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SPRING, 1982



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MARK II

OIL FIELD PUMPING UNITS



GEARS FOR INDUSTRY
AND SHIP PROPULSION

SOUTHEASTERN DIVISION ISSUE

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COVERS: Front: Jupiter Inlet north of Palm Beach, Florida.

Inside Front: Winter of 1982 in Stone Mountain State Park in Stone Mountain, Georgia.

Photos by David Freeze, LUFKIN Photographer

In observance of the company's 80th anniversary, a special calendar for 1982 containing reproductions of several paintings by E.M. (Buck) Schiwetz is available in limited numbers. Please send requests to the Public Relations Department, Lufkin Industries, Inc., P.O. Box 849, Lufkin, Texas 75901.



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A place apart . . .

CUMBERLAND ISLAND

If one word describes this island on the Georgia coast, it is tranquility. Here birds sing while palmetto fronds chatter in the wind, and the surf rolls in upon the shore

by Webb Garrison

Though it lies just 20 air miles from Jacksonville, Florida, Cumberland Island is about as far from civilization as any place in North America.

It is the southernmost of a string of buffer islands that shield the Georgia coast from the sea. The zeal of modern conservationists has protected the area from man, the worst enemy of any wilderness area.

At one time, the Cumberland seemed destined to become a reverse image of Disney World—a place of natural wonder overrun by a million visitors a year. Headlines of Atlanta papers made that

The view is unobstructed from the inland side of the island.



prediction just a decade ago.

After the National Park Service acquired the area in 1972 and designated it as a national seashore, it looked ripe for development or exploitation. Years of fierce feuding followed, but the forces of conservation were victorious.

One of the islands most marvelous life forms became a symbol of its future. During a long spell of hot, dry weather, tiny ferns on ageless live oak trees turn brown and withered. They seem to be dead.

Yet, hours after a squall, the aptly-named resurrection fern stands erect and strong, exhibiting a shade of green seen nowhere else on the continent. Some lucky visitors to



the Cumberland have seen the fern spring from apparent death to life.

There are many other natural phenomenon to see on Cumberland Island. A week would not be long enough to see everything found in the six separate life zones that cover an estimated 32,800 acres.

There are wild horses with manes blowing in the wind and a 15-foot alligator lying still as a log in a seemingly inert marsh or pond that is actually churning with activity.

In its own way, that monochromatic bit of marsh that shelters a big 'gator is a symbol as meaningful as the resurrection fern. For generations, nobody appreciated the marsh. Even though it is one of the most fertile spots on earth, it seemed to produce nothing of value. Now it is known that the healthy marsh with its smell of salt iodine and decay plays a unique role in nature.

The marsh is a huge natural shock absorber. Energy from the sea and wind is absorbed by the marsh in such a marvelous fashion that it serves as a buffer between the land and sea.

Here, small but important creatures

play their roles in the drama of nature.

Fiddler crabs and other animals are so big, by comparison, that the casual visitor might not even notice tiny insects feeding on *Spartina Alterniflora*. This marsh grass, golden in the fall and winter, becomes a sea of undulating green in the summer and flourishes in the brackish water where the salt content is too high for other plants.

Spiders capture plant-eating insects. When spiders get plump, rice rats or marsh wrens seize them. Then a marsh hawk is likely to feast on a well-fed rice rat. On and on, goes the food-and-energy chain.

Dunes seem almost lifeless unless they shift when the wind is brisk. But they offer special ecological niches. One stalk of sea grass anchored in the white sand can begin to form a bastion that will slow and then stop the shifting particles.

More oats, a few crotons and a railroad vine or two start the building of a young dune. In time, it will shelter marsh pinks and bayberries plus such shore birds as willets and oyster catchers.

At the edge of the dune, live oaks

(Above) Wild horses graze in the inter dune area. (Right) Cabbage palmetto trees adorn the beach dunes. (Below) Sea oats, an endangered species, grow along the beach.







shaped by salt spray and ceaseless winds seem literally to have come from the hand of a master sculptor.

Their larger and more symmetrical cousins in the forest zone are draped with Spanish moss. To step under their overhanging limbs is to enter nature's cathedral.

Sloughs and ponds make up Cumberland's fifth life zone. Do not fret if you fail to see an alligator here. In their own way, the frogs, herons, egrets and coots are equally spectacular. The golden marsh grass is an intricate still-life painted on nature's living canvas.

An incredibly white and smooth beach, cleaned twice daily by the tides, makes up still another distinct life zone. Startlingly brilliant by contrast is the canopied live oak forest. Souvenirs such as flat sand dollars or smoothly rounded shells of the moon snail are there for the taking.

