

IRACORE

ADVANCING WEAR TECHNOLOGY

ENGINEERED TO THE CORE

BUYER'S GUIDE

IRACORE.COM

TABLE OF CONTENTS



MISSION & VALUE PROPOSITION	3
PRODUCT LINES	4
URETHANE-LINED PIPE	5
[URETHANE-LINED PIPE INFOGRAPHIC]	6
RUBBER-LINED PIPE	7
[PRODUCT COMPARISON INFOGRAPHIC]	8
REPAIR KITS	9
HISTORY	11
ABOUT IRACORE	12
[COMPANY OVERVIEW INFOGRAPHIC]	13
FABRICATION & INTEGRATION	14
INDUSTRIES WE SERVE	15
CASE STUDIES	17
CONTACT	20

OUR MISSION

***"To create value for our customers
by advancing wear technology."***

In heavy industrial pipe systems, abrasion and corrosion cause unpredictable wear and premature failure of components. Unlined pipe and traditional lining materials have been proven insufficient for the oil sands and mining sectors' production demands, leading to increased downtime and repair costs.

To maximize throughput and maintain operational efficiency, oil sands and mining operations need pipes and components lined with specially designed polymers that withstand abrasion and corrosion in the most demanding conditions.

For over 60 years, Iracore International LLC has designed and manufactured custom wear materials to overcome abrasion and corrosion challenges. Our high-performance polymers are engineered to withstand the highest operational demands in the oil sands and mining industries, providing longer wear cycles and unrivalled reliability.

With over 3 million feet of Iracore lined pipe installed worldwide, we're proud to add value to our customers' operations through longer life cycles, lower maintenance and replacement costs, and exceptional service every step of the way. No matter what your operation needs, Iracore provides innovative solutions for the wear challenges heavy industry faces today.



PRODUCT LINES

In 1972, Iracore became one of the first companies to offer **Urethane-lined** pipe solutions for mining and other heavy industrial applications. Compared to an unlined pipe and conventional materials, urethane provides superior performance and durability characteristics, making it the ideal lining for pipe systems in high abrasion and corrosion environments.

Today, Iracore remains the industry leader in engineering and manufacturing urethane-based wear materials for a wide variety of industries. Our commitment to innovation in advancing wear technology makes us the top choice for the evolving needs of heavy industry.

01 COMPLETE PIPELINE SYSTEMS

Iracore offers a complete pipeline system consisting of pipe spools, versatile end connections, and a full range of fittings, all lined with advanced urethane-based compounds. Iracore compounds were engineered specifically to protect slurry pipe for hydro transport and tailings pipe in harsh environments, including the Canadian oil sands, primary mineral ore tailings, and other heavy industrial applications.

02 INNOVATION BY DESIGN

All Iracore polyurethanes are formulated by our in-house chemists to meet the demands of every operating environment. Our proprietary formulations have been developed through decades of field knowledge to meet the rigorous requirements of heavy industry.



03 MANUFACTURING FOR ALL SCOPES

With the largest computer-controlled casting machines in North America, Iracore creates urethane parts ranging from small pours (a few lbs) to the large volumes (3500+ lbs) required to line pipe up to 60' in length.

Our industry-leading manufacturing facilities are capable of high output, allowing us to support projects of all sizes and scopes. We are committed to our ISO 9001 quality management system to achieve customer satisfaction through the delivery of quality products, on time, 100% of the time.

04 ENGINEERED FOR PERFORMANCE

Our system is field-proven to outlast unlined steel pipe and metallic pipe liners, with some customers reporting more than eight times longer life cycles in the most challenging operating environments. Iracore pipeline systems offer cost and safety advantages while helping you increase uptime and throughput.

In addition to outlasting conventional materials, our advanced elastomeric bonding technology ensures maximum durability for all Iracore components. Our compounds effectively bond to steel and other piping substrates, providing unmatched strength and sustained performance in your piping systems.



Iracoupling™ technology for fast clamping/welding in the field.

60 ft. spool sizes for lower installation costs.

