that works more smoothly in conjunction with magnesium rebar. This approach produces a stable concrete surface with less embedded rebar and the same degree of stability.

Magnesium in construction can help one of the world's most energy-intensive industries shift to a lighter, more plentiful metal that is produced with lower energy.

Building a lightweight future.



Galaxy Life

Magnesium is key to healthy nutrition for everyone. It is also a powerful tool in specialized medical treatment. Fulfilling both nutritional and medical needs with high-quality, economical magnesium is the mission of Galaxy Life.



Moderate magnesium deficiency is common across all populations and demographics, worldwide. Because magnesium is key to enzyme reactions that affect the absorption of nutrition, protein synthesis, muscle and nerve function, blood glucose, blood pressure regulation and heart rhythm, and an immune system that is resistant to virus and bacterial infection, the symptoms of sustained magnesium deficiency can range from uncomfortable to serious. Symptoms of moderate magnesium deficiency may include difficulty in sleeping, loss of appetite, sensitivity to loud noises and bright lights, numbness, nausea, abnormal heart rhythm, chronic weakness, colds and viral infections, and personality changes.

Getting enough magnesium is easy for most people, given a balanced diet of green vegetables, nuts, legumes, whole grains and berries, but sometimes these dietary options are not observed, or other conditions like diabetes or alcoholism are present, and modest daily supplements are needed. 70% of the U.S. population has some degree of magnesium deficiency. But not all magnesium supplements are created equal; the correct ratio of magnesium and companion compounds ensures that this vital mineral is fully bioavailable and can be absorbed thoroughly.



Galaxy Life provides precise, high-quality magnesium supplements in various forms, to the nutritional supplement industry. Because Galaxy has large reserves of pure, inspected magnesium, and can cut through inefficient supply chains that add unnecessary cost, magnesium supplements from Galaxy are among the most cost-effective in the world.

Severe magnesium deficiency is another matter. Because of genetic, dietary or environmental factors, severe magnesium deficiency, which exhibits little in behavioral symptoms, is sometimes not detected until serious health conditions, including sudden cardiac arrest syndrome, occur. According to the U.S. National Institutes of Health, sudden cardiac death (SCD) may be associated with as many as 30,000 deaths each year in the U.S. alone. More study is needed, taking into account population diversity and lifestyle issues, but this finding could implicate 250,000 or more needless deaths per year, worldwide.

To correct severe magnesium deficiency, carefully-controlled intravenous administration is required, using highly purified magnesium compounds in liquified form. By arming the medical community with sufficient supplies of high-quality magnesium, as well as the know-how to test for the deficiency and administer magnesium correctly, it is possible that Galaxy Life may assist in preventing needless death and suffering.

Currently, cost may be a factor; an intravenous bag of pharmaceutical-grade liquid magnesium may cost \$300 or more. The same high-quality liquid magnesium is available from Galaxy Life at less than 1/4 of this cost.

Galaxy Life can provide pharmaceutical-grade magnesium at significantly lower cost to the medical community, and make it more universally available. Galaxy Life is also dedicated to providing consumer, patient and physician education, to identify, detect and treat severe magnesium deficiency, including knowledge of correct dose and timing.

Magnesium - a source of Life.



Galaxy Power

Galaxy Power, a division of Galaxy Magnesium, is focused on the use of magnesium components and materials in the production of energy. Galaxy proposes magnesium as a strong, lightweight alternative metal that can be introduced into Green Value Chains across the Energy Exploration and Production Marketplace.

Galaxy supports the design and creation of new alloys, coatings, and adhesives that position magnesium to complement and compete in durability, performance, and price with HSLA (High Strength Low Alloy Metals), Aluminum, Carbon Fiber, and other Composites.

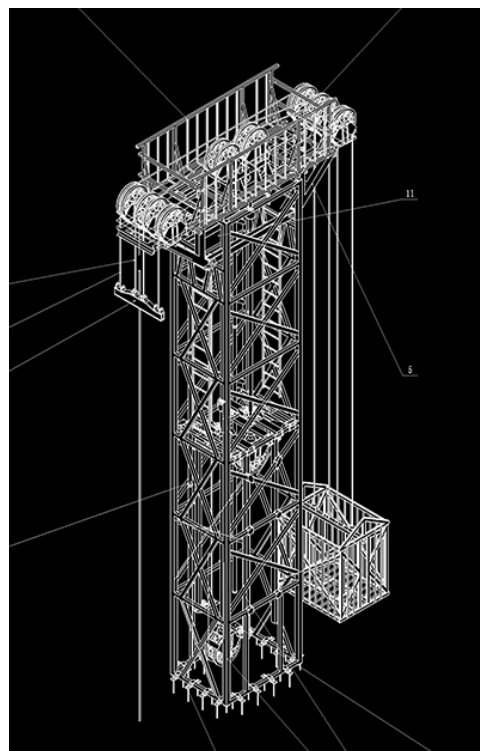
Innovation in the Energy Marketplace through the use of magnesium optimization and lightweighting can provide significant savings in operational costs, energy efficiencies, and bring many positive, green environmental advantages of magnesium to a wide range of established products, companies, and markets worldwide.