Because it is so utterly apart from the man-shaped world, Cumberland Island lures its visitors to march to the beat of a different drummer.

There is also a wealth of history on Cumberland Island. Toonahowi, a young Yamacraw Indian, named the

Cumberland Island, a lush, semitropical island, was once the playground of millionaires. Now about 85 percent of the island is owned by the federal government and designated as a national seashore. (Above) Ruins of the Dungeness mansion stand as mute reminders of the history of the island. (Right) The early morning sun enhances this live oak savannah behind one of the mansions that remain from another era.

island. General James Oglethorpe, Georgia's founder had run out of names for the rapidly-annexed regions. Because England's Duke of Cumberland had given him a gold watch, the native American asked that his name be bestowed upon the island.

Today, few persons remember the battle in which the Duke of Cumberland fought, but no one who catches a glimpse of the ceaseless but often silent struggle for existence on Cumberland Island will ever forget coastal Georgia's place apart.

Photos courtesy of Georgia Department of Natural Resources.





THE SHUTTLE SHIPS

The booster retrieval ships for the space shuttle program feature two propulsion systems—one which includes two LUFKIN marine gears

by Janice Aston

When the space shuttle thundered into space twice last year from NASA Kennedy Space Center, two of its unique components did not rocket into the earth's orbit. They were floating in the waters off Florida's east coast.

The UTC Liberty and UTC Freedom are ocean-going ships specially equipped to locate and retrieve the solid-rocket boosters that are discarded from the spacecraft's orbiter after take-off. By refurbishing the 150-foot long boosters and flying them as many as 20 times each, NASA hopes to reduce their per-flight costs from about \$25 million to \$7 million dollars apiece, a 70 percent savings.

As the shuttle's twin boosters, the most powerful rocket engines ever built, propel the orbiter Columbia toward space, they generate almost

six million pounds of thrust during a two-minute burn time. At an altitude of 31 miles, they separate from the orbiter, which uses its own engines for the last bit of boost into space, and plummet back toward earth. All parts of the boosters, except their nose caps, descend into the ocean on a series of parachutes, hitting the water at a little over 60 miles per hour.

The two booster retrieval ships, waiting within 12 miles of the predicted impact area, are each charged with recovering one booster's elements. Shipboard automatic direction finders pick up signals from the booster's radio beacons, and the vessels proceed to their location.

The ships are operated by United Space Boosters, a subsidiary of United Technologies Corporation, which has total responsibility for the

shuttle's solid-rocket-booster program, including assembly, testing, launching, retrieval and partial refurbishment of the rockets. Naval architects Rudolph F. Matzer & Associates designed the craft.

Since the vessels navigate both in the open sea and in inland waterways, two propulsion systems are provided. For open ocean travel, each of the 1,052-ton vessels is powered by twin diesel engines that generate 2,900 horsepower, and are equipped with two LUFKIN HSQ2120 marine reduction gears and two huge controllable pitch propellers. For maneuverability, a 425-horsepower diesel-powered tunnel thruster points the bow in the desired direction. The craft can sustain speeds up to 15 knots with a range of 6,000 nautical miles.

The UTC Liberty, pictured at left, and her sister ship, the UTC Freedom, are molded steel hull vessels, 176 feet long with 37-foot beams and nine-inch minimum drafts. They carry a 30-day food and water supply for 24 crewmen and retrieval specialists. (Photo courtesy of United Space Boosters)

(Right) The Columbia thunders off the launch pad. It is the first manned spacecraft ever to return to orbit. (Photo courtesy of National Aeronautics and Space Administration)

When the ships travel the Banana River to and from Cape Canaveral, the propellers are turned off. There, the vessels are driven by 425-horsepower water-jet stern thrusters. The reason for this backup propulsion system: to protect an endangered species of sea mammal, the manatee (or sea cow), which inhabits the river.

These lumbering and timid creatures, the "mermaids" first spotted by Christopher Columbus in the New World in 1493, swim like dolphins and eat grass like cows. Hunted almost to extinction until a 1907 law began providing them with some protection, they are still unwittingly slaughtered by the propeller blades of power boats. Most adult manatees carry one or more propeller scars, so the retrieval ships are designed to be manatee-safe.

Both vessels feature sophisticated electronic communication and navigation equipment for tracking and locating the returning boosters. Each ship also carries a ballast aerating retrieval boom (BARB) and a diver-operated plug (DOP). As the booster casing bobs vertically in the ocean, divers insert the BARB into the nozzle and air is pumped into the casing to drain and seal it. As the sea water is expelled, the casing drops to a horizontal position for towing.

