



**Omniseal Solutions**  
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# GOING BEYOND

Who We Support

Where We Provide Value

What We Solve For Tomorrow



## Technology Advantage Stories



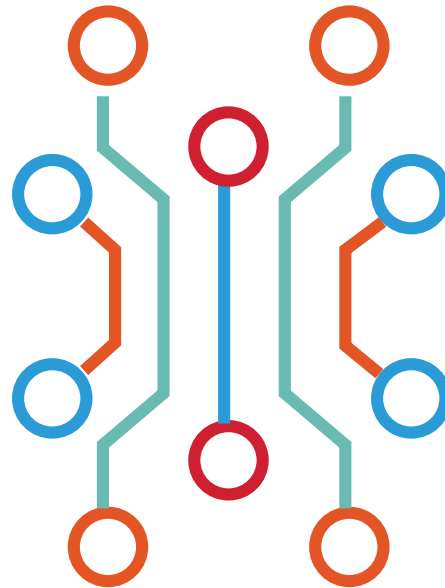
GOING BEYOND  
*Together!*

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# SHAPING & PROTECTING OUR WORLD:

## Precision Special Shapes & Large Diameter Sizes

When you think of seals, do you imagine a round part that fits in the palm of your hand? It is indeed true that seals come in this shape and size; however, the seals from Omniseal Solutions are specifically **designed and manufactured in many shapes and sizes** such as rectangular, oval, square, triangular, large diameter, miniature, and more! The custom engineered seals you will find at this precision seal and materials business are not the norm, and a **technology advantage provided to customers**. Due to many of their polymer seals, metal seals and custom components being installed INSIDE critical applications, they are not visible to the human eye. However, these precision parts hold a “hidden” value that goes beyond in major industries that influence various aspects of our daily lives.

Have you thought about what these engineered seals and components do? Technically, the critical parts are mechanisms that physically prevent gases, oils or liquids from crossing a barrier such as a joint or opening. They also prevent leaks and contamination; maintain pressure integrity; handle temperature variations; ensure proper, safe and efficient operations; and protect the environment from corrosive or hazardous substances. These benefits are commonplace and expected of reliable sealing solutions; however, for specific requirements or extreme conditions, customers rely on the Omniseal Solutions’ technical team to develop their custom sealing solutions, and this is where **shape and size DO matter**.



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## **LARGE DIAMETER METAL & POLYMER SEALS: SEALING FOR THE EARTH & UNIVERSE**

What applications require extremely large seals? Extreme environments require extremely large seals, and space launch vehicles are a good example. Fluids such as liquid fuels and oxidizers, hypergolic propellants, and non-hypergolic propellants are stored in very large fuel tanks and propel a launch vehicle off the ground. Required to reach GEO (Geostationary Orbit) or further, the rocket engine needs a significant amount of fuel to fly until its final destination. These large fuel tanks require seals that are equally large in size – **typically between one and two meters or even larger**. Additionally, the seals must meet the precise leakage requirement of tank applications in the range of  $10^{-2}/10^{-3}$  sccs.

Large diameter sealing solutions are not new for Omniseal Solutions, having been qualified in many NASA space programs for the past 60 years. With launch vehicles being built more powerful, seals also need to be engineered for these extreme designs. For example, the Space Launch System (SLS) was successfully launched on November 16, 2022 as part of the Artemis I moon mission. It is NASA's most powerful rocket to date, which successfully launched with 8.8 million pounds of thrust. Omniseal Solutions supplied very high-strength **polymer and metal seals for this historical mission** (Omniseal® RACO® and 103A polymer, spring-energized seals; and Omniseal® metal C-Seals), sealing the extremely large liquid oxygen and hydrogen tanks (up to two meters in diameter) and valves that control the flow of Orion's spacecraft propellant tanks.

Omniseal Solutions' space experts will next protect the launch vehicle, spacecraft and CREW on Artemis II and III missions.

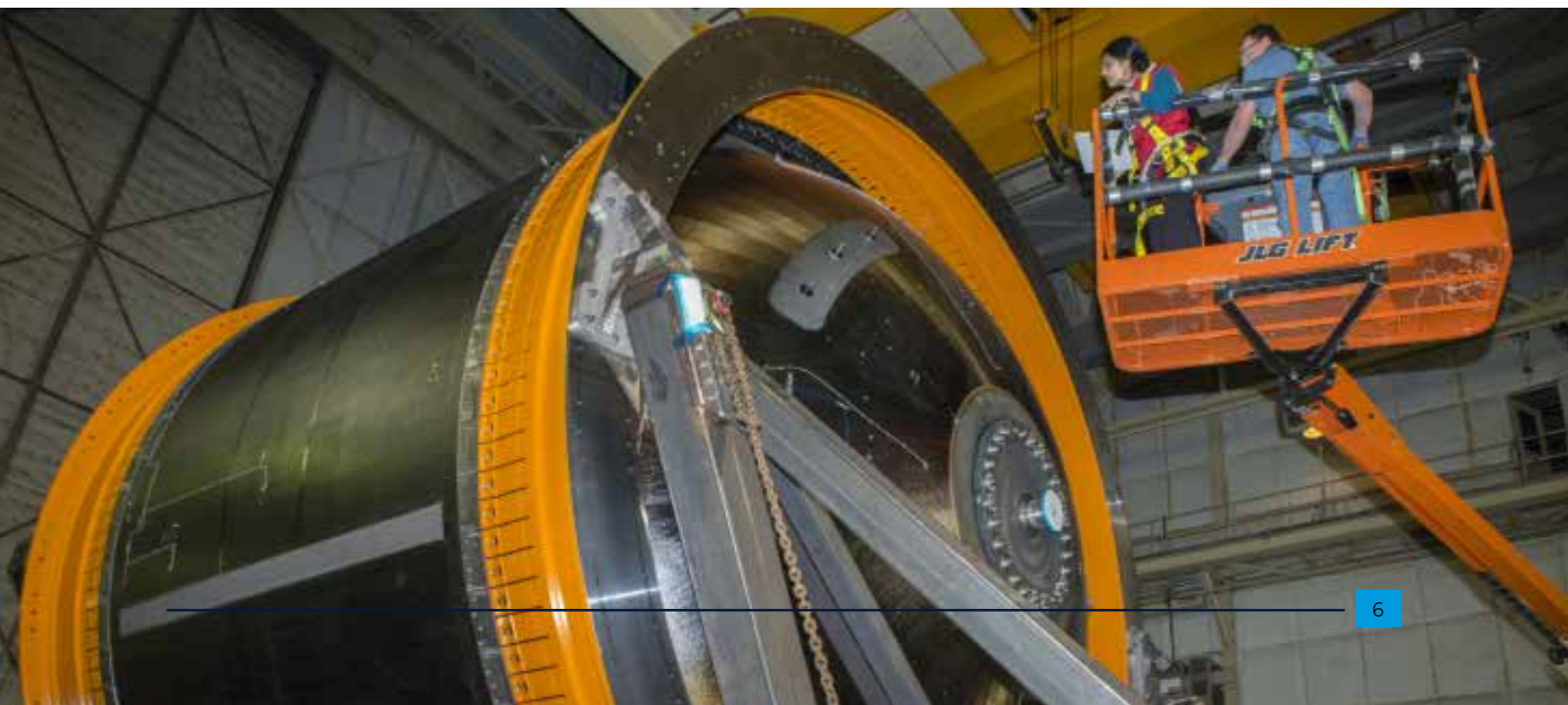
Going the distance – even into the universe - is quite an understatement when you talk about what makes a complex machine like a rocket operate in extreme conditions.