Lining thicknesses from 3/8" to 5".

Installation in as little as 15

Lining compounds engineered resist wear.



Low coefficient of friction and bore-to-bore joint matching for optimum throughput.

Advanced elastomeric bonding for improved durability.

No exposed steel, eliminating corrosion.

Superior insulative properties to maintain fluid temperature.

Engineered to withstand 11 m/s fluid velocities.

COMPLETE PIPELINE SYSTEMS

Iracore manufactures custom-designed pipeline systems for all applications. Available components include:

- Multi-port manifolds
- Tees
- Expansion barrels
- Branched runs
- Wyes
- Threadolets
- Elbows
- Reducers
- Multiple coupling options
- and more!

99%

PIPELINE UPTIME

thanks to reduced maintenance and replacement.

50%

LOWER COSTS/YEAR

(based on cost-per-foot)

6X

LONGER LIFE

operating life than unlined steel pipe

-45°C To 93°C

OPERATING TEMP

for performance in harsh operating environments

60

YEARS EXPERIENCE

engineering pipe systems for heavy industrial applications.

20

PROPRIETARY COMPOUNDS ENGINEERED

for heavy industry, with continual research and development.

Since 1957, Iracore **Rubber-lined** pipe has been the backbone of the heavy industry across the world. Beginning with custom rubber lining services for northern Minnesota's iron ore mines, Iracore's reputation for unparalleled reliability and unbeatable value quickly established it as a top provider of wear materials for all industrial applications requiring dependable components.

Iracore's legacy of quality and innovation continues with one of the largest selection of rubber-based pipe linings for the mining, oil sands, and other industries. Our range of high-performance rubber and neoprene compounds provides our customers with reliable abrasion and corrosion resistance their operations need, all while delivering exceptional value.

01 LINING COMPOUNDS FOR EVERY APPLICATION

No matter what your operation or industry requires, Iracore offers a diverse selection of neoprene and rubber linings that will meet the most stringent requirements. Our material catalogue includes:

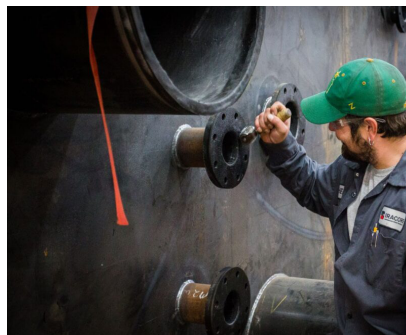
Soft Natural Gum Rubber, offering superb abrasion and tear resistance in challenging hard rock mining conditions while providing exceptional value.

Chlorobutyl/Bromobutyl, with unrivalled resistance to extreme heat and caustic solutions.

Chloroprene (Neoprene), with outstanding oil, ozone, weathering, and abrasion resistance, as well as top performance in high-impact, high-velocity applications, making it an ideal choice for oil sands applications.

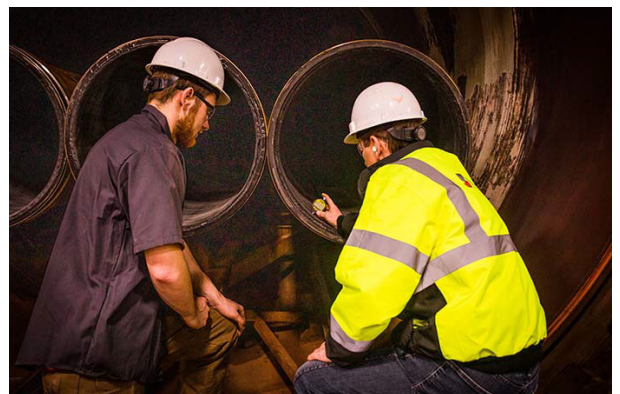
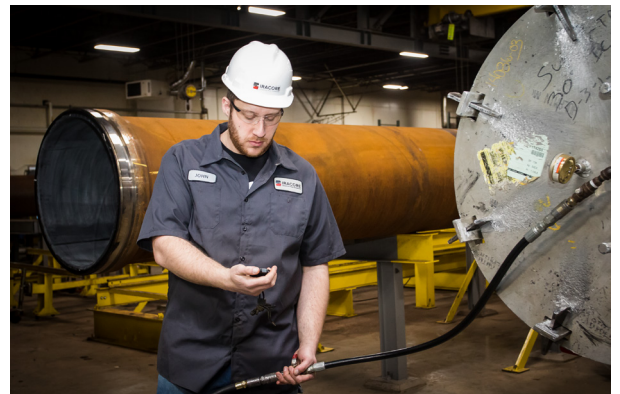
Moderate Oil Resistance (MOR) Rubber, a blend of natural gum and nitrile compounds that performs well where trace amounts of oil are present.