Galaxy Power offers Energy Market Innovations and Resources:

- **The Galaxy Power VHP-MgOPT1000** (vertical tower gravity balance hydraulic assisted pumping unit) is currently operating at multiple sites and is adapted for viscous oil well production needs worldwide. It is a new energy-saving sucker rod pump design. This system incorporates high-quality hydraulic elements, multiple production accessories, an overall structure that is advanced, competitively priced, reliable, and easy to repair and maintain.

First-generation transverse oil pumps -- the familiar bobbing horsehead design used in oilfields around the world for more than a century -- are obsolete. Their mechanical design exerts wear and tear on the well bore equipment, pump arms, gears, fulcrum and supports, requiring expensive ongoing maintenance. Energy consumption is high in these lift systems. The performance of this original design has been improved over time, but the basic physics of the transverse pump have rarely been questioned.

Moreover, from the material design and performance perspective, Galaxy Power offers this re-designed alternative for the oilfield to demonstrate light weighting





with magnesium alloy optimization. The system includes a vertical hydraulic assisted pump, with fully-enclosed components in a compressed vertical geometry. This patented, proprietary design creates alternating pressure within the well that extracts liquids (oil and/or water) more efficiently, with less energy. The equipment can be serviced and replaced less frequently, leading to dramatic cost and energy savings.

- **Soluble Magnesium Bridge Plugs:** Bridge Plugs are used in vertical and horizontal oil wells and are typically constructed of conventional steel, aluminum, and composites. Traditional permanent bridge plugs are difficult to extract and recycle; the process is time-consuming, delays productive work for crews, and requires expensive equipment. Galaxy Power offers a variety of bridge plug technologies featuring soluble magnesium that can be programmed to dissolve within a pre-set range of pressure, temperature and time parameters based on specific operating environments.



- **Artificial Lift System Well- Bore Components:** Galaxy Power offers product development and system analysis to identify and produce lighter, thinner downhole innovations and designs for well-bore equipment using magnesium alloys. Up to 50% lighter than steel currently in use, magnesium allows for precise alloy designs that can be durable, thinner and perform with less friction. The tubes, barrels, liners and other components that are used in the well-bore can be optimized with lighter, magnesium-based designs placing less stress on the pump at the surface. This means the potential for a more efficient lift system, which breaks down less frequently and consumes less energy in operation.

Galaxy Power: Green Value Chain Resource

The Energy Production marketplace faces unique challenges worldwide. New magnesium alloys will contribute to **safety, create efficiencies in operations**, and address persistent challenges to the **delivery of sustainable performance**.

To work in the most difficult surface, subsea, and subterranean environments, Galaxy looks to form strategic partnerships and alliances where our science and materials will impact the bottom line, and provide environmental and social value to energy producers.

From cement, wind turbine blades, to offshore platforms and agriculture, more and more products and services are passing through global value chains to the customer that contain light weight magnesium. The goal of optimizing productivity at each level of the chain anywhere in the world is to impact natural resource use at different stages. It is through value chains that resources ultimately 'start', as they are transformed or used as inputs -- like energy and water or magnesium -- and 'end', back into the same natural environment through final safe disposal.

The aim of a green approach in value chains introducing the use of magnesium is to a) ensure the sustainable use of magnesium as a natural resource and to increase the share of this renewable and recyclable resource across the entire value chain, b) to maximize material and energy efficiency at each stage of the process, and c) to reduce negative environmental impacts as outputs at all points of the chain.



The Green Value Chain is a systematic approach, integrating environmental support functions, environmental rules and regulations and market players in greening the value chain. The environment in broad terms -- or environmental goods and services in a narrower perspective -- is integrated into the value chain approach as the starting point of conception of products and services, and as the final recipient of end products, in addition to functioning as a recycler and a supplier of renewable resources.

Galaxy Power: Now and in the Future

We begin by listening — this is the key to earning a leadership position in the industry, building a reputation for understanding the current challenges of the customer. Galaxy Power then creates **intensively tested, fully-trusted technologies**, with a comprehensive range of cost-effective materials, products, and services. We invest in research, prototyping, partnerships, and joint development — constantly keeping our eye on the horizon of innovation.