From cryogenic temperatures to high pressure requirements, high-performance sealing solutions from Omniseal Solutions address critical requirements to make space exploration successful. Their large diameter solutions are a proven sealing technology that has also been translated to other critical industries such as emerging energy sources (hydrogen applications).

#### **SETTING UP FOR SIGNIFICANT SUCCESS: MANUFACTURING A LARGER IMPACT**

As a business that is always looking ahead to improve processes and technologies, Omniseal Solutions made a significant investment into their Kontich, Belgium,

manufacturing site in 2018 by adding a new **large diameter seal production area**. This decision improved the quality output and reduced lead times for their large diameter, Omniseal® polymer seals, which can be produced up to 118 inches, and still deliver a consistent level of performance with full material qualification, including Norsok M-710 and certification according to API 6A. These larger seals are valued in demanding energy applications: FPSO turret swivels, large-engineered valves, compressors and turbines. The dedicated Kontich area includes a new compression molding press, sintering ovens, a large diameter CNC lathe, bespoke flexible forming and welding technology for Meldin® 5301 PEEK-based components, special transportation racks and a large table for assembly and inspection. The state-of-the-art equipment operates in a climatized environment to guarantee optimal dimension consistency throughout the manufacturing process until final shipping.





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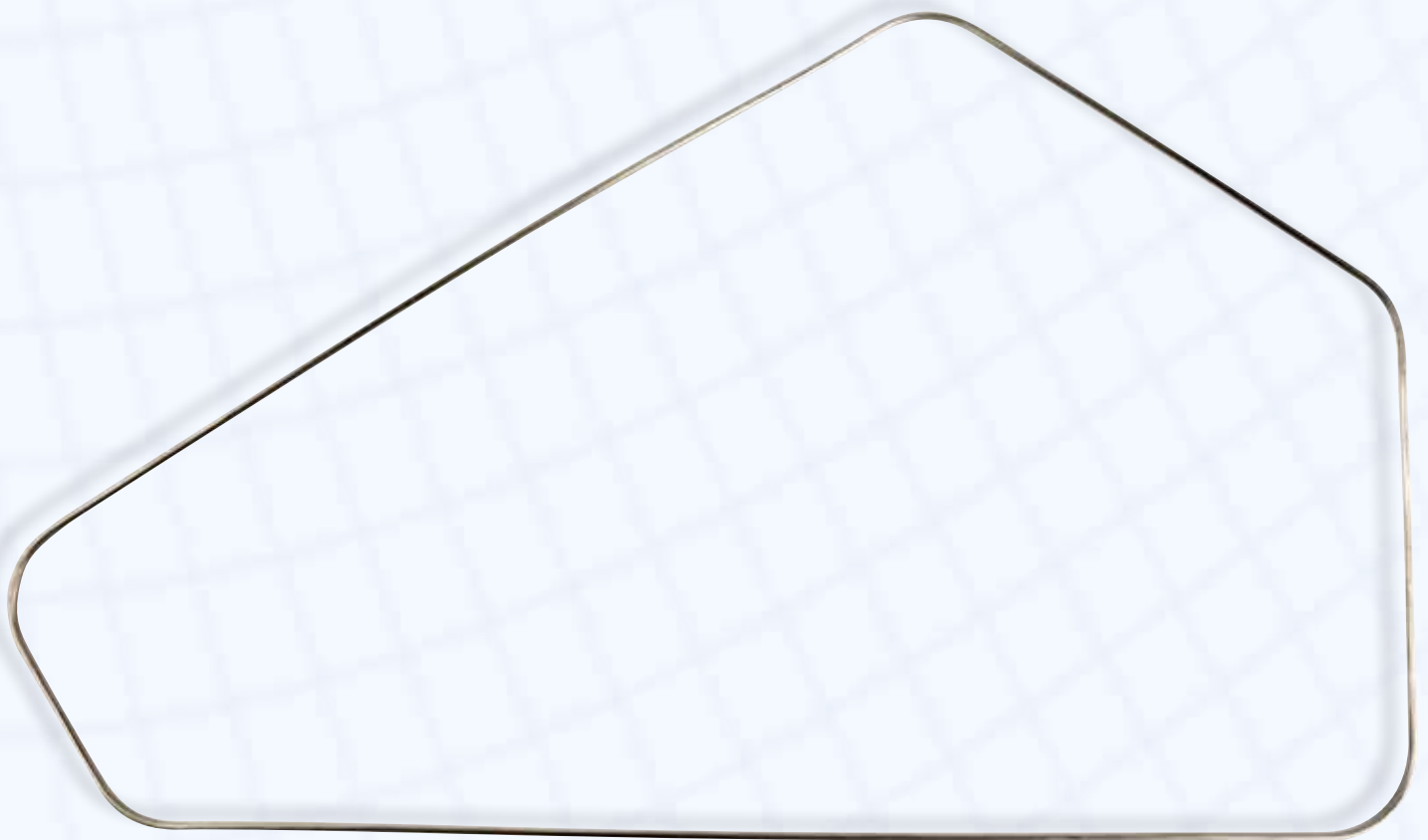
How does this past investment affect present and future needs? The investment made at the Kontich site several years ago has proven to be a strong strategic decision as emerging technologies such as hydrogen and nuclear are in need of large diameter sealing solutions. Let us delve deeper into the world of hydrogen, specifically electrolyzer cells. Electrolyzer manufacturers continue to increase their production; however, they are challenged by supply chain bottlenecks involving the many critical components used in electrolyzer stacks. Further, stacks are increasing in power capacity, which require progressively larger gaskets. To support this trend, Omniseal Solutions has designed **single-piece, large-diameter polymer gaskets (maximum size exceeding two meters), which is larger than any sheet size currently available on the market.** This may prove impossible for most manufacturers, however, Omniseal Solutions has already planned ahead for serial production and collaborated with partners to have the necessary equipment. Their production line is expected to be operational before the end of 2024.

## **A SAFER & SUSTAINABLE FUTURE: A DIVERSE RANGE OF NUCLEAR SEALING SOLUTIONS**

Similar to the space industry, the nuclear industry uses large diameter metal seals (up to four meters) for power plants, small modular reactors (SMRs), nuclear fusion, and more. What is unique about nuclear sealing solutions is not only the large size but also the various shapes. In fact, Omniseal Solutions provides shaped metal seals that are racetrack, oval, rectangular, square, or not even linear at all; they are customized to meet customer specifications. Why is there a need for these shapes? Due to the extreme conditions of high pressure, high temperature and leakage rate, a standard seal will not meet precision fit guidelines and have the physical properties to work reliably. Custom-made seals are ones that need a non-standard axial section.