After the spent casings, frustums and parachutes are recovered, the ships return to Port Canaveral where final booster dewatering is accomplished with DOPs. Then the ships proceed to the USBI Disassembly Facility for booster disassembly and cleaning. Motor segments are sent to the Utah manufacturer for reloading while the remaining booster elements are refurbished by USBI at the Kennedy Space Center for future shuttle flights.

The UTC Liberty and UTC Freedom will be back in action again this spring as the Columbia lifts off into space for a third time. The flight is scheduled for March 22.



In the heart of Florida's sugarcane country, Osceola Farms Company transforms the grassy stalks into...



Photo courtesy of Florida Division of Tourism

by Janice Aston

Photos by David Freeze, LUFKIN Photographer

Sugar. We eat it...we drink it...we crave it. For thousands of years, cultures have savored the sweetening taste of sugar, and considered it one of their delicacies.

When people speak of sugar, they usually mean sucrose—the sugar that comes from sugarcane or sugar beets. Today about 60 percent of the world's output of sugar is from sugarcane. The plant with the lusciously sweet stalks was introduced to Europe when Alexander the Great invaded India in 325 B.C. It was described by the invaders as "the grass that produces honey without the help of bees."

The art of making sugar from cane syrup through a crystallization process was introduced by the Spanish Moors in the 11th century. When Christopher Columbus traveled to the New World for a second time in 1493, he brought the sugarcane plant to the island of Santo Domingo. The first attempt at cultivation of the plant failed, but in 1506, sugarcane was planted there again. Three years later, the first sugar in the Americas was produced.

Explorers soon spread the secret of sugarcane to the West Indies, Brazil and Mexico. Taxes on sugar built the royal palaces of Madrid and Toledo, and sugar provided a large part of the great wealth of Charles V of Spain. Sugar in that era was as eagerly sought by pirates and merchants as gold and silver. In 1751, Jesuit missionaries took sugarcane from Haiti to New Orleans, Louisiana. By 1795, the

commercial production of sugar had begun in what was shortly to become part of the United States.

The present sugar industry in Florida began in 1923 at Canal Point on the southeast shore of Lake Okeechobee, the second largest fresh water lake in the continental United States. At that time, the Everglades Drainage District had a huge project underway to develop vast acreage of muckland swamps to rich, fertile, crop-growing lands.

The first sugar mill was built in the Glades area in 1931, but it was not until 1947 that another mill was built. When the federal government lifted quotas on sugarcane production in the early 1960's, the opportunity finally arrived for further expansion of the industry. The state produced around 175,000 tons of raw sugar per year before 1961. By 1964, eight new sugar mills were built, and production increased to 572,000 tons per year, a 400 percent increase in sugar production.

Florida's first million ton production of raw sugar was achieved in the 1975-76 crop. The state is now the largest producer of sugar in the United States.

One of Florida's most successful sugar mills is the Osceola Farms Company, located in the heart of Florida's sugarcane country which surrounds the bottom half of Lake Okeechobee. Of the mills operating in Florida, Osceola was the third mill to be built. The original mill was built

with old machinery from Vermillion Sugar Factory of Jeanerette, Louisiana, and some component parts from Slacks and Loisel Factories, also of Jeanerette, and a considerable amount of new equipment. During its first year of operation in 1961, the mill had a grinding capacity of 1,500 tons per day, enabling the factory to grind 132,923 tons of sugarcane and to produce 10,330 tons of raw sugar.

Osceola Farms Company is an excellent example of the modern day sugar mill which uses or sells all three of its end products: bagasse, sugar and molasses.

When the sugar cane is ground and the juice is removed, only the fibrous part of the cane, bagasse, remains. Osceola Farms Company burns the bagasse as fuel in its plant's boilers, generating enough steam to operate all of the plant's machinery including a turbo generator which produces the electricity needed to run the plant.

The crystallized sugar produced by the mill is sold to refiners, soft drink companies and candy manufacturers. The raw sugar shipped to a refinery is about 96 percent pure sucrose. The refinery further processes the sugar into the final snow-white product that is packaged for the grocery shelves.

Molasses, the sweet syrup which remains when all of the crystallized sugar has been extracted, is sold by Osceola Farms Company to cattle feed lots and distilleries.

Very little of the original equipment

(Top) Of the mills operating in the Lake Okeechobee area, Osceola Farms Company was the third to be built. Last year, the mill was involved in an extensive renovation project which replaced all of its original grinding station equipment.