Our unique compounds are engineered to offer performance in all industries and applications, with comparison tests demonstrating a life expectancy up to two times that of other lining material.

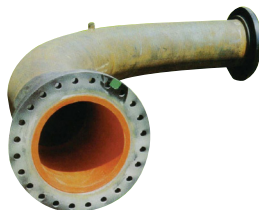


02 INDUSTRY-LEADING PRODUCTION CAPACITY

Iracore proudly offers unrivalled production capacity to support projects of all sizes and scopes. Our manufacturing facilities boast the largest autoclaves in the industry, featuring a 14' diameter and a 60' length. This means we can manufacture lined pipe solutions for any customer requirement, from 3" diameters to the largest sizes in production today. All Iracore manufacturing facilities are ISO 9001-certified, ensuring consistent quality for our customers.



IRACORE VS THE COMPETITION



60

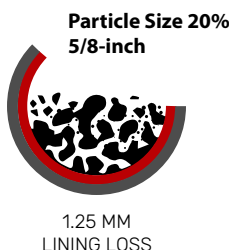
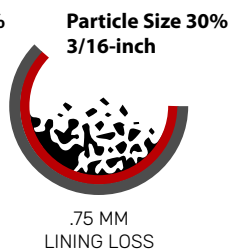
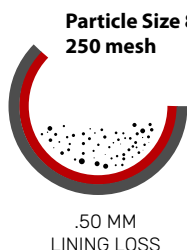
YEARS EXPERIENCE
engineering pipe systems for
heavy industrial applications.

20

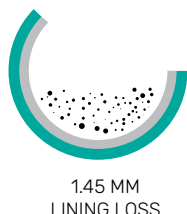
**PROPRIETARY
COMPOUNDS ENGINEERED**

for heavy, with continual
research and development.