As you can see, there are many types of sealing solutions and the shape or size does make an impact on performance and reliability. When you think of a seal, now you can imagine all the different possibilities!







# PREDICTIVE ENGINEERING & DECISION-MAKING:

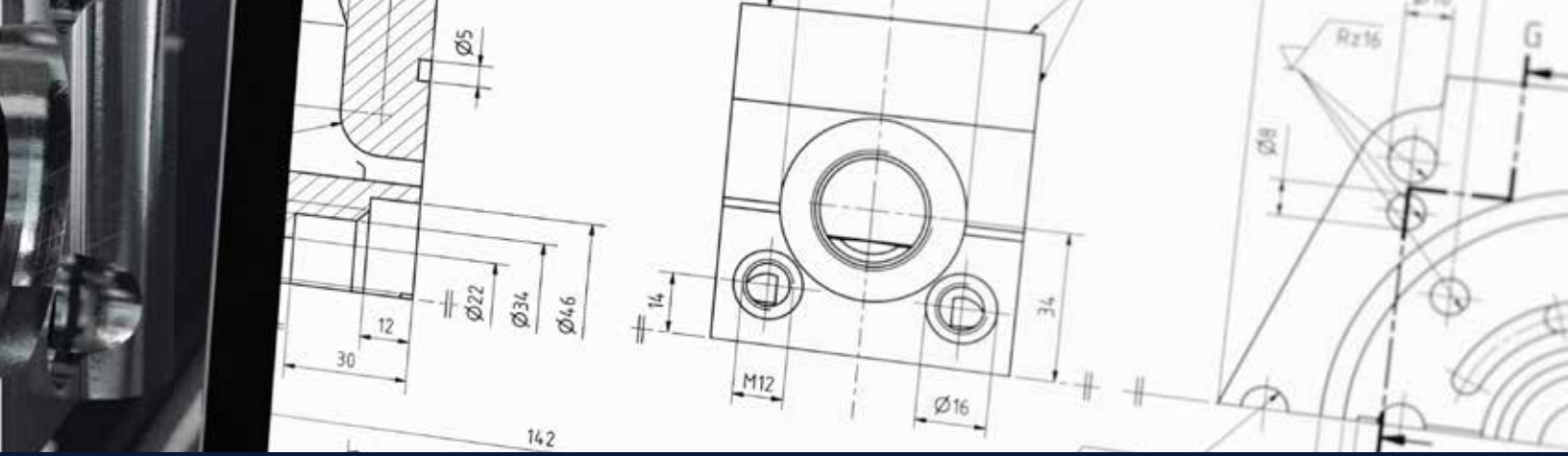
## Going Beyond with Advanced Numerical Simulations

Every day, we make different type of decisions based on the events in our lives. For example, what should we wear today? Based on the weather, planned activities, people we are to meet, and how we feel, we may wear something casual like a T-shirt and jeans or dressier for the office. This decision may seem quite simple; however, some factors should be considered. If the weatherman predicts a 37% chance of rain that day, you may decide to take extra precautions. Omniseal Solutions' customers face dilemmas and challenges within their application every day where decision making is critical. In their case, the question may be 'will the seal protect under cryogenic conditions?' or 'what temperature or pressure will affect leakage rate or sealing control?' Since the factors in this equation

are more complex, **advanced numerical simulations** come into play and turn a result from what could be a negative to a positive.

Are you familiar with numerical simulation? According to Nature.com, a numerical simulation is a calculation that is run on a computer following a program that implements a mathematical model for a physical system. Numerical simulations are required to study the behavior of systems whose mathematical models are too complex to provide analytical solutions, as seen in most nonlinear systems.

Where does numerical simulation make technical sense? A customer requires a new sealing solution for their application, where the required component needs to operate under extremely high temperature



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and pressure conditions, with a rotating shaft and corrosive media (e.g., acids or oils). The customer believes that an Omniseal® spring-energized RACO® seal would be the best solution, since the polymer seal is designed with a fluoropolymer jacket and a metal spring and does work with these conditions. However, the customer may also require a clamping load as well as high speed properties. How do you know if the RACO® seal is still the right choice? Omniseal Solutions has compiled extensive test data on each of the materials and designs; however, knowing exactly if or when a seal will fail when installed inside a customer application is difficult to determine. If you use numerical simulation, this unknown becomes clearer.

## **NUMERICAL MODELS:**

### **THE MATH ADDS UP**

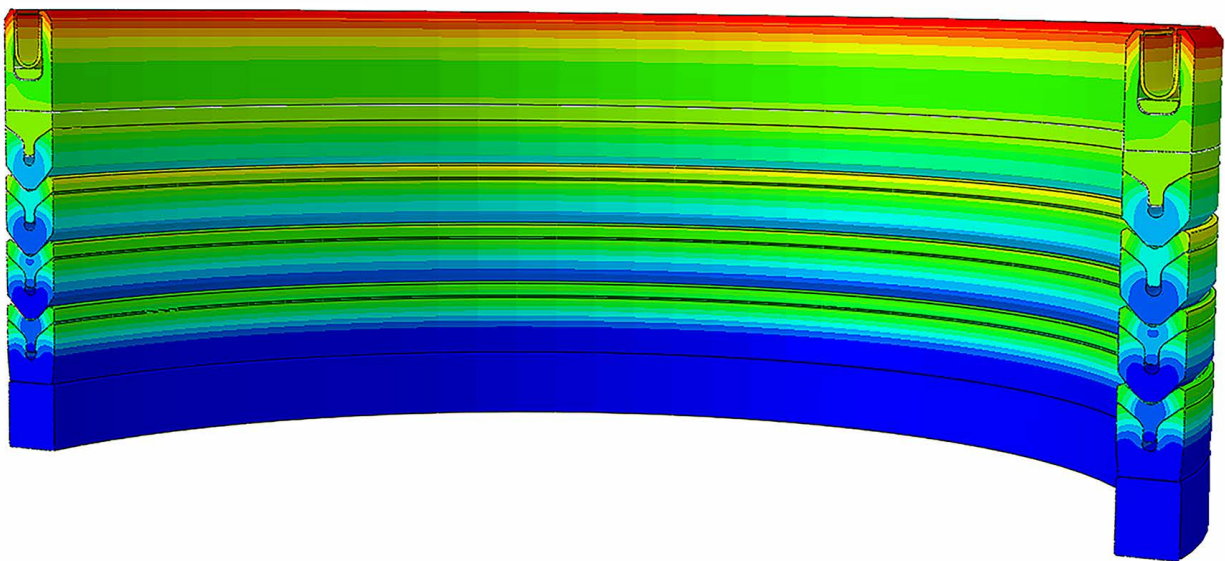
One of Omniseal Solutions' technology advantages is their **numerical simulation services team** who uses past test data, known material models, and the customer's application data to simulate the solution. This predictive model can tell us the component's behavior within the application and what will happen if a parameter is changed. How is this achieved? With computers, bespoke coding, and a little **predictive engineering**.

