



# Heavy Industry and Steel

## Off-Highway Drive and Motion Systems

Dana Brevini™ Motion Systems provides a complete range of mechanical transmissions and hydraulic-electronic products which, by integrating a broad selection of technologies, fulfills the requirements for the most diverse applications in the Heavy Industry and Steel sectors.





# People Finding A Better Way®

Established in **1904**. Employing **42,000** people in **31** countries across **six continents**. Shipping to **14,000** customers, leveraging a global network of technology centers across **9** countries.

### Our Vision

Powering Innovation  
To Move Our World

### Our Mission

This mission is embodied in our company theme: People Finding A Better Way. Driving stakeholder value by:

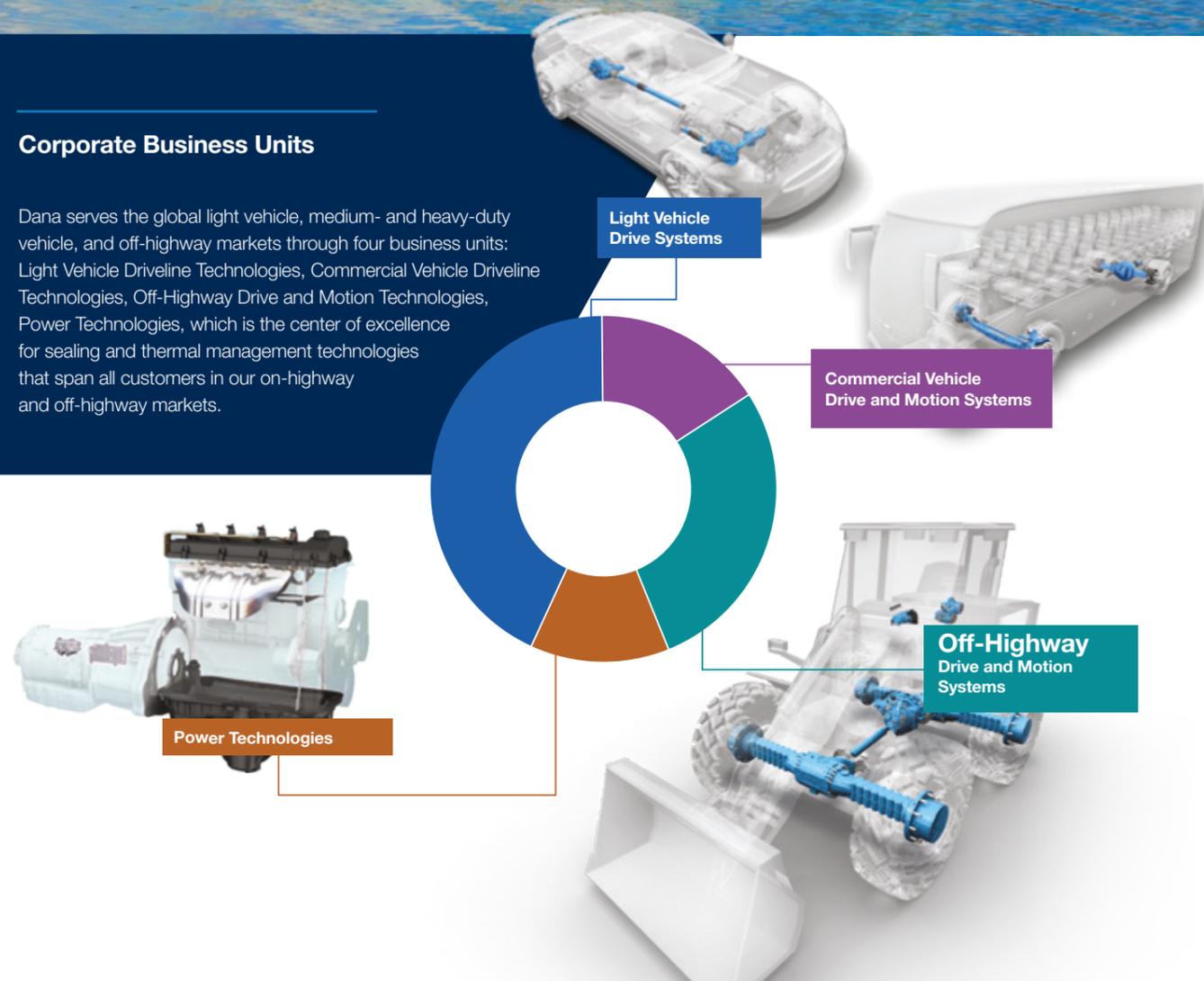
- powering vehicles and machines around the world
- shaping sustainable progress through invention and execution
- making the amazing happen wherever people live, work, and play.

### Our Values

- Value Others
- Inspire Innovation
- Grow Responsibly
- Win Together

### Corporate Business Units

Dana serves the global light vehicle, medium- and heavy-duty vehicle, and off-highway markets through four business units: Light Vehicle Driveline Technologies, Commercial Vehicle Driveline Technologies, Off-Highway Drive and Motion Technologies, Power Technologies, which is the center of excellence for sealing and thermal management technologies that span all customers in our on-highway and off-highway markets.



## Where there is a need, Dana finds a better way.

### A new era of mobility is upon us.

Emissions regulations and government policies are manifesting at an ever-increasing pace, and visions of vehicles that reduce operating costs while enhancing productivity and safety are accelerating the need for alternative propulsion solutions.

For over 20 years, our group of highly focused engineers has been dedicated to research and development of new technology solutions aimed at electrification.

We have built a broad portfolio of award-winning, patented technologies, making us a leader in electrification.

## Why should you rely on Dana?

### Solutions designed, engineered, and manufactured for maximum efficiency.

We approach electrification with a trained eye and an insightful, innovative perspective, utilizing market synergies to provide an advantage in electrifying offerings across multiple applications.

A component is only as good as the system in which it operates. That's why we take a systems-focused approach, seamlessly integrating our components into complete electrified systems.

We have an in-house, multi-disciplinary team of system solutions engineers who provide turnkey software and controls for our entire portfolio of technologies. This in-house knowledge and integration produces solutions that provide enhanced performance, packaging optimization, and reduced system weight. All of which results in savings to your bottom line.



LIGHT VEHICLE



COMMERCIAL VEHICLE



OFF-HIGHWAY VEHICLES

# Off-Highway Drive and Motion Technologies to meet the needs of the Heavy Industry and Steel Sectors

Dana offers an array of solutions for industrial processes in heavy industry sectors such as Steel, Sugar and Cement.