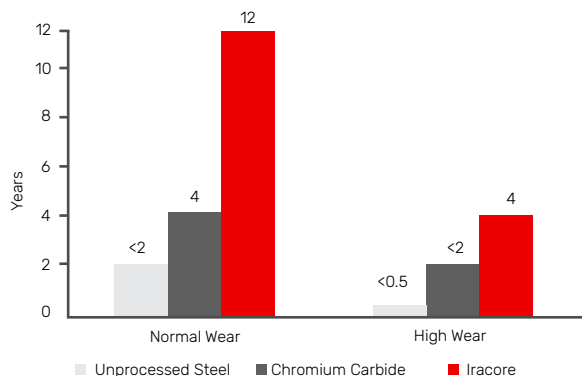
IRACORE
LINING LOSS



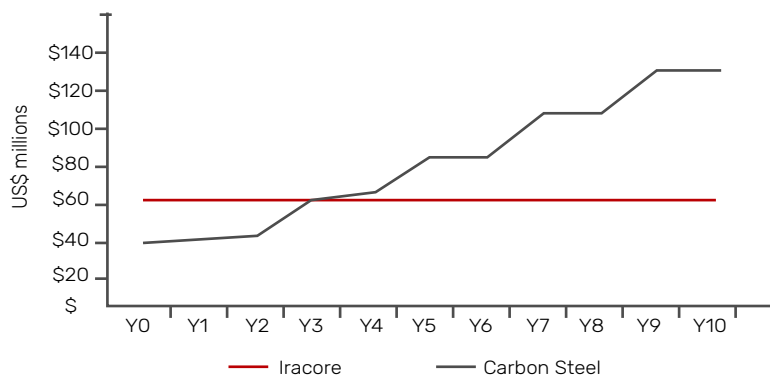
COMPETITOR
LINING LOSS



WEAR LIFE



CUMULATIVE COST OVER LIFE

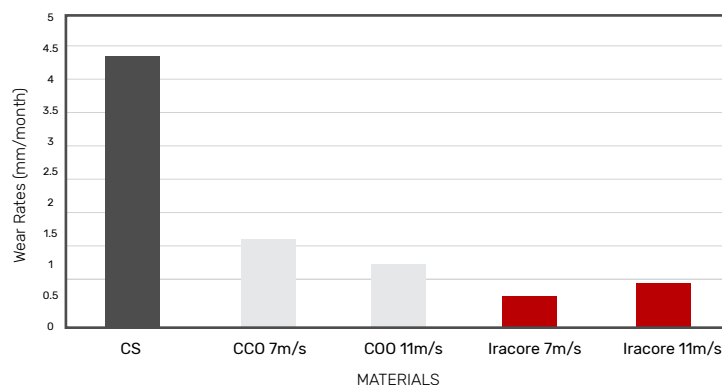


Compares 30 km. 30-inch diameter unlined pipe with IRACORE 30 km. 30" diameter lined

Not only does Iracore lined pipe outlast unprocessed carbon steel and chromium carbide in the field, but it provides significant cost savings to our customers through reduced repair and maintenance, fewer required pipe rotations, and less downtime.

SUNCOR™ HIGH VELOCITY FIELD RESULTS

Max Wear Rates (mm/month)



Compares lining loss rates between carbon steel, chromium carbide, and IRACORE lined pipes in independent Suncor testing. **Lower lining loss indicates higher durability.**

Independent field testing done by Suncor™ demonstrates Iracore's superior durability in high-velocity pipe systems.

For nearly 50 years, Iracore has engineered industry-leading urethane wear materials that provide superior performance and durability across numerous industrial applications. Our commitment to innovation and customer service has made us world leaders in designing and manufacturing urethane compounds tailored to oil sands and mining operations across the world.

In addition to pipe linings and other wear components, Iracore continues to offer two high-performance urethane polymers as part of our field repair kits. Iracore Repair Kits are designed for fast, efficient field and in-plant repair of any rubber, metal or urethane surface, minimizing downtime and keeping your operation running smoothly.

01 PERFORMANCE-ENGINEERED REPAIR KITS

Our team of in-house chemists and engineers have developed urethane compounds tailored to a fast, easy application in a repair setting. Additionally, Iracore repair compounds provide powerful resistance to abrasion, heat, humidity, and moderate concentrations of mineral acid or alkalines.

Each kit includes a high-performance polymer, solvent and primer for bonding the urethane to nearly any surface. Iracore Repair Kits also include disposable gloves, mixing and application tools, and detailed instructions for preparation and application. Every kit has everything you need to complete repairs and get your system online quickly.



02 SAVING TIME WHILE MAXIMIZING THROUGHPUT

Operators in the mining and oil sands industries know that a mechanical failure can be disastrous for productivity. Every moment your system remains offline represents lost profit, not to mention the cost of repairs.

Iracore Repair Kits are designed for rapid application. Our high-performance urethane compounds readily cure at room temperature, allowing equipment to return to service in as little as four to six hours.

03 ADDED VALUE FOR EVERY SYSTEM

Iracore repair compounds are compatible with all rubber, metal, or urethane surfaces (including those made by other manufacturers!). No matter what wear materials are present in your operation, Iracore Repair Kits can add value through fast and easy repairs, worry-free maintenance, and the world-class durability our customers have come to expect from Iracore products.