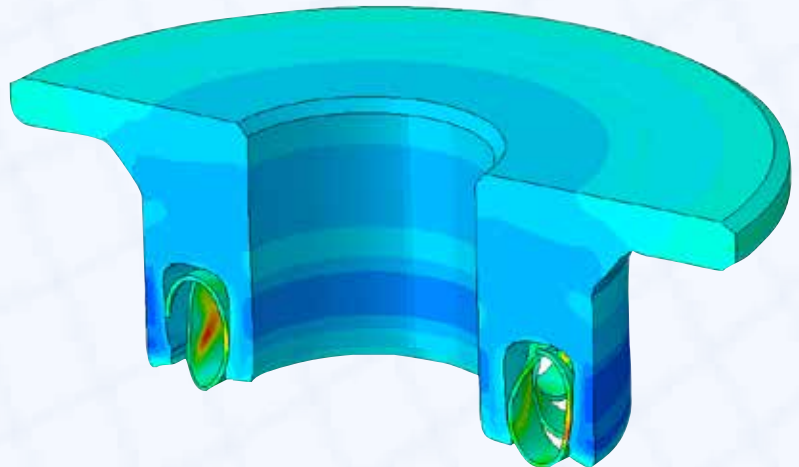
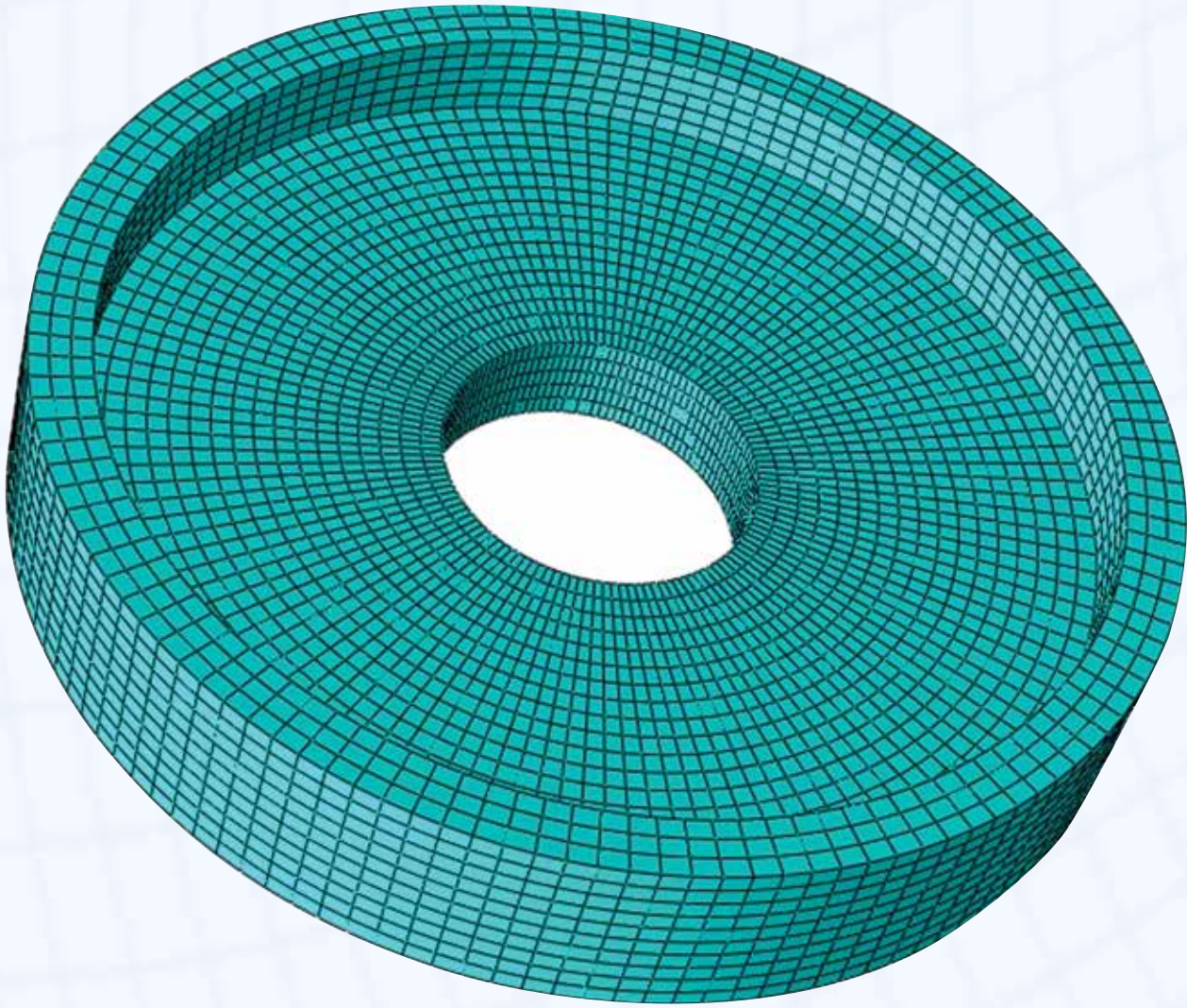
Using mathematics, the Omniseal Solutions' technical team can input all test data and customer parameters to create a **numerical model**. This model runs calculations and predicts actual physical processes. The result is one of the most powerful analysis

tools for complex physical and engineering problems. Advanced numerical simulation technology integrates many disciplines such as mechanics, materials, computers, and physics. The two most used methods in a numerical simulation are Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD). FEA simulates real-world physical systems (geometry and load conditions) based on mathematical approximation. CFD uses numerical analysis to solve the equations of fluid mechanics in a computer in order to predict the flow of a flow field. Imagine the many possibilities where numerical models can help Omniseal Solutions' customers in space, aviation, life science, nuclear and more, enabling our customers to move the world forward.