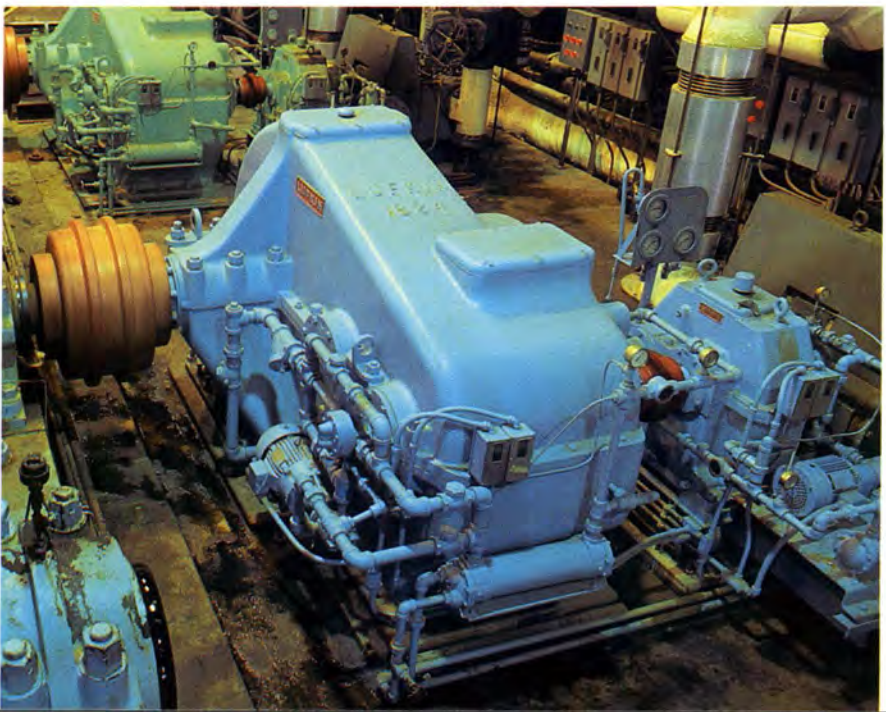


(Middle) When a crop of cane is ready for harvest, the field is set afire to burn out the dried leaves. This makes it easier to harvest. At the mill, the burned cane is stacked until it is ready to be ground. Last year, Osceola Farms Company ground 969,761 tons of sugarcane, producing 96,877 tons of raw sugar.



(Bottom) A part of the new mill tandem at the Osceola Farms Company sugar factory consists of a LUFKIN N1204C Gear Reducer with LUFKIN D1824 Double Reduction Gears driving the spur gear final-drive and Fulton three-roll sugar mill.