Covering all applications concerned with steel production, going from raw material handling to semi-finished castings, steel wire, tubes, plates and coils, Dana provides components for equipment used in countless metallurgical processes.

Dana also provides solutions for a wide range of applications related to sugar and alcohol production.

Starting with raw material handling ('sugar cane') to final distribution from the production plant.

In the cement-manufacturing industry, the range of solutions available from Dana starts from quarrying and continues through the processes required to obtain cement and its distribution from the cement works.



## Market-Driven Innovations

We deliver innovative technologies to meet worldwide customer demands. By anticipating market trends, Dana uses industry expertise to deliver product solutions to help customers achieve their goals.



Customized Technologies



Full-System Solutions



Low Cost of Ownership



Electrification



Global Support

# Serving the **Steel** Making Industry

Today's modern steel manufacturing companies will benefit from Dana's comprehensive offering for applications within the steel industry.

There are two distinct categories in modern steelmaking. Primary steelmaking involves converting liquid iron from a blast furnace

and steel scrap into steel using the technique known as basic oxygen steelmaking.

This can also be achieved in an electric arc furnace by melting scrap steel or what is called direct reduced iron.

Prior to casting into semi-finished products, crude steel needs to be refined;

this category is known as Secondary steelmaking and the majority of operations are performed in ladles.

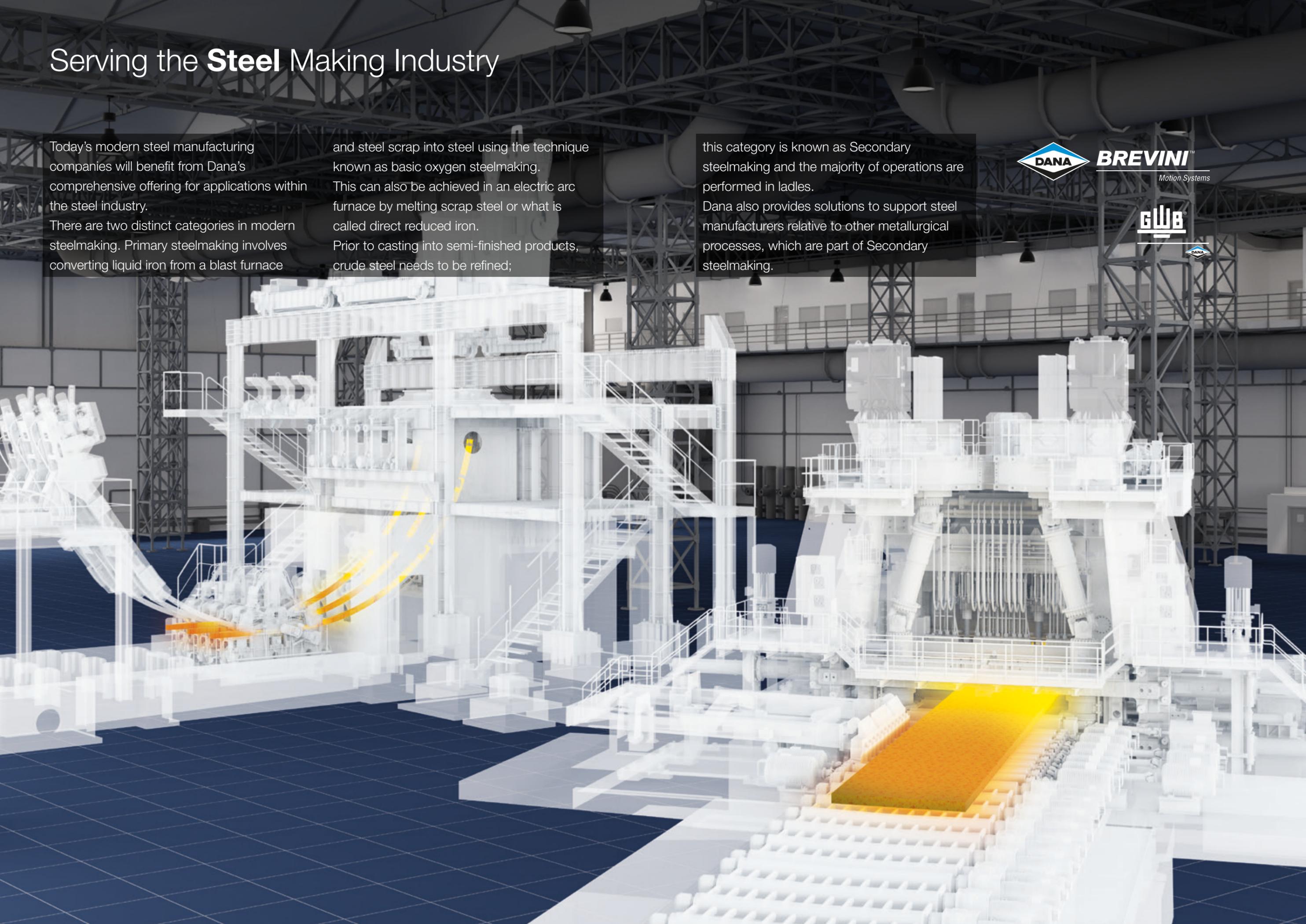
Dana also provides solutions to support steel manufacturers relative to other metallurgical processes, which are part of Secondary steelmaking.



**BREVINI**

Motion Systems

**GWB**



# Powering **Steel** Transformation from within

## Calender

A calender is a series of hard pressure rollers used to finish or smooth a metal sheet, also used in industries transforming plastics or rubber. There are various types of calender with two, three or four rollers driven customarily by hydraulic motors and planetary gearboxes. Whereas metal sheets can be heated prior to processing, some calender rolls are themselves heated or cooled according to the process and the physical characteristics of the material being processed.

## Bending Machine

A bending machine is used for the plastic deformation of a metal sheet. Performed cold or hot, deformation results in a curvature of the sheets themselves. For tube making, the sheets are preheated in an oven and bent to form a tube, welding the two ends together. The rollers are driven by transmissions (usually planetary) with either hydraulic or electric motors. The bending machines are sized according to the maximum thickness and width of the sheet metal, maximum bending radius and minimum number of passes.