## CLOSER EXAMINATION OF HISTORY-MAKERS: FINITE ELEMENT ANALYSIS (FEA)

How did it all begin? Although there is no definitive date or origin story of the first developed Finite Element Analysis (FEA), the generally accepted record dates to the late 1800s when John William Strutt (third Baron Rayleigh) developed a method for predicting the first natural frequency of simple structures by assuming a deformed shape for the configuration. He quantified the build by minimizing the distributed energy in the layout. Later, Walther Ritz expanded the process to a method for predicting the displacement and stress on structures - now known as the **Rayleigh-Ritz method**. By the 1940s, scientists





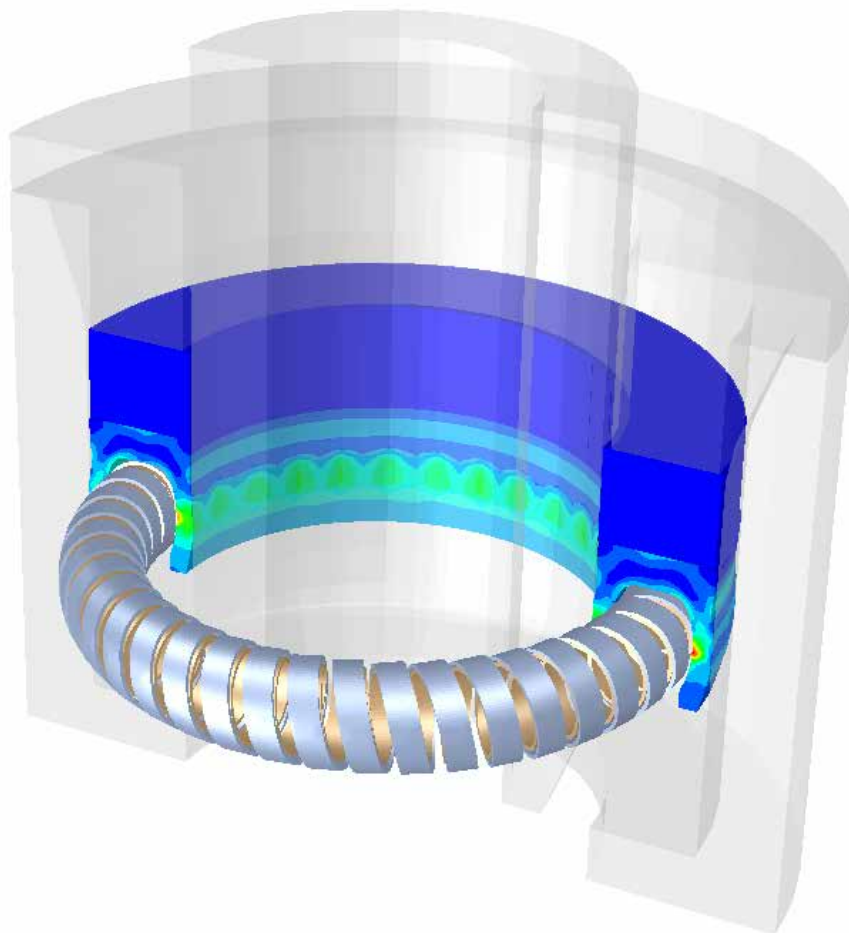
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developed other models to predict the behavior of more general systems, frame and truss based from Alexander Hrenikoff and later utilized energy methods from Carlo Alberto Castigliano and William Rowan Hamilton. In 1943, mathematician Richard Courant proposed breaking a continuous system into triangular segments. Other innovators in the field included Argyris, Turner, and Clough.

The 1940s also saw the “birth” of digital computing with the unveiling of ENIAC (Electronic Numerical Integrator and Computer) at the University of Pennsylvania. The United States Army commissioned a room-sized computer to calculate ballistic trajectories during WWII, which used

electromechanical devices for data storage and vacuum tubes for calculations. This precursor to the modern CPU required a team of operators to keep it running at a maximum processor speed of 46 operations per second.

**FEA was further developed in the 1950s in the aerospace industry by Boeing and Bell Aerospace in the USA and Rolls Royce in the UK.** They used triangular stress elements to model airplane wings. The benefit to the growing aerospace industry was clearly proven in the skies, and most major aerospace manufacturers followed by developing in-house programs for structural analysis on computers.



Although the basic concept of finite element analysis was born, the process remained time-consuming and limited. Several authors (M.J. Turner, R.W. Clough, H.C. Martin, and L.J. Top) collaborated to publish one of the first papers to lay out the method in 1956. Originally made as free software or freeware, the technology became popular in numerous universities. In the following decade, several other programs started based on this pioneering work.

- In 1965, NASA funded a project headed by Dick MacNeal to develop a more capable FEA software program, which later became the NASTRAN program.
- Also in the 1960s, Westinghouse Electric Company engineer John Swanson developed another FEA software for nuclear reactor analysis that became known as ANSYS.
- John Hallquist developed a popular program, LS-DYNA, while he attended Livermore National Laboratory. Engineers favored LS-DYNA for crashworthiness, sheet metal forming, and prototype simulations.
- HKS was founded in 1978 and went on to develop ABAQUS. ABAQUS became very popular in the research community because HKS allowed users to formulate new material models and elements.

Within Omniseal Solutions, their technical team created the first proprietary numerical simulation model over a decade ago.

Such numerical computations would not be possible without several computing and graphics processing advancements. The initial model was created as a result of their usual **collaborative spirit with a customer** – solving a problem and working closely together with engineers to design a precision solution. When Omniseal Solutions introduced the service, the team concentrated mainly on FEA. This process allows the team to simulate/model the behavior of a component under given conditions such as in a test rig specified and built to meet a specific application. The following shares the FEA timeline of Omniseal Solutions' constant improvement and innovation, a part of their DNA to go beyond the boundaries of possible.

- In 2011, the technical team adjusted several commonly used, metal spring material models, initiated compressive testing and characterization of their Meldin® HT Thermoplastics, and delivered the “first batch” of proprietary material models ready for internal usage. Based on their in-house materials and applications, these models allowed them to more accurately predict when a component would fail in a given environment and equipment.

- In the following year, the technical team made more advanced materials models available to the business and advanced the work on HPHT testing for thermoplastic materials. These new models allowed the team to develop even more advanced simulations.
- By 2013, the technical team was able to use this base to create hybrid physics and data-based engineering emulators for spring force, extrusion, process, and product simulations., such that by 2015, they completed the development work on wear/leakage tests and simulations. Progress continued in 2017 when the team launched optimized fatigue tests and models. Soon after that, they announced cryogenic tests and models.
- All the hard work came to a full circle when in 2020, the team responsible for all these innovations was officially named: **Engineering Simulation Services (ESS)**. Currently, ESS uses proprietary calculations and in-house developed models to guarantee customer confidence. Primarily, they use the ABAQUS model with advanced models and simulations. The team also uses FESafe for fatigue analysis of metal parts and Comsol for other configurations. Each of the individual

engineers on the team are experts in their fields of scientific analysis and have advanced each of the models and simulations beyond the basic parameters with in-house developed coding, e.g., different sub-routines for ABAQUS with Python scripting.

- In 2023, the team initiated a vital physics and data driven program called Digital Service Platform (DSP), aiming to streamline design solutions, drive business growth, and establish a sustainable business model by leveraging digital innovation and customer engagement, to offer customers "first time right" solutions much faster with lifetime confidence.

What does going beyond in 2024 look like? The team is committed to continuing their innovation journey and embracing the fast-changing digital world, leveraging DSP and delivering the most value to customers. By working closely with customers to anticipate evolving needs, the manufacturing business overall gains a deeper knowledge of critical applications and specifications. Further, in-house testing results and bespoke simulations bolster customer success by determining the exact point a component design will fail under the given conditions and can adjust the design accordingly.