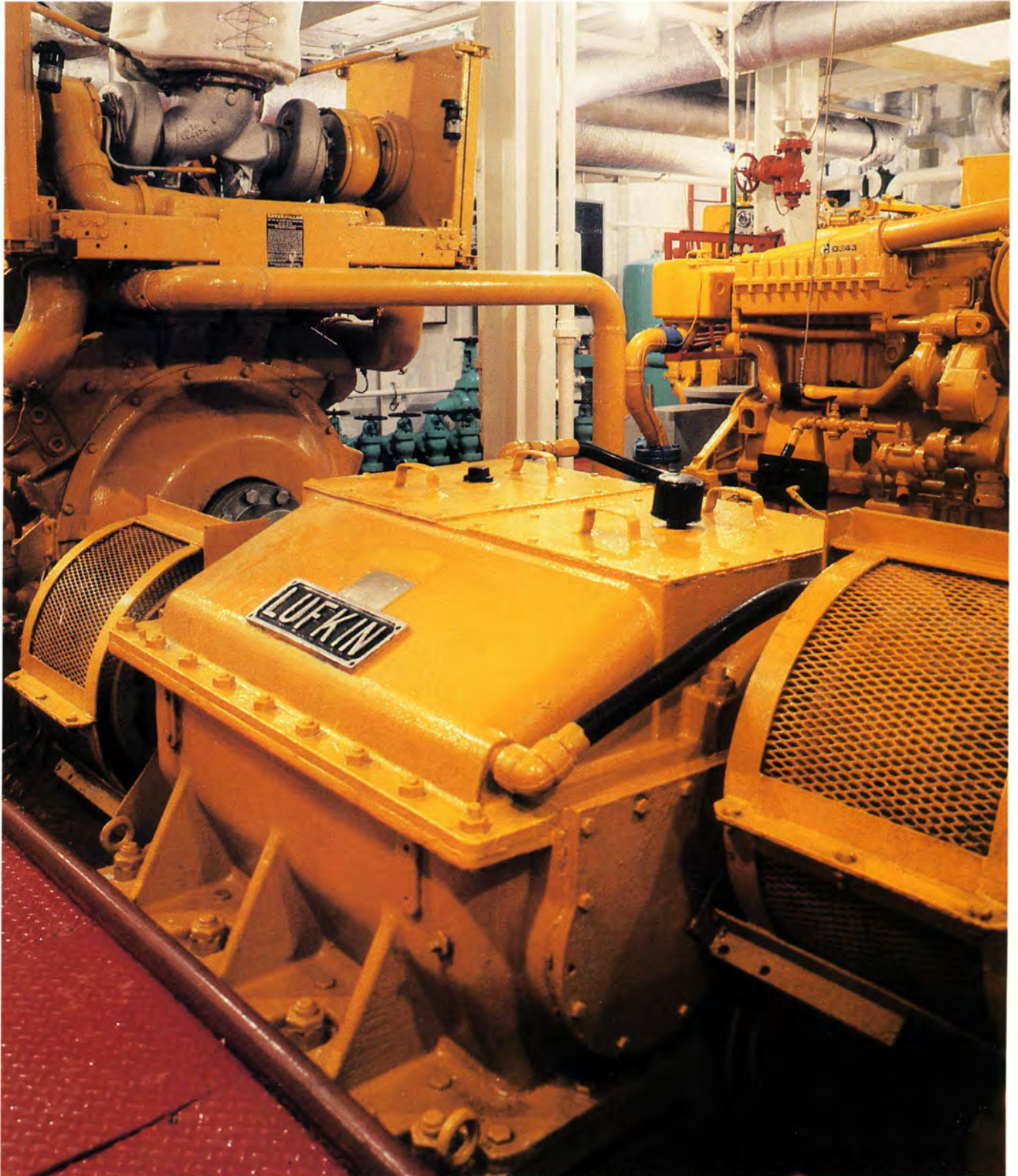
remains in the mill today, and the Osceola Farms Company has grown considerably in size in the past 20 years. In 1975-76, the mill set a new yearly record, grinding 1,179,451 tons of sugarcane which produced 108,011 tons of raw sugar. The daily record for the most cane ground by the mill was established the following year when the mill ground 8,505 tons of sugarcane in one day. In 1980-81, Osceola Farms Company had a grinding capacity of 7,800 tons of sugarcane daily, and processed cane from 26 independent farmers.



The future is extremely bright for Osceola Farms Company and the sugar industry in Florida. With commitments requiring a daily output of ground sugarcane of 10,000 tons, the mill replaced all of its original grinding station equipment with new modern equipment last year. The new mill tandem consists of seven 42-inch by 84-inch roller mills independently driven by 850-horsepower steam turbines through LUFKIN NM1204C high speed gear reducer connected to LUFKIN D1824 intermediate speed gear reducers. The mill estimates that during the coming year 1,300,000 tons of sugarcane will be ground which will produce 130,000 tons of raw sugar.

Thousands of years may have past since the secret of sugarcane was introduced to the world, yet sugar remains a popular delicacy today. Ah, how sweet our sweet tooth has become!

LUFKIN Installations

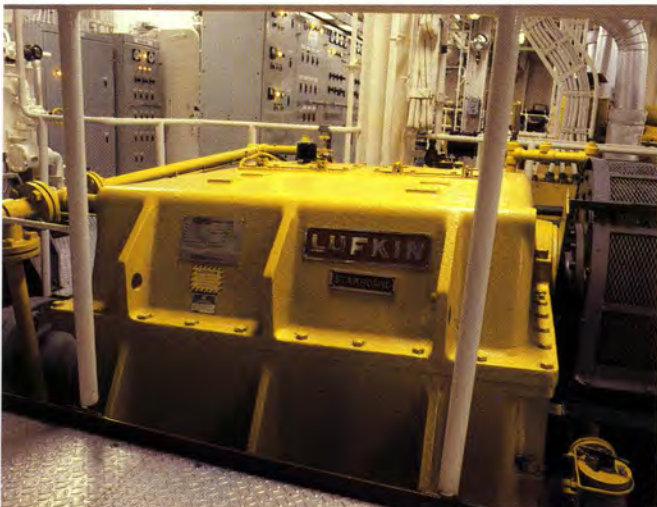


A LUFKIN RS1818 Marine Reverse-Reduction Gear transmits 850 HP from a 1,200 RPM engine with an output speed of 300 RPM. The unit operates in a specialty cargo ship owned by a Florida shipping company.



A LUFKIN NM1800C Gear Reducer transmits 850 HP from a steam turbine at 4,554 to a cane knife at 602 RPM in a sugar mill.