REPAIR KIT SPECIFICATIONS

Basic Properties	IRAPAIR 255	IRAPAIR FASTFIX 275
Resilience (Rebound)	G	G
Tear Strength	A	A
Hydrolysis Resistance	G	G
Ozone Resistance	VG	VG
Resistance to Oil & Grease	VG	VG
Water Swell Resistance	A	A
Abrasion Resistance		
Particle Size > 1/4"	G	G
Low Angle Impingement	G	G
High Angle Impingement	G	G
Sliding	G	G
High Temperature - Optimal	50-130°F	50-130°F
High Temperature - Special	180°F	180°F
Low Temperature - Limit	-60°F	-60°F

VG-VERY GOOD

G-GOOD

A-AVERAGE

P-POOR





IRACORE HISTORY



Iracore International LLC has been designing, manufacturing and providing custom wear materials to solve abrasion and corrosion issues for over 60 years. Across the markets we serve, we help our clients get more from their assets. No matter the application or industry, we strive to deliver better reliability and increased equipment lifecycle for our customers.

Our story begins in 1957 in the Minnesota Iron Range. There, Industrial Rubber Applicators began providing custom rubber lining services for iron ore mining operations. The mining industry needed a solution to abrasion, corrosion, and premature equipment wear found in

high-throughput mining systems; our rubber lining protected our customers from costly and unpredictable downtime while increasing their system's overall operating life. Our strong ties to the industry continue today, with Iracore continuing to provide high-performance wear components for mining operations around the world.

Early in our history, we assembled a talented team of chemists, engineers, technicians and consultants to design compounds expressly for industrial applications. Never content to settle for what was readily available, we continuously developed innovative solutions and products to meet the abrasion and corrosion challenges of heavy industry. Throughout our history, our team continually explored and developed new wear materials that enabled our customers to achieve increased productivity and lower operating costs. By 1972, we had engineered a unique product that would revolutionize the wear component industry: urethane-lined pipe.

Our superior products and value-adding solutions allowed us to expand operations into new markets through the coming decades. Our durable, cost-effective components and materials gained traction in the aggregate, power generation, transportation, dredging, and oil and gas industries. To keep up with demand, we've continually expanded our production capabilities; today, our three world-class facilities provide high-output, high-quality component manufacturing to our customers around the world. Our facilities are capable of producing the largest high-performance pipes and wear materials on the market today, allowing us to provide industrial operations of all sizes and scopes with solutions to their abrasion and corrosion challenges.

In the early 2000s, we undertook our most ambitious project yet: developing a lined pipe system capable of meeting the performance requirements of Alberta's Oil Sands. To meet these challenges, we developed unique polyurethane lining systems, rubber, and neoprene materials engineered to handle extreme operating conditions while compensating for high wear areas, changing temperatures, rock size and velocities. The result? A comprehensive product line featuring unrivalled durability and performance in any operating environment. The oil sands industry quickly took notice of our innovative solutions, allowing us to gain a ~50% market share in Canadian oil sands tailings and hydro transport.

With over 3 million feet of pipe installed and hundreds of thousands of molded and cast parts used in operations worldwide, Iracore is a field-proven leader in wear material engineering and manufacturing. No matter what heavy industry may face, our commitment to innovation, performance, and value will continue to provide our customers with the solutions they need for wear material challenges.



ALL ABOUT IRACORE

FACILITIES



3 MANUFACTURING
FACILITIES

WITH 120,000+ SQ. FT.
MANUFACTURING SPACE

ISO **9001**
CERTIFIED

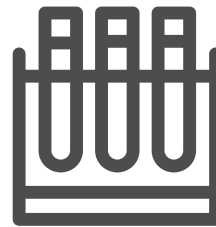
QUALITY MANAGEMENT
SYSTEMS

CAPABLE OF PRODUCING

7000 FT OF PIPE PER WEEK

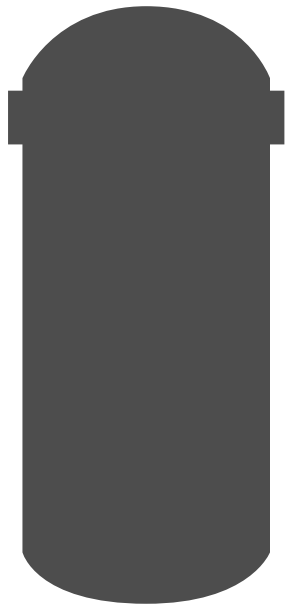


**WORLDWIDE
PROJECTS**



**DEDICATED
RESEARCH LABS**

FOR TESTING
WEAR MATERIALS.