## Brevini™ Industrial Planetary Gearboxes – S Series

- Modular concept
- Extensive ratio range
- Supports torque range up to 2200 kNm
- Spheroidal graphite cast iron housing
- High efficiency
- Diverse low-speed shaft options
- Premium sealing
- Low noise

## Brevini™ Plano Helical Gearboxes – High Power Series

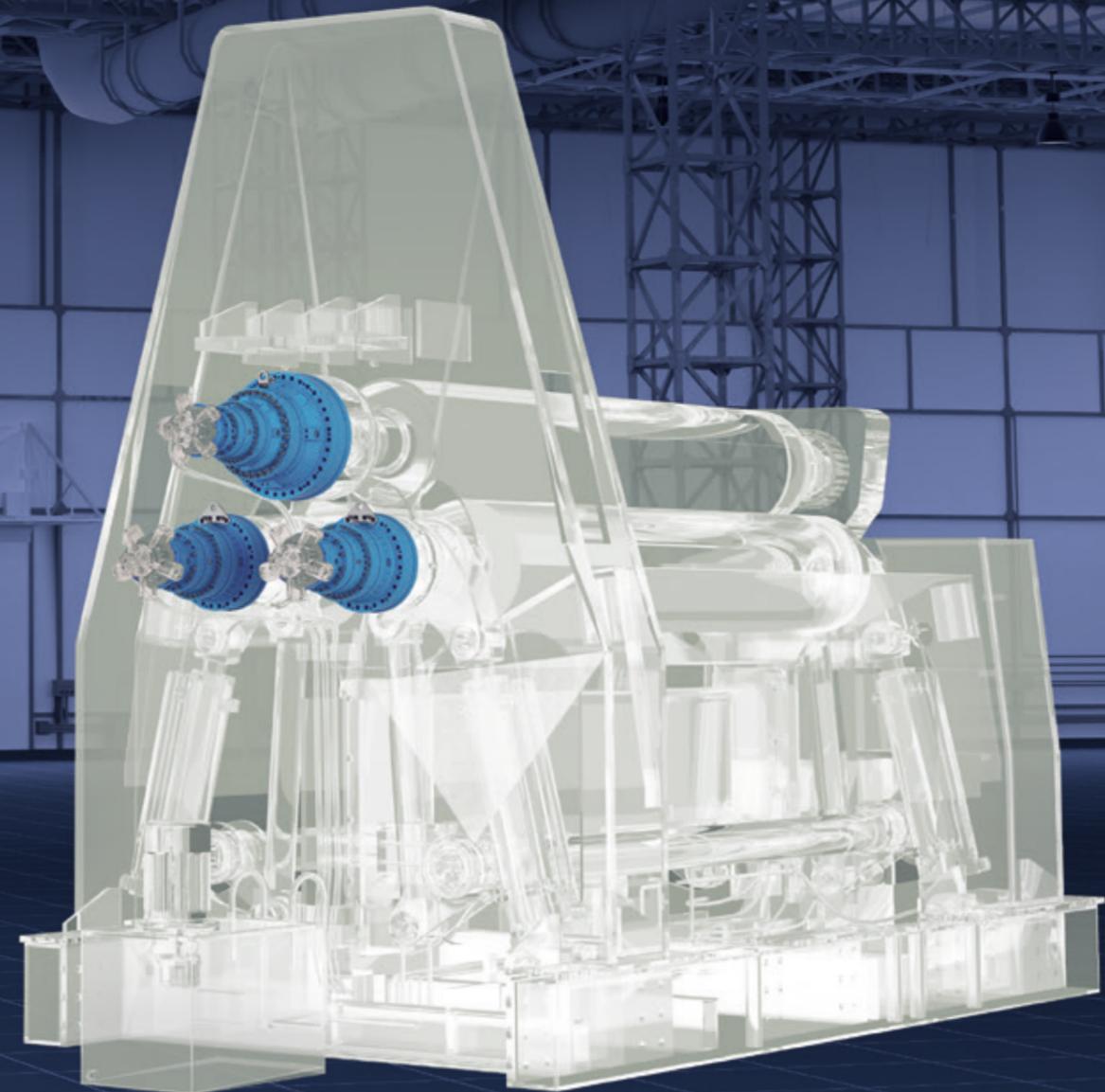
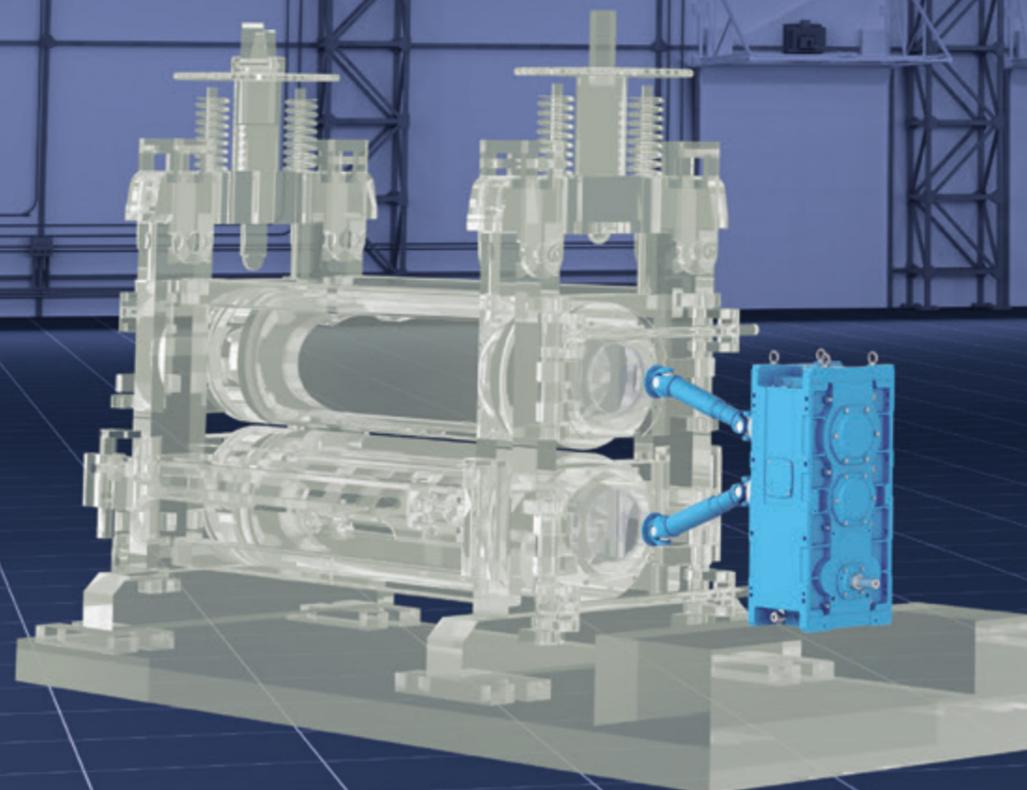
- Extensive ratio range
- Supports torque range up to 2200 kNm
- Increased thermal capacity due to shared oil chamber
- Spheroidal graphite cast iron housing
- High efficiency
- Diverse low-speed shaft options
- Premium sealing
- Low noise
- Customized male shaft with keyway