The story of Omniseal Solutions' ESS team is a physical and mental testament to the **power of numerical simulation technology**. Their advancements in this field not only solve complex engineering problems but also save time, cost and effort for customers who simply cannot rely on unknowns. Omniseal Solutions is very excited about engineering and manufacturing the future of tomorrow. Are you ready to go beyond together?



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# MATERIAL MATTERS:

## Going Beyond in Certification & Universal Testing Standards

Look around you, and you will see many things of different colors, sizes, shapes and composition – perhaps a wooden chair, a paper notebook, a ceramic cup or a glass vase – so many interesting items with each being made of various defined materials. What is the definition of a material? Why does it matter? A material is defined as the substance or mixture of substances that constitute an object, which can be living or nonliving, and classified on its structure, uses and properties. The material world is vast, most commonly represented by **ceramics, metals, glass, composites and polymers**. Polymers in particular have become such a major part of our communities, serving high performing functions in electronics, life science, industrial, aviation, space and

more industries - in the end, they certainly improve our quality of life. The reason polymers are so useful is because they can be synthesized to varying levels of hardness, flexibility and biocompatibility. The first synthetic polymer was invented in 1869 by John Wesley Hyatt, who made the first substitute for ivory billiard balls. Those who are **experts in the polymer material world** such as Omniseal Solutions know how complex they can be and know how to transform these everyday items to protect people, improve process, and advance technology.

Polymer materials are not new to Omniseal Solutions; they have developed thousands of formulations over 60 years as part of their Rulon®, Meldin® and Hycomp™ material families. With any technology or



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science, the quest for newer and more performant materials continues. A material solution's performance is often reliant on the characteristics of the base material used. Due to its proven history in design engineering and research and development, in addition to a collaborative spirit with universities, research centers, startups and pioneers, the business has been able to go **beyond the boundaries of possible in developing custom materials for many fields — a technology advantage for their customers.**

#### **A LIGHTER WEIGHT FOR AVIATION MANUFACTURERS & OEMS**

When you think of an industry that needs lighter weight, high strength and stability, aviation may be the first to come to

mind. The field of materials engineering is critical in the aviation industry, which is governed by international organizations that maintain standards for the involved materials and processes. These standards require exceptional safety performance, high mechanical strength, chemical compatibility, and fatigue resistance.

Have you heard of “aerospace grade”? Since the aerospace industry places extraordinarily high demands and specifications on its materials and components, the term “aerospace grade” has become practically synonymous with “high tech”, which involves quality control, documentation, traceability and accountability. For example, Omniseal Solutions is a **manufacturer of aerospace-grade seals and materials;** and therefore, responsible for traceability

of all sources used to make these seals and materials, including rigorous testing and documentation. On the other hand, non-aerospace grade materials that are supposedly the same as aerospace grade materials usually have wider specs but never have the meticulous documentation, traceability, or testing standards. With safety and reliability at the forefront, it is no wonder that manufacturers and OEMs select “aerospace grade” parts such as precision seals and materials.

How do you maximize an aircraft’s performance? Selection of materials is critical in aviation component design since it is tied to performance, including structural integrity, energy efficiency, flight safety and reliability, lifecycle cost, and recyclability. Studies show that the most effective way to improve structural efficiency is to reduce density, and this is where lightweight materials fly high.

Omniseal Solutions’ **Hycomp™ carbon composite materials** are used often in many aviation applications due to these benefits:

- Decreased Weight
- Improved Fabricability
- Reduced Number of Parts

Polymer materials are powerful due to their lighter weight and efficiency, but that is not all! They are relied upon for their endurance in extreme conditions, such as those experienced in the hydrogen industry.

#### **A SUSTAINABLE GAIN FOR OUR PLANET**

In the pursuit of a carbon-free world, companies are developing carbon capture & storage (CCS) technologies that can achieve significant carbon dioxide (CO<sub>2</sub>) emission reductions. CCS involves three major steps: capturing CO<sub>2</sub> at the source, compressing it for transportation, and then





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injecting into a deep reservoir at a carefully selected and safe site for permanent storage. In hydrogen applications involving transport/storage and distribution of hydrogen gas or liquid at extreme pressures,

**using the right materials do matter.**

Traditional elastomers typically undergo severe degradation, i.e., chemical ageing, swelling, and blistering. The initial sorption of CO<sub>2</sub> into elastomers results in swelling, which changes their mechanical and physical properties. Furthermore, blistering of elastomers can create catastrophic failure when depressurized, called Rapid Gas Depressurization (RGD) or Explosive Decompression.

Partnering with an Energy major, the Omniseal Solutions' technical team collaborated on a 100% CO<sub>2</sub> certification campaign for several of their proprietary thermoplastic materials that consisted of a bespoke immersion testing in compliance with the pass/fail criteria of NORSOK M-710, Edition 3. According to test results, **every selected material successfully passed the acceptance criteria**, proving these materials are a better option compared to standard elastomers for sealing applications when exposed to CO<sub>2</sub>.

The following were the selected materials used in testing:

1. Fluoroloy® A02 - Proprietary Custom PTFE
2. Fluoroloy® A19 - Proprietary Custom PTFE
3. Fluoroloy® A21 - Proprietary Custom PTFE
4. Fluoroloy® A20 - Proprietary Custom FEP
5. Fluoroloy® A08 - Proprietary Ekonol Filled PTFE
6. Fluoroloy® A09 - Proprietary Custom UHMW-PE
7. Fluoroloy® A10 - Proprietary Custom PTFE
8. Fluoroloy® A16 - Proprietary Custom PTFE
9. Meldin® 5301 - Proprietary Custom PEEK

From emerging technologies that heal our environment, polymer materials can also heal us.

## **A HEALTHIER OUTCOME FOR OUR PATIENT CARE**

### **Biocompatibility is one of the most important factors in the life science**

**industry** to ensure that materials not only withstand the chemistry and environment, but they also do not affect the environment and our human body. Omniseal Solutions is relentlessly dedicated to the protection of customers and the patients they serve. Their solutions portfolio includes over a thousand unique compounded materials that is even more enhanced with **Rulon® solutions and USP Class VI certified materials.**

Developed for custom specifications, these materials have been thoroughly tested and validated by the USP Class VI requirements (a process that is quite intensive).

How do biomaterials interact with our human bodies? How does this impact the clinical success of medical devices we use every day (e.g., pacemakers, continuous glucose monitors, syringes, ultrasound scanners, and prosthetics)? As a result of these life impacting influences, the medical device industry continues to be one of the most strictly regulated sectors. Therefore, for all types of medical devices and biopharmaceutical manufacturing, biocompatibility testing is essential.