Energy professionals who bring challenges to Galaxy involving magnesium or new alloy concepts receive our immediate attention. As an international team, we assist customers worldwide with understanding the technical and business advantages of magnesium.

Our **science, chemistry, nano-processing, metallurgy**, and alloy product development resources allow us to produce solutions based directly on customer specifications. Additional capabilities include prototype creation, small-volume manufacturing and ultimately if needed large **volume manufacturing**. Galaxy Power brings magnesium to all **segments of Energy Production**.

We invite industry professionals and customers who seek information about the #Magnesium Revolution to contact us about your requirements.

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Galaxy Green

Galaxy Magnesium is developing green, environmentally-positive products that utilize the special properties of magnesium. Applications begin with in home cleaning and home energy.

Keep an eye on this space for updates to come in the near future.

Magnesium for the future of our earth.





Galaxy Finance

The major challenge to widespread adoption of magnesium as a standard industrial metal is the limited, inconsistent availability of large quantities of high quality magnesium products at predictable prices.

On the current spot dealer market, with many mines, magnesium types and customers, prices fluctuate from week to week. Some mines withhold supplies anticipating higher prices; some mines cannot meet demanding environmental standards and shut down.

Layers of dealers, local and international shippers, brokers, insurers, tariffs and taxes, warehouses and distributors and shifting currency exchange rates add expense and unpredictability to the global magnesium market.



In this shifting landscape, potential magnesium buyers — engineers and production managers from the automotive, aerospace, construction, energy and pharmaceutical industries — often hold back on large, long-term commitments to magnesium. They recognize the many benefits of magnesium, but they cannot take the risk of inconsistent supplies and pricing in their long, complex supply chains and fast-moving assembly lines.



To mitigate these risks, and offer magnesium supplies that are consistently guaranteed, Galaxy Magnesium has formed a new division, Galaxy Finance. Galaxy has started by consolidating access to 20% of the world's commercially-mineable magnesium.



Galaxy Finance delivers the capital and credit resources needed to deliver the huge reserves that Galaxy Magnesium has developed. Together with the largest magnesium group in the world, the company holds a substantial reserve of thousands of metric tonnes of magnesium, and a network of more than 15 mature, continuously producing mines, along with many refining, alloy and manufacturing facilities.

Galaxy Finance provides magnesium at a reliable, repeatable, consistent quality and price through an alliance with Wisdom Capital, a private equity bank based in New York.

These innovative capital, credit and financial logistics resources serve the customers of all Galaxy Divisions — Motion, Flight, Life, Build, Power and Green — to provide financing vehicles that make the adoption of magnesium a straightforward commercial and fiscal decision.

Galaxy Finance consists of two key financial tools: Galaxy Guarantee, and Galaxy Exchange.

On the other side of the coin, Galaxy Exchange will utilize the Multilateral Trade Facility, a real-time magnesium commodities exchange authorized under the financial market regulations of the European Union.

The MTF is a 24/7 electronic exchange that allows many buyers worldwide to simultaneously see magnesium available that day from many sellers. Both buyers and sellers are pre-authorized, so that an accepted bid is immediately documented, with funds transferred and contracts in place.

Galaxy Exchange, set to be operational before the end of 2021, will list all magnesium products offered by registered global mines, refineries, manufacturers and suppliers. This includes Galaxy Magnesium as a key supplier, but is open to all magnesium product suppliers worldwide. With careful cultivation and continuous investor and supplier education, the Exchange will attract many suppliers and buyers to an open, transparent market.

The continuous dynamic of a real-time electronic bid-ask system, akin to the London Metals Exchange, provides for the most efficient price discovery and consistent value establishment, for all members of the global magnesium community.



In addition to the purchase of physical magnesium directly through the Exchange for industrial use, asset managers and individual investors will be able to implement options strategies, to manage risk and opportunity in the metals marketplace, and diversify their market portfolios with magnesium.



The price of magnesium often moves counter-cyclical to other non-ferrous metals like aluminum, silver, copper, lithium, cobalt and zinc. With magnesium as an additional tool, a hedge that can be positioned long or short and indexed for volatility, the tools for magnesium diversification will be available to asset managers of all types — commercial and merchant banks, mutual funds, index funds, institutional investors, trusts and pension funds.

Adding magnesium to the financial market ecology will open up new market strategies for investors, and lead to more stable, long-term commodities markets.

Finance for the magnesium market.



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