## Brevini™ Helical Gearbox TS Series

- Dedicated design
- Shape and cost customization
- Double output drive
- Forced lubrication (and cooling) on board in case of need
- Extensive ratio range
- Supports torque range up to 1300kNm
- Spheroidal graphite cast iron housing
- High efficiency
- Diverse low speed shaft options and quantity of shafts
- Premium sealing
- Reliable operation

## GWB® Cardan Shaft

- Complete product range featuring flange/ swing diameter from 120 to 1300 mm
- Superior bearing life
- High torque capacity
- Designed for ease of maintenance with service-free option
- Engineered to withstand harsh conditions, proven with more than a 75-year history on the market
- Minimized total cost of ownership



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.

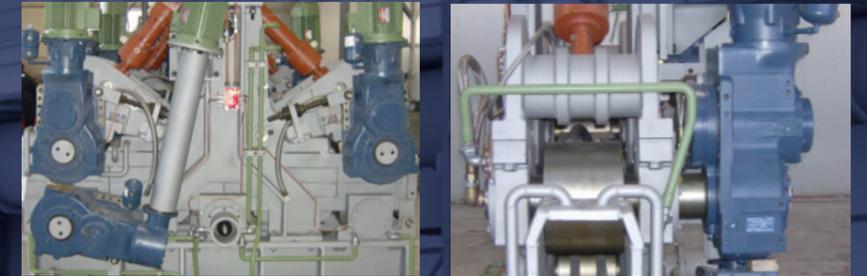
# Powering **Steel** Transformation from within

## Straightener

Straightener machines are used in the continuous casting process. During continuous casting, molten steel is solidified into semi-finished billets, blooms or slabs for subsequent rolling in finishing mills. Liquid steel is transferred using a ladle to the casting machine. When the casting operation starts, the sliding shutter at the bottom of the ladle is opened and the steel flows at a controlled rate into the tundish and from the tundish into one or more molds. Straighteners ensure the semi-finished product is straight and, by controlling the speed of the steel as it runs

through the rollers, optimizes the quality of the billet, bloom or slab. In most cases straighteners are made by the manufacturers of the continuous casting system. The configuration of the straighteners can differ according to size depending on the product to be straightened (billet, bloom or slab). Different products and relevant sizes define the number of rolls, how many are to be driven and the electric motor power. Gearboxes are generally equipped with cooling coils to cool down the gearbox oil.

## Straightener



### Brevini™ Plano Helical Gearboxes – Compact Drives

- Light, compact solution
- Spheroidal graphite cast iron housing
- Supports torque range up to 40 kNm
- High efficiency
- Premium sealing
- Easy to assemble/disassemble



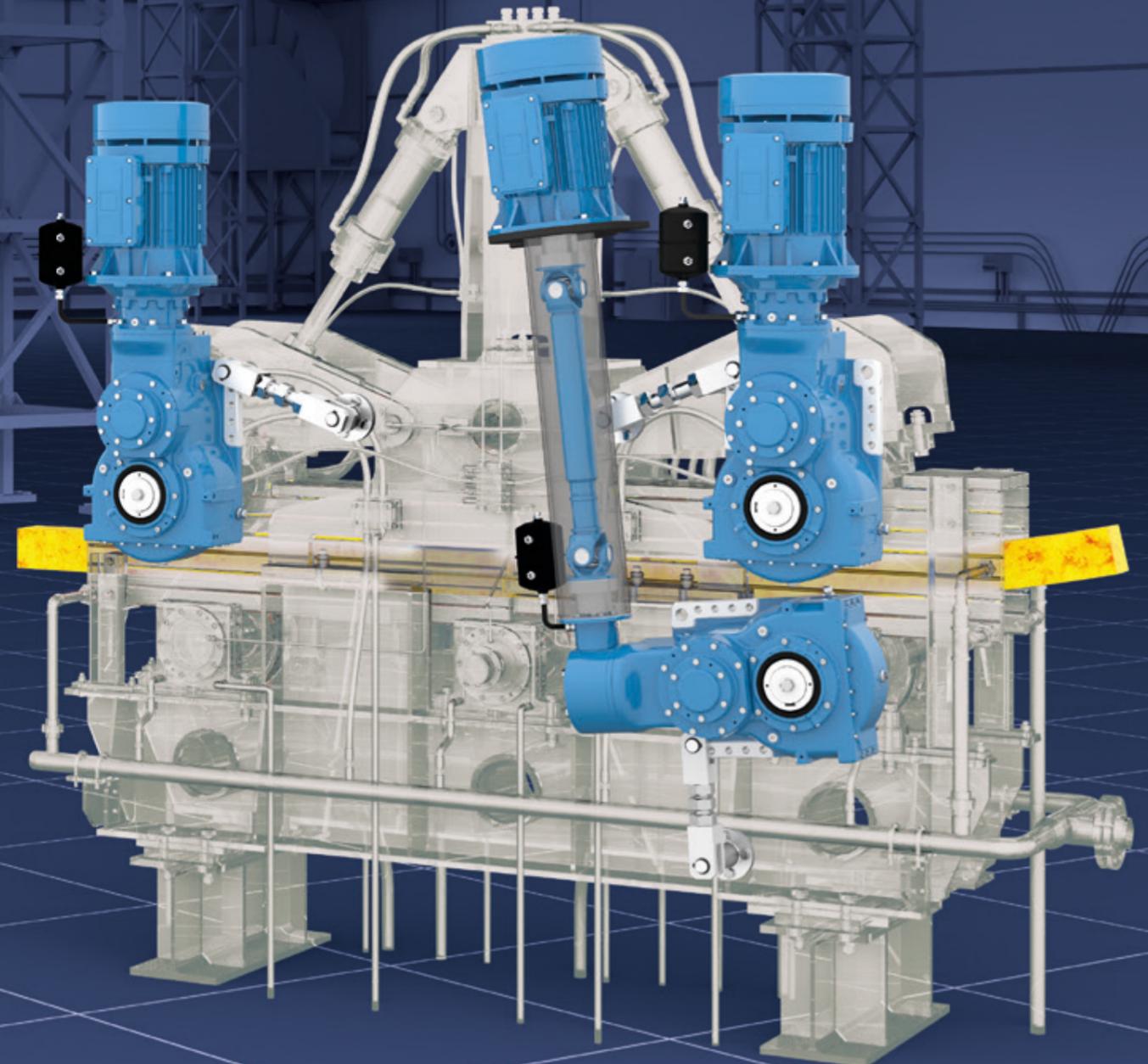
### Brevini EvoMax™ Gearbox

- Complete drive system including base and bed plate
- Supports torque range up to 1300 kNm
- Spheroidal graphite cast iron housing
- High efficiency
- Premium sealing
- Reliable operation
- Low noise



### GWB® Cardan Shaft

- Complete product range featuring flange/ swing diameter from 120 to 1300 mm
- Superior bearing life
- High torque capacity
- Designed for ease of maintenance with service-free option
- Engineered to withstand harsh conditions, proven with more than a 75-year history on the market
- Minimized total cost of ownership



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.