RUBBER LINING

**LARGEST
AUTOCLAVE
VULCANIZERS
IN THE INDUSTRY**

CAPABLE OF
PRODUCING 12'
DIAMETER X 64'
LONG PIPES

HAND-LAID RUBBER CAPABILITIES:
NATURAL GUM, NEOPRENE, SYNTHETIC

URETHANE-LINED PIPE



60'
LINED PIPES, THE
LARGEST AVAILABLE ON
THE MARKET TODAY.

3 MILLION
FT. **1.4** MILLION
HOURS

LINED PIPE PRODUCED FOR
CUSTOMERS WORLDWIDE.

IN OPERATION IN OIL
SANDS OPERATIONS.

**SUNCOR, CNRL, US STEEL, CLIFFS
NATURAL RESOURCES** TRUST
IRACORE FOR THEIR LINED PIPE NEEDS.

01 PRODUCT DEVELOPMENT

Iracore's fabrication process begins with our dedicated research and development process. Unlike other manufacturers and distributors, Iracore sources raw materials directly from major chemical producers to engineer compounds suitable for specific applications and use cases. Our team of chemists, engineers, technicians and consultants continually work to improve and optimize our products for our customers and the unique challenges their operations face.

Iracore's proprietary compounds have been developed through decades of field knowledge and laboratory testing. They have been continually proven to stand up to the harshest environments, including the Canadian oil sands, primary mineral ore tailings, other rigorous operating conditions. Our commitment to innovation ensures our products will remain at the forefront of wear technology as the heavy industry continues to advance.

02 WORLD-LEADING MANUFACTURING

All Iracore components are manufactured in state-of-the-art facilities. Our three dedicated facilities are capable of high-output, high-quality production for the most demanding industrial operations. We are capable of producing the largest urethane and rubber-lined components available on the market today. Additionally, our production capacity allows us to support projects of all sizes and scopes, including large-scale oil sands and mining operations. Our facilities are ISO 9001 Quality Management-certified, ensuring consistent quality for our customers no matter how large the demand.



03 FORGING RELATIONSHIPS

At Iracore, we take our commitment to innovation, quality, and service seriously. When selecting vendors and sub-suppliers for raw materials, we seek to build long-term relationships with partners who share these values. As a result, we have developed decades-long partnerships with a select group of like-minded organizations that work with us to deliver top-quality lined pipes and wear materials to our customers across all industries.

Since 2000, we have been proud to partner with Enerfab Inc., a world leader in steel fabrication, for our lined-pipe products. Over their 120-year history, Enerfab's passion for excellence, unrelenting focus on safety, and determination to innovate make them an ideal partner in delivering top-quality, high-performance products for industrial projects of all sizes and scopes.

OIL SANDS

For more than 20 years, Iracore has been increasing wear performance and reliability in the Oil Sands industry through innovative polyurethane, neoprene, and rubber lined piping solutions.

Beginning in 2000, Iracore became the first company to develop elastomeric lining and wear materials specifically for the demands of Alberta's Oil Sands. Although Iracore had been producing polyurethane and rubber wear components for decades prior, the Oil Sands presented unique challenges due to extreme temperature changes, varying particle size and slurry mixes, and high-velocity throughput found in many operations. The compounds we use today are the result of decades of research and field testing and have been demonstrated to outperform unlined pipe and conventional wear materials.

Today, we are proud to serve the Oil Sands' extraction, tailings, and hydro transport markets, providing our customers with high-performance pipe lining systems that add value to every operation through:

- 60' pipe spools, reducing installation costs compared to conventional 40' spools.
- Versatile Iracoupling™ for fast and easy installation without the risk of damaging the lining.
- Superior insulative properties to save on slurry heating costs and prevent the "cold wall effect."
- Up to eight times' longer lifespan compared to an unlined pipe or conventional materials.