- The components of any medical device must be confirmed to have no harmful reactions or long-term bodily effects caused by chemicals within plastic materials or trigger undesirable biological reactions within a patient.
- The components of any medical device must also be verified for human usage in order to test for any possible adverse physiological impact or hazardous reaction due to the complexity of various complex systems in the human body.
- The most relevant certification procedure for biocompatibility testing is USP Class VI and can be used in a wide range of medical applications. Material selection in medical devices has always been a challenging task for the designer and engineer; however, one priority that can be agreed upon is USP Class VI certification.

Achieving USP Class VI accreditation can be highly advantageous in terms of operational functionality but also building trust. First and foremost, medical manufacturers need to produce parts with minute tolerances, extreme precision, and exacting specifications. **Any technology advantage can make the difference in reducing waste, increasing profitability and boosting production.** Proper guidance from material suppliers such as Omniseal Solutions help navigate challenging regulations and complex testing.

Additionally, their cutting-edge materials maximize performance while guaranteeing component integrity in a variety of wear components, including precision bearings, piston rings, cup seals, and wear components with high specification compounds. That is how Omniseal Solutions can offer a wide variety of FDA and USP Class VI certified materials for the required biocompatibility. Without this technology advantage, sealing function will be unreliable, causing major production losses.

The make up of materials is wide and complex. With Omniseal Solutions' material experts who work with high-performance polymers every day, you can go beyond in your critical application with precision, strength and efficiency.



# LIFESAVING SOLUTIONS:

## Miniature Seals with Considerable Protection

In the dynamic world of life science and healthcare technology, the smaller the size of the medical equipment, the faster, safer, smarter and stronger the results for patient care. You may have heard of many different medical terms with “micro” added in the front such as microsurgery, micro robotics, micro instrumentation, etc. Why is everything getting tinier? Let us look closer at the market and human forces driving the global medtech industry to understand how its evolution over the last several decades keeps designs growing smaller and more compact.

Medical staff rely on the highest degree of precision and quality. Instrument miniaturization is revolutionizing their industry by allowing them to do more in the same space with less of a footprint.

One example is **minimally invasive medical instruments and implants**. In early 2010, powered, microsurgical devices grew in popularity with advancements in minimally invasive surgeries, which provided the benefits of smaller incisions, more versatile solutions for surgeons, and improved patient recovery times. A decade later, the trend for smaller designs in this industry continues as can be evidenced by a rise for miniature motors in surgical tools, pumps and ventilation equipment.

How do you go beyond to push these limits to go even smaller? As instrumentation becomes even more miniaturized, their interior parts still need to deliver big results in regard to performance, safety and protection – a challenging task for OEMs who make this equipment and



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the end user (physician). You need to consider the following factors: **expertise (design and engineering), capabilities (manufacturing), and sustainability (material development).**

**LIFE SCIENCE EXPERTISE:  
DESIGNING SMALL SEALING SOLUTIONS  
WITH PLENTY OF POWER**

Many microsurgical tools use polymer seals such as those designed by Omniseal Solutions, which are a critical component to alleviate operational and maintenance demands. Since there are electronics housed within the tools, Omniseal Solutions' **Omniseal® spring-energized seals protect interior circuitry from steam and cleaning extensions** such as during autoclaving, the most common method

for sterilizing surgical instruments in high temperature and pressure conditions. This process can reach temperatures up to 149°C (300°F), and high-performance seals will prevent any fluid entry into electronics and shafts along with other debris. Even if the medical device is exceedingly small, there are many parts working inside together. For instance, in a drill or stapler, there may be up to six rotating mini shafts, each accommodating a different motion of the device and requiring a miniature seal to protect the parts in the cleaning process.

Not only are sealing solutions designed to protect interior functionality but also to provide ease and comfort to the end user. Hand-operated, microsurgical staplers are a good example. Previously, these devices

were often heavy, difficult to wield and required a large amount of force to rotate and staple properly. If you look at today's modern version, devices are much smaller – a third of the size – comfortably fitting in the surgeon's hand. Often battery powered, the latest surgical staplers assist surgeons to apply staples easily and properly with the push of a trigger. Hand-operated surgical staplers are one critical application in the **minimally invasive surgical instrument industry**; others include orthopedic, ophthalmology, cardiovascular, neurosurgery and pediatric surgery. These applications also benefit from the use of miniature spring-energized seals:

1. Long service life
2. High speed capabilities
3. High temperature management in overload conditions (torque or speed)
4. Contact protection relating to fluids and alkaline solutions due to strict cleaning and sterilization requirements.

## **LIFE SCIENCE CAPABILITIES: MANUFACTURING MINIATURE SOLUTIONS WITH EFFICIENCY & AGILITY**

Designing these miniature technologies to go beyond is one factor; however, you must also consider the capabilities needed or the manufacturing process. A main concern of OEMs who manufacture microsurgical instruments is finding a seal manufacturer who can make seals small enough that would operate efficiently. With any unique or custom size, there are challenges. For example, larger diameter seals are complex and expensive to produce; however, once spring-energized seals reach sizes below  $\frac{1}{4}$  inch, they also become increasingly more difficult to design and manufacture.

One of Omniseal Solutions' **technology advantages** is its ability to not only design but also manufacture the smaller-sized seals needed for micro instruments. Once the diameter of the seal goes below  $\frac{1}{4}$  of an inch, the list of sealing companies



who can reliably meet this requirement drops dramatically. In fact, Omniseal Solutions produces some of the smallest seals for these applications in the world. The challenge relates to achieving tight tolerances (of +1) in these miniature seals. You can see that extreme precision and applied knowledge are key to success. Further, Omniseal Solutions had made huge advancements in their prototyping services, shortening the gap between product development and manufacturing. Working in collaboration with the customer, they are able to test new designs and features within a very short deadline.

**LIFE SCIENCE SUSTAINABILITY:  
DEVELOPING MATERIAL SOLUTIONS  
WITH LONGER LIFE & WEAR**

With over 100 different jacket materials and six spring styles including advanced pitch to cantilever, extended spring, Omniseal Solutions provides precision sealing options to address specific applications. What are the customer's requirements – low wear and friction or some other stringent specification? In the past, to ensure a long seal life, shafts needed to be comprised of hard materials to prevent wear from jacket materials working against the soft substrates. Using hardening, plating or coating materials can become expensive,

and with some instruments having up to six shafts, these costs will multiply. Omniseal Solutions' jacket materials enable equipment manufacturers to leverage any type of shaft material, including soft materials. The technology advantage provides **longer lifetime, enabling less expensive surgical devices to be created.**

Omniseal Solutions ensures the quality of its polymer and metal materials, which are known for their strength, flexibility and biocompatibility. As an example, they use a specially formulated high-performance polymer as the jacket material for spring-energized seals (with numerous options available). This custom material formulation is produced in-house. The business also offers high levels of purity to meet stringent cleanroom standards with seals for surgical applications able to be designed in a Class 10000 Clean Room. In any healthcare environment, materials are strictly regulated. Omniseal Solutions has developed materials that meet USP Class VI certification and are suitable for sealing and friction control.