# Powering **Steel** Transformation from within

## Edger

Edging drives, usually found at the start of the rolling process, are used to reduce the width of the slab.

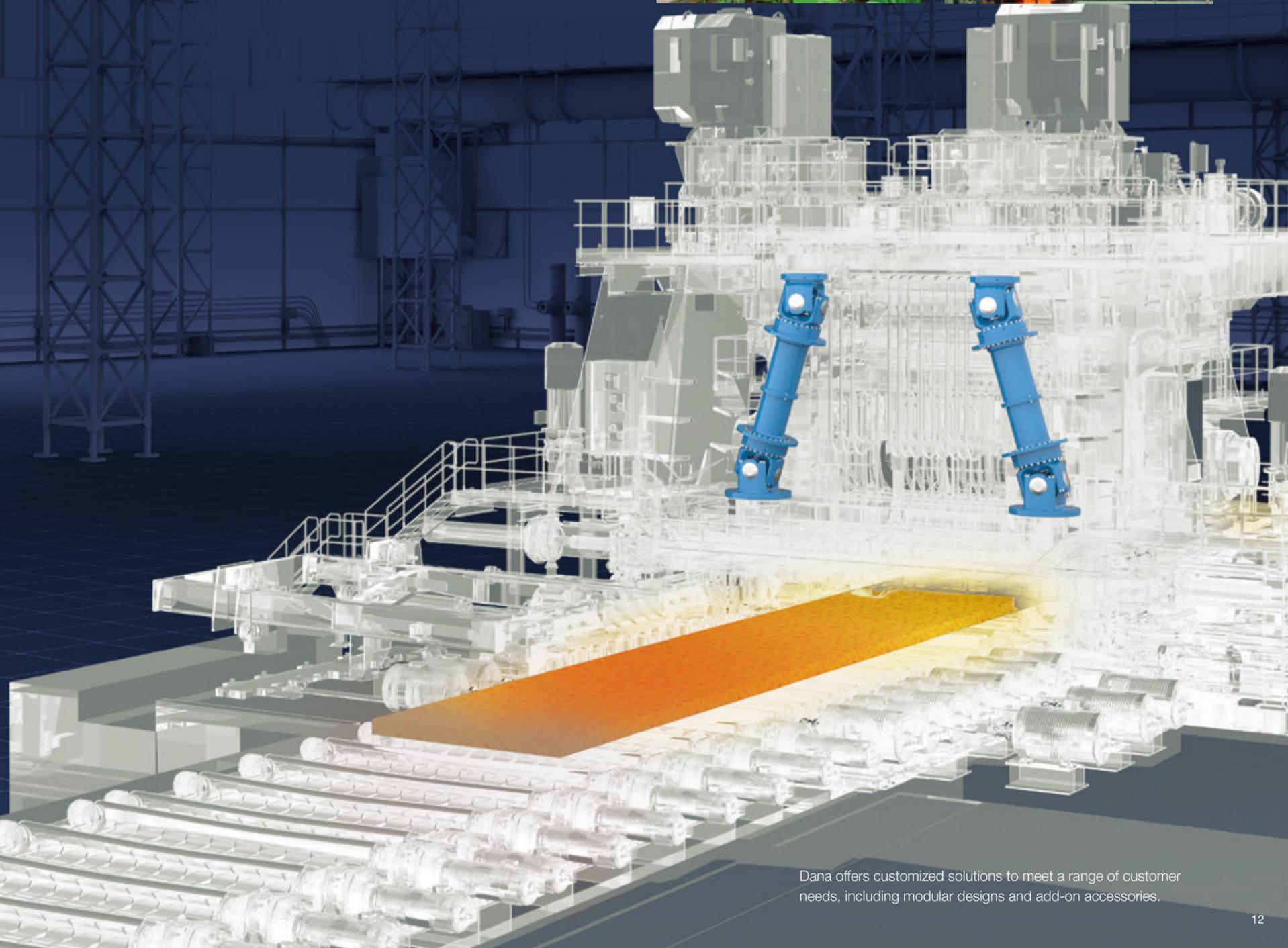
Based on operating conditions, the drive shafts (cardan type shafts) have tailor-made features to optimize performance. Based on the close relationship between Dana GWB® and customers, performance is assured even in a harsh, sometimes hostile, environment. Focusing on easy maintenance, longevity and trouble-free operation, each solution is carefully engineered and unique.



## GWB® Heavy-Duty Cardan shafts

- Series 498, 598
- Max. torque capacity up to 20.000 kNm
- Flange diameter up to 1600 mm
- Journal Cross with unique heat treatment for exceptional bearing lifetime
- Forged design and length compensation with nitrited spline
- Condition monitoring of journal cross trunnion without disassembly of the bearing

## Edger



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.

# Powering **Steel** Transformation from within

## Down Coiler

Down coilers wrap the strip at the end of the line after passing the finishing stands.

Having different demands on the drive lines, the cardan-type drive shafts feature customized elements optimizing performance according to operating conditions.

Consolidated experience has led to an array of solutions that ensure top performance in a difficult environment.

The outcome of engineering solutions can be unique, thus making a difference in terms of straightforward maintenance, problem-free operation and equipment life cycle.

## GWB® Heavy-Duty Cardan shafts

Series 390, 392, 393, 492  
Maximum torque capacity up to 1.300 kNm  
Flange diameter up to 550 mm  
Tailor made design of bearing bush to withstand highest radial forces and impacts  
Proven spline sealing for trouble free operation over years

Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.

# Solutions for **Sugar** Manufacturers

Dana develops a range of solutions for sugar refineries, in particular with regard to raw sugar cane and sugar beet processing. With years of experience in this industry, Dana has built up a reputation as a supplier and partner to those companies requiring production efficiency, equipment reliability and advanced technologies tailored to their needs.