Iracore stands behind its products, along with the superior durability, unparalleled performance, and unbeatable value they provide to the Oil Sands industry.



MINING

Since day one, Iracore has been committed to innovation, performance, and reliability for our valued customers in the mining industry. Our very first customers in 1957 were the mining operations in Minnesota's Iron Range, for whom we provided custom rubber lining to combat abrasion and corrosion in their systems.

Although much has changed over the last 60 years, our dedication to advancing wear technology in the mining industry remains as strong as ever. Today, Iracore continues to develop and improve its high-performance wear components for the mining industry, engineering rubber and polyurethane compounds to withstand the demands of modern mining operations. In addition to complete lined pipe systems, Iracore also offers a wide variety of rubber and urethane-lined components engineered to maximize throughput, including

- Discharge Cones
- Flotation Components
- Launder and Chute Liners
- Pump Liners
- Screen Panels and Accessories
- Custom Lining Services
- Dead Bed Sleeves
- And More

With some of the largest autoclaves, casting machines and manufacturing facilities in the industry, Iracore is proud to serve mining operations of all sizes and scopes. No matter what your requirements, Iracore supplies top-quality wear components for every aspect of your operation.

As mining technology continues to advance, you can count on Iracore to continue to develop solutions to abrasion and corrosion challenges, providing value for our customers through better predictability, longer maintenance cycles and optimum equipment performance.

OTHER INDUSTRIES

Iracore is proud to serve heavy industry across North America and around the world with high-quality solutions to abrasion and corrosion challenges. Our customers span a wide range of industrial sectors, including:



OIL SANDS



MINING



DREDGING



OIL AND GAS



TRANSPORTATION



PIPE PROJECTS



AGGREGATE

No matter what the industry or application, our customers rely on us to deliver innovative products that provide superior performance and durability while adding value to operations of all sizes and scopes.



CASE STUDY

BACKGROUND

With claims dating back to 1882, Arizona's Bagdad Mine is one of the oldest mining operations in the United States. With an estimated 873.6 million tonnes of 0.36% copper ore, it is also one of the world's largest copper reserves. Currently operated by Freeport-McMoRan, the mining operation produces over 80,000 tonnes of copper and molybdenum concentrates per day* using stockpile leaching, with pressure leaching for molybdenum.

CHALLENGE

In the mid-2010s, work began on a new raised tailing storage facility as part of a project to increase Bagdad's production capacity. An engineering firm was contracted to design and commission a tailing pumping, cyclone and return water system to accommodate a planned concentrator expansion from 50 000 t/d to 113 000 t/d**. Their design called for a new 34-inch rubber-lined steel line. Iracore was selected to manufacture the rubber-lined piping system.

The design of the tailings system posed numerous unique challenges. Both stockpile and pressure leaching produce highly acidic tailings; the lining material would have to be highly resistant to corrosion to avoid premature wear and system damage. Additionally, the raised tailings facility required a higher slurry pressure and velocity, increasing the potential abrasion the lining would need to withstand. With the tailing system's demands and the economic and environmental consequences of system failure, Iracore's lining needed to handle the most rigorous requirements.

IRACORE'S SOLUTION

In order to create a liner that would stand up to the demands of copper mining and tailings transportation, we selected Iracore's 8221 rubber compound. Its unique wear and adhesion properties ensured maximum performance and durability while transporting acidic, high-velocity slurries.

Iracore's in-house engineers worked closely with the engineering firm to provide the detailed spool drawings and the finished product. Iracore was responsible for the procurement, pipe fabrication, rubber lining, and painting of over 5,000 linear feet of tailings lines.

In order to meet our customer's rigorous schedule, pipe manufacturing and specialty bends were split between two Iracore lining facilities. This allowed us to expedite pipe spool manufacturing and complete the order within six months after receipt. Iracore's large production capacity and highly-dedicated team kept the Bagdad Mine project on-schedule, allowing our customers to keep their operation running smoothly and efficiently with minimal downtime.