The life science industry is full of fascinating discoveries and as our world grows larger, the technologies we need to thrive grow smaller. Omniseal Solutions will continue to go beyond in miniaturization – after all good things do come in small packages!





# SUSTAINABILITY IN ACTION:

## A Future-Forward Website

As part of the Saint-Gobain and Omniseal Solutions' families, team members are supported and encouraged to reduce their **carbon footprint**, and specific targets have been set to achieve these goals such as participating in an interactive and educational **climate fresk**. Not only are large organizations committed to sustainability within their internal teams but also externally with customers. We may wonder how this relates to what we do, or if what we do makes a real impact. Each one of us is vital to this worthwhile goal!

All of us have experienced significant events in our lives that have made a profound impact. Wherever you live or work, it is hard not to see how the environment and climate changes have affected us. For example, Omniseal Solutions' Garden Grove site is

located in California, an area where wildfires are common in the summer months, which cause catastrophic environmental and socioeconomic impacts as well as negative consequences for human health. Studies funded in part by NOAA's National Integrated Drought Information System (NIDIS) found "that nearly all the observed increase in burned areas over the past half-century is due to human-caused climate change, with a +320% increase from 1996 to 2021."

You may have seen these fires on the news where black smoke is so thick that breathing is very difficult. The ashes blow in the wind and fall upon people and houses like hot, black snow. Even if you have experienced these wildfires many times or not at all, this still feels devastating. Due to these



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significant events, we cannot help but feel that we need to make a change.

Personal or professional changes? Both do make an impact on our global imprint! For example, not printing materials means less paper wasted and ink used; however, taking this action also means more energy is needed to store the materials on a server. Servers need to be cooled, costing even more energy. Do you really need to print? How often will the material be accessed? Can you consider other environmentally solutions such as eco-friendly paper or the creation of digital business cards?

Speaking of **digital technologies**, they have the potential to be powerful tools to fight climate change and drive an eco-friendlier future. Websites come to mind

immediately when you think of one of the most important tools of communication and data sharing. A digital tool that can be sustainable as well!

### **A TRANSFORMATION IN DIGITAL DESIGN: GOING BEYOND IN WEBSITE**

Have you visited the Omniseal Solutions' website yet? You should take a closer look – [omniseal-solutions.com](https://omniseal-solutions.com) – as the site is full of interesting facts and stories about team members, capabilities, services, components, and materials. Launched two years ago with a new identity and branding as well as a wealth of content, the website is massive. Analytics prove high customer engagement and a considerable number of returning users. Between 500 to 600 document downloads happen every month

with new blogs and videos being added to the site on a regular basis, in order to gain future customers and improve SEO and Google ranking.

Digital assets such as videos are by far the most eye-catching lead magnet for Omniseal Solutions in terms of marketing; however, they are also the largest files.

This has an enormous impact on the page loading speed as well as on the size of the server - not great for the environment.

When looking at the size of their website database, it was 896MB, which is huge. All the information on the website is important, so what can be done? As a business that strives to go **beyond the boundaries of possible** every day, there were several solutions found. Working with the technical team at GDI, the Omniseal Solutions' marcom team achieved the following:

1. Optimized the code for the website
2. Compressed images and videos without losing quality
3. Converted file types of the videos to webm, with preparation to change the images to webp going forward
4. Discovered and removed redundant code

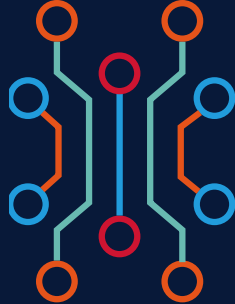
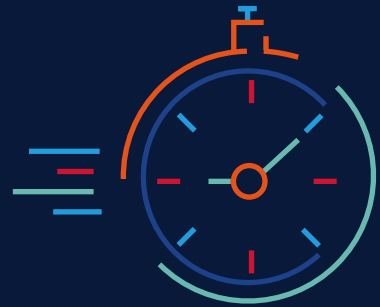
These changes resulted in the size of the database being reduced from 896MB to 339MB without losing any data or structural integrity. The database size was not the only positive reduction: the amount of server space needed was reduced, which reduced costs as well as the energy needed to maintain the server. Overall, the performance of the website was significantly improved, influencing our customers to more likely return to the website.

These changes are only the beginning of Omniseal Solutions' **technology advantage in the digital space**. There is much more planned – as you can see, any function or any team can make a real contribution to a company's impact on the environment. If you are interested in the technical side, the full list of improvements made this year is on the right. Have an idea on how Omniseal Solutions can improve digitally? Contact their marcom team!



<b>Database Size &amp; Storage</b>	Size has been reduced from to 896MB to 339MB without losing any data or integrity. In addition to reducing server space, performance is improved.
<b>Images</b>	Without losing quality, all images are improved due to being optimized and compressed. Future plan is to convert all images to webp.
<b>Videos</b>	By converting videos to webm, they were optimized by 60% without affecting quality.
<b>Error Free Code</b>	All the page render errors and warnings were fixed.
<b>Module Compatibility</b>	In addition to global code shared by all Saint-Gobain websites, marcom team has successfully upgraded and contributed modules to Drupal 10 (latest version) to improve coding standard and security. This in turn reduces errors, redundancy, and improves stability.
<b>File Size Optimization</b>	<p><b>The file size has been optimized in the following two ways:</b></p> <ol style="list-style-type: none"> <li>1. Removed the "seals_default" module that consumed a huge amount of space with many JSON files. Intended to be a second source of analytics, it never ran correctly, nor were the analytics useful.</li> <li>2. Worked on the script to run on auto pilot, in order to auto-delete document-archives older than two days. This will help to clean file system on regular basis.</li> </ol>
<b>UI Improvements</b>	<p><b>The following are improvements:</b></p> <ol style="list-style-type: none"> <li>1. Reduced the number of times the code "important" is mentioned at the level of CSS</li> <li>2. Reduced redundancy</li> <li>3. Respected the SMACSS-style categorization in order to have an efficient aggregation</li> <li>4. Avoided Hack CSS</li> </ol>
<b>Fixed Google Search Console Issues</b>	This is ongoing work. The better the ranking in Google Search Console, the better the performance, Search Engine Optimization (SEO), and the user experience. One of the improvements is below "Optimize Cumulative Layout Shift."
<b>Optimize Cumulative Layout Shift</b>	<p><b>Marcocom team has done the following to improve CLS:</b></p> <ul style="list-style-type: none"> <li>· There was late-loading content in the site, which caused layout shifts. By reserving the space for them in the initial layout, this issue was improved. This was be done using min-height and visibility properties instead of display styling to reserve space.</li> <li>· The top and left CSS properties have been replaced with CSS translate properties to smooth the effect of the animations.</li> </ul>

Omniseal Solutions is on a path with Saint-Gobain to reduce their carbon footprint and moving towards digital sustainability not only has positive effects for the world as a whole but also pushes them to go beyond and innovate in many other areas ... to promote wellbeing, to support future generations, to make the world a better home. How do you think you can contribute?



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