Ranging from thickeners, crystallizers and clarifiers to the rollers at the sugar mill, Dana provides solutions for a substantial part of the sugar manufacturing process and can support companies with technical consultancy and cater for ongoing service requirements throughout the world.



# A Key Element for **Sugar** Processing at every step of the way

## **Clarifier – Vertical Crystallizer - Thickener**

The principal task of a clarifier, also known as a juicer, is the separation of solids from the sugar cane liquid in order to minimize impurities and thereby obtain the purest juice possible. Juice is heated to help kill natural enzymes; flocculants are added as well as lime which brings the juice to a neutral pH value, a vital factor in sugar processing. While the impurities precipitate to the bottom of the clarifier, the clear juice flows off the top part of the vessel towards the next crystallization phase. Crystallization is achieved inside the crystallizer, where by means of an artificial process, sugar is transformed from its liquid form into a solid crystallized structure. This takes place immediately after evaporation of the clarified juice, which turns into syrup which is boiled at low temperatures under a partial vacuum. Crystals begin to grow and the resulting mixture of raw sugar

crystals and molasses is called massecuite. The most efficient solution is a vertical crystallizer where the massecuite flows vertically from top to bottom. Vertical crystallizers are found in both the beet and cane sugar industries. Separation of the molasses from the sugar crystals takes place in a centrifuge. On both applications, the gearboxes allow for slow turning of the rake. This is also true for similar applications within heavy industry such as thickeners, that follow the same working principle.

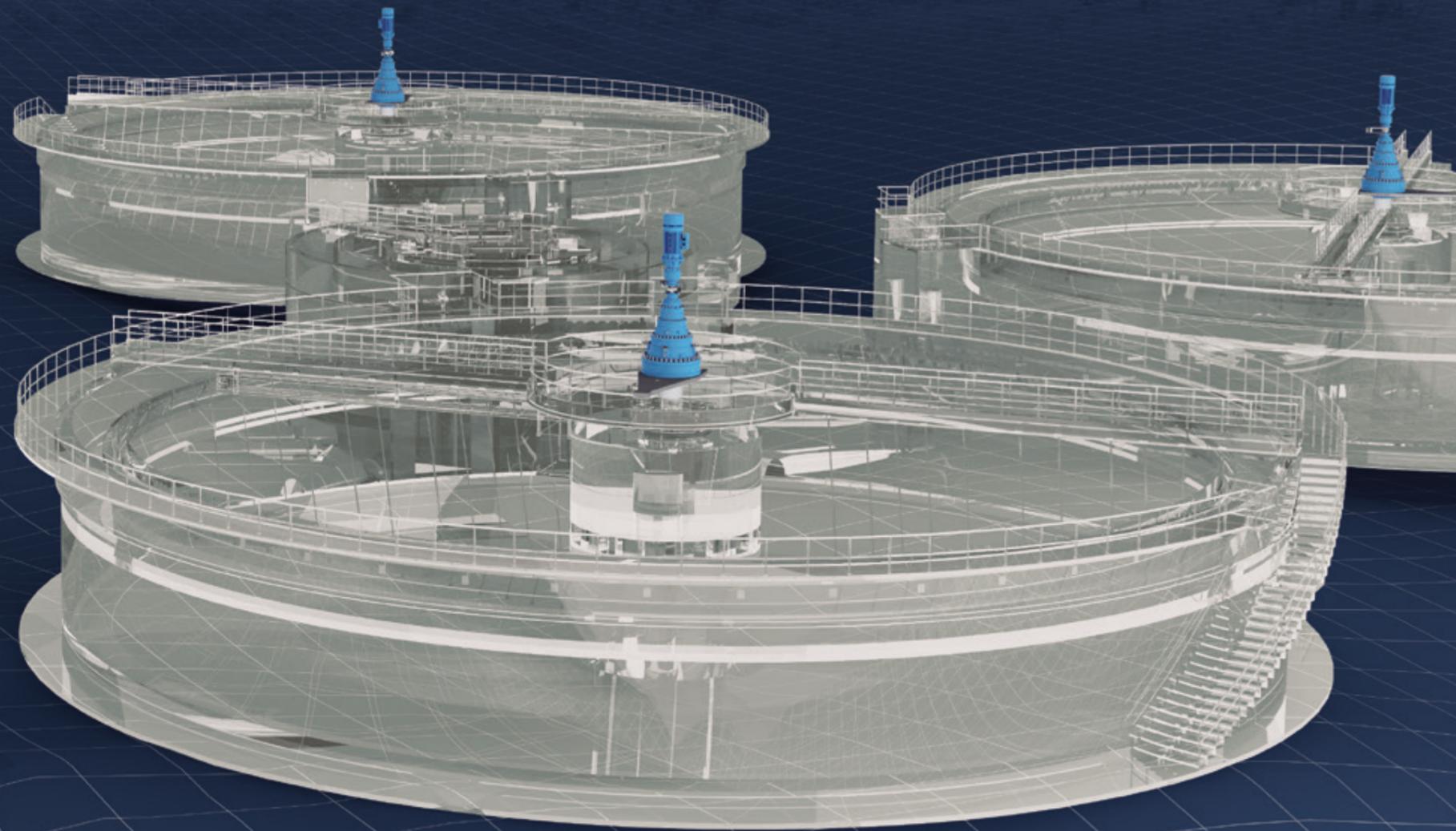
Thickeners are predominantly found in mining or the cement industry, where they are used to separate solids from the fluid. Once the solids reach around 50% density, they are discharged from the thickener by a pump. The clear liquid overflows at the top of the thickener and is pumped away.



## **Brevini™ Industrial Planetary Gearboxes – S Series**

- Double torque arm with load cell included as option for the electric driven
- Modular concept
- Extensive ratio range
- Supports torque range up to 2200 kNm
- Increased thermal capacity due to large bevel set
- Spheroidal graphite cast iron housing
- High efficiency
- Diverse low-speed shaft options
- Premium sealing
- Low noise
- IEC flanges up to 355 size

## **Clarifier – Vertical Crystallizer - Thickener**



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.

# A Key Element for **Sugar** Processing at every step of the way

## Sugar Mill - Multiple Drive

When the sugar cane reaches the sugar mill, it is shredded to break down the fibrous stalks and burst open the juice cells. Subsequently the raw material is crushed using multiple roller drives. This enables the extraction of the molasses, a black treacly substance, leaving the fibrous leftovers, which are used

to fuel the mill's furnaces. Performed annually, shortly after the harvesting of sugar cane, this process can last anything up to six months. Once the juices are separated, any impurities are removed in a clarifier.