IMPACT

Iracore's tailings pipe system continues to withstand the most demanding requirements of the Bagdad Mine. Our high-performance rubber lining facilitates the safe, efficient transportation of tailings while providing excellent wear and abrasion resistance. Iracore products minimize downtime and help facilitate high-volume production in challenging operating conditions.

PARTNERING FOR THE RIGHT SOLUTIONS

Iracore chose Enerpipe as the pipe fabrication partner because of the expedited timeline on this project and their expertise in large-diameter slurry piping. Our long-standing relationship and Enerpipe's unique shop capabilities allowed us to meet challenging scheduling demands while maintaining the quality product needed for this site's unique conditions.

*Source: MDO Mining Data Online

**Source: Iracore

***Source: Freeport-McMoRan





CHALLENGE

In the early 2000s amidst rapid expansion, Suncor began experiencing new challenges in its tailings systems. These systems consisted of nearly 40 km of unlined thick-wall carbon steel tailings pipe. These components had an expected operating life of 18 months to two years, requiring three rotations during that time. The sheer size of Suncor's tailings systems made continual repair and replacement costs prohibitive; Iracore was tasked with finding a solution to these challenges.

The demanding operating environment of Alberta's Oil Sands created unique obstacles. Typical tailings slurries have particles up to 4" in size, with hydrocarbon fluids moving at velocities of 5 m/s. In addition to resisting abrasion from high-velocity tailings, Iracore's solution also had to be able to withstand extreme temperatures ranging from -40°C to 65°C to account for Northern Alberta's unforgiving weather conditions. The new tailings pipes had to be weldable in the field quickly and efficiently, as well as have an operating life of eight years.

IMPACT

Iracore's new pipeline was required to last for eight years. After being installed in 2006, the system was finally decommissioned and replaced in 2019, a 65% increase in life expectancy over Suncor's expectations. Iracore's innovative design resulted in significant savings in maintenance and replacement costs, allowing Suncor to run its oil sands operations with unprecedented efficiency and value for its stakeholders.

Iracore's dedication to innovation continues today in our product development for Alberta's Oil Sands. Current-generation urethane-lined pipes have a life expectancy of up to 20 years, demonstrating our commitment to adding value to oil sands mining operations for years to come.

*Source: Suncor

BACKGROUND

In 1967, Suncor began the first commercial development of the Alberta Oil Sands. Today, Suncor's oil sands operations in Northern Alberta produce up to 330,000 barrels of bitumen per day. Consisting of multiple developments in the Fort McMurray area, Suncor's assets are projected to produce a reliable, long-term energy supply, with production capacity continuing to grow over the coming years*.

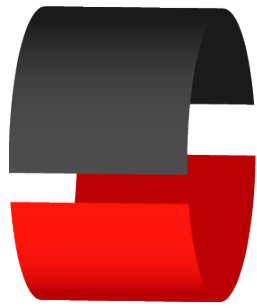


IRACORE'S SOLUTION

Iracore's in house team of chemists, engineers, and consultants developed a new proprietary compound to meet Suncor's specific needs. The new elastomeric polyurethane lining was capable of withstanding the heat and wear experienced transporting oil sands slurries. Additionally, Iracore developed a unique bonding system to eliminate the "cold wall effect" caused by extreme temperatures, ensuring that the lining would remain secured to the pipe walls.

Our innovation didn't stop there; Iracore engineers incorporated standard wall Spiral Weld pipe to replace the thick wall carbon steel for increased durability and a 30% weight reduction (approximately 10 tonnes per component). Finally, Iracore partnered with its trusted sub-suppliers to develop all-new end connections, allowing the polyurethane-lined pipe to be welded together in the field without risk of damage.





IRACORE

ADVANCING WEAR TECHNOLOGY

ENGINEERED TO THE CORE

**GET IN TOUCH
WITH US**

218.263.8831

Info1@iracore.com

iracore.com