## Sugar Mill - Multiple Drive



### GWB® Cardan Shaft

- Complete product range featuring flange/ swing diameter from 120 to 1300 mm
- Superior bearing life
- High torque capacity
- Designed for ease of maintenance with service-free option
- Engineered to withstand harsh conditions, proven with more than a 75-year history on the market
- Minimized total cost of ownership



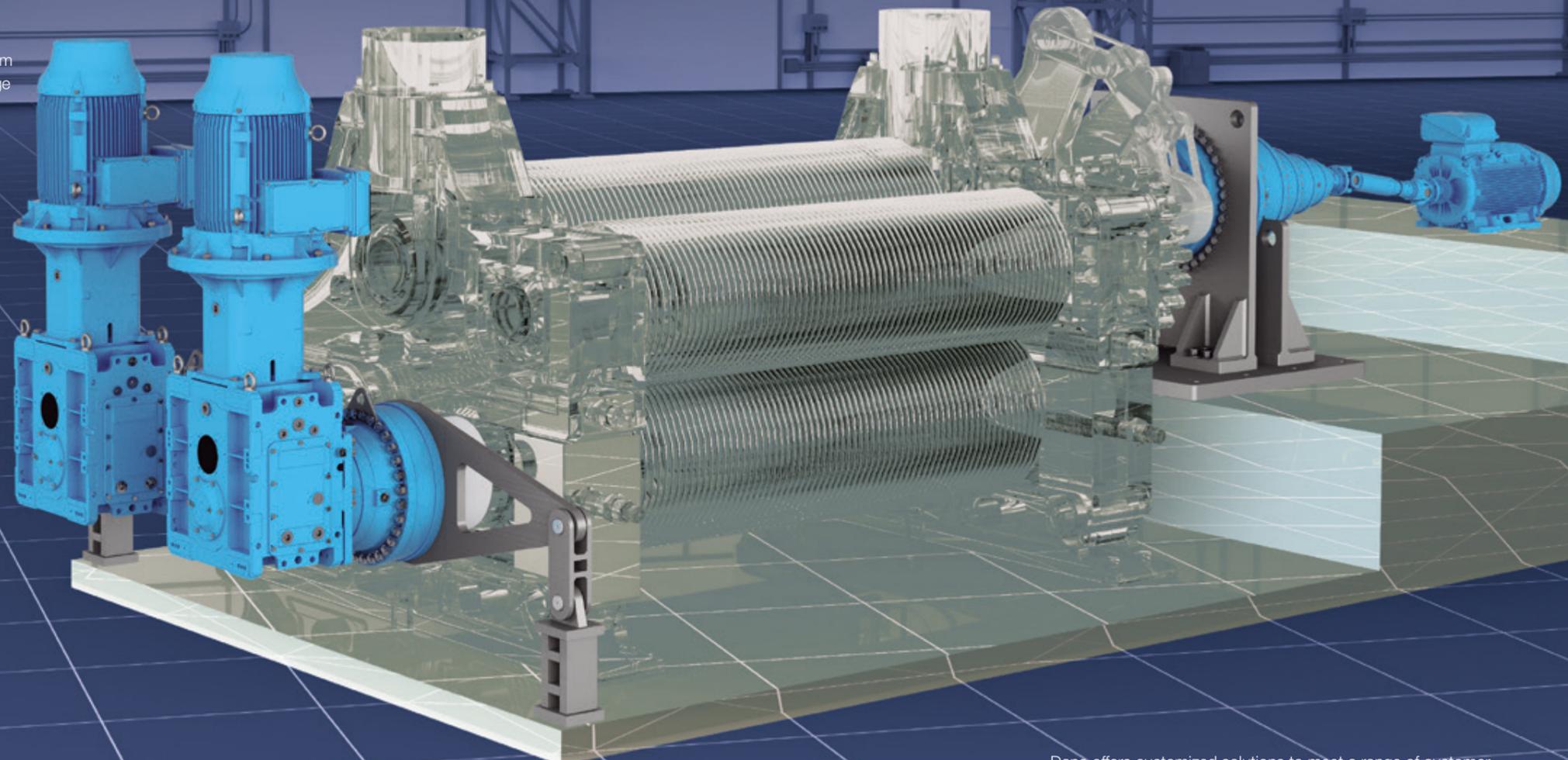
### Brevini™ Industrial Planetary Gearboxes – S Series

- Double torque arm with load cell included as option for the electric driven
- Modular concept
- Extensive ratio range
- Supports torque range up to 2200 kNm
- Increased thermal capacity due to large bevel set
- Spheroidal graphite cast iron housing
- High efficiency
- Diverse low-speed shaft options
- Premium sealing
- Low noise
- IEC flanges up to 355 size



### Brevini™ Plano Helical Gearboxes – High Power Series

- Extensive ratio range
- Supports torque range up to 2200 kNm
- Increased thermal capacity due to shared oil chamber
- Spheroidal graphite cast iron housing
- High efficiency
- Diverse low-speed shaft options
- Premium sealing
- Low noise
- Customized male shaft with keyway



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.

# Partnering **Cement** Manufacturers throughout the toughest Applications

Dana is a key partner for cement manufacturers and covers a wide range of applications in the industry, from the limestone quarrying stage right up to the packed cement powder ready for distribution.

Usually extracted at close-by locations to save on transportation costs, limestone and clay reach the cement works via a conveyor belt. Crushed into raw meal, it is subsequently transformed into clinker inside a sintering furnace.

Clinker is ground down into a fine powder substance and mixed with gypsum to obtain cement powder.

In collaboration with the key OEMs in the industry and the end users, Dana acts as a primary partner supporting the market with a special focus on minimizing environmental impact.



# The Strongest Solutions at the heart of **Cement** Manufacturing

## Milling and Grinding

Once the nodular clinker issues from the sintering furnace, it needs to be ground down into a fine powdery substance. This can be done using different milling or grinding equipment: horizontal mills, hydraulic roller presses or vertical roller mills. Horizontal mills, which are essentially large cylinders rotating horizontally or at a slight angle, mostly contain steel balls, although some mills use ceramic or rubber balls, which reduce

the clinker to powder through impact and attrition. Hydraulic roller presses use two rollers, one of which is fixed, the other is adjusted using hydraulic pressure. Material is crushed as it passes between the rollers to the desired particle size. Vertical roller mills reduce material using the principle of mill stones, whereby vertical pressure exerted by the rollers, as they rotate in a circle, grind the clinker by crushing it onto the horizontal disc beneath.



## Brevini EvoMax™ Gearbox

Complete drive system including base and bed plate

Supports torque range up to 1300 kNm

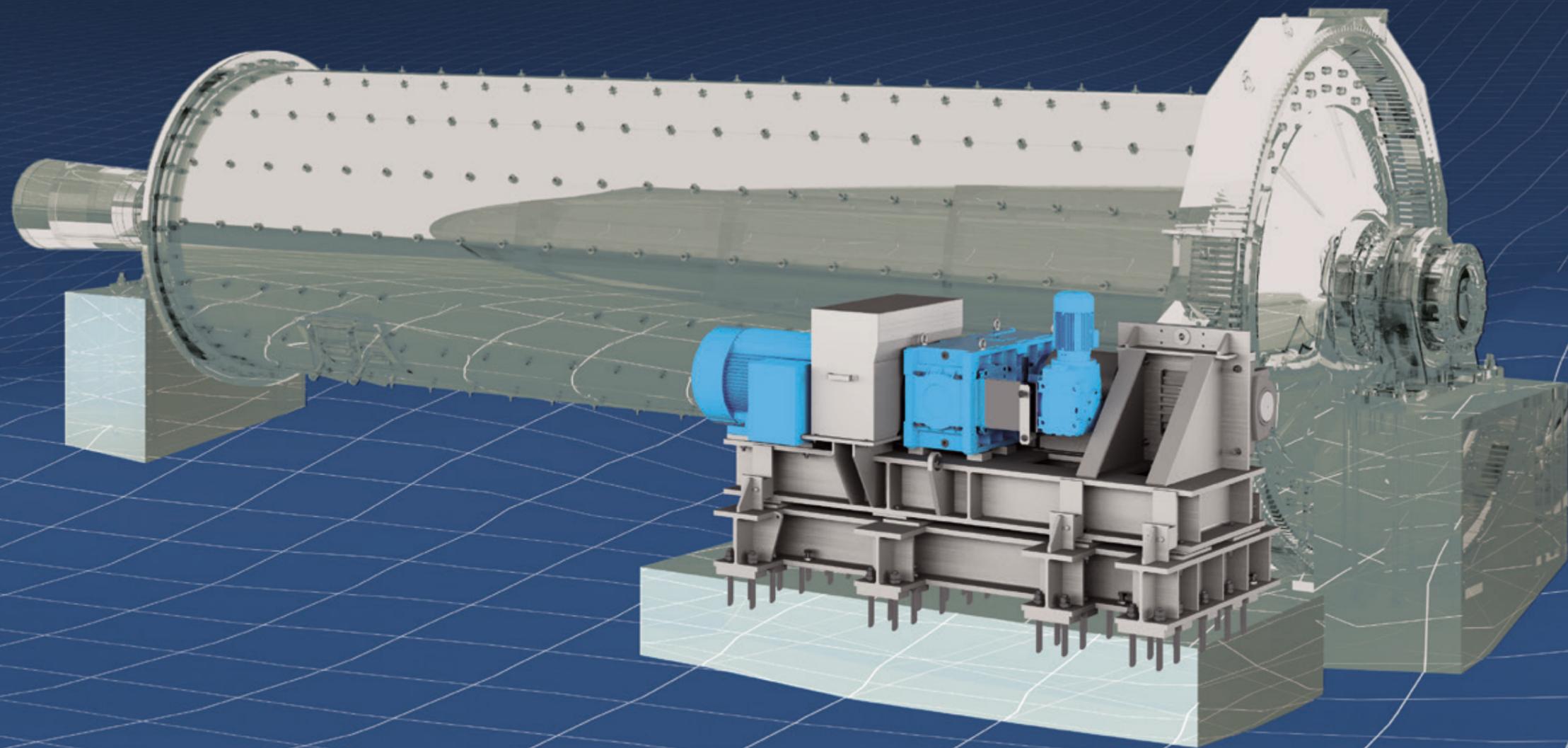
Spheroidal graphite cast iron housing

High efficiency

Premium sealing

Reliable operation

Low noise



Dana offers customized solutions to meet a range of customer needs, including modular designs and add-on accessories.

# Our Strengths



## Global Identity

We leverage our global expertise to deliver **premium quality**, technically advanced, and cost-effective solutions - all designed to meet the specific needs of our customers.

## Local and Fast

Our network of Service and Assembly Centers and sales offices provide **local support and expertise for our customers**. Our local inventory and assembly capabilities deliver the right product to you at the right time.

## Solutions Provider

Dana's experienced team can match **technologies and key components** together to deliver industrial system solutions that integrate seamlessly into your application, improving performance, and simplifying your supply base.

## Customization

We **collaborate with our customers** to define your specific application requirements and provide fully customized, tailor-made solutions that check all the boxes for performance, reliability, and efficiency.

## Technical Consulting

Dana recognizes that every customer has individual needs. Our engineers discuss the requirements of each customer in detail, calling on their in-depth knowledge of global industrial markets to **develop the right solution**.

## Extensive Product Range

Our portfolio of world-class solutions meets the needs of more than 20,000 customers around the world today through **standard and customized products** that can meet most requirements.

## Lifetime Support

Our global network of Service and Assembly Centers support you throughout the **lifetime of your application** with a wide and flexible portfolio of cost-effective solutions.

## Today and Tomorrow

Our culture of continuous improvement drives us to deliver best-in-class **reliability and performance** through cost-effective solutions available today while developing advanced technologies for the future.



# Market-Driven **Innovation**

## Off-Highway Performance Expectations

Safety

Productivity

Maneuverability

Durability

Serviceability

Total Cost of Ownership

### **About Dana Incorporated**

Dana is a leader in the design and manufacture of highly efficient propulsion and energy-management solutions for all mobility markets across the globe.

The company's conventional and clean-energy solutions support nearly every vehicle manufacturer with drive and motion systems, electrodynamic technologies, thermal, sealing, and digital solutions.

### **About Dana Off-Highway Drive and Motion Systems**

Dana delivers fully optimized solutions to customers in the construction, agriculture, material handling, mining, and industrial markets.



[Dana.com/oh](https://Dana.com/oh)  
[Dana-industrial.com/contact-us](https://Dana-industrial.com/contact-us)

#### **Application Policy**

Capacity ratings, features, and specifications vary depending upon the model and type of service. Application approvals must be obtained from Dana; contact your representative for application approval. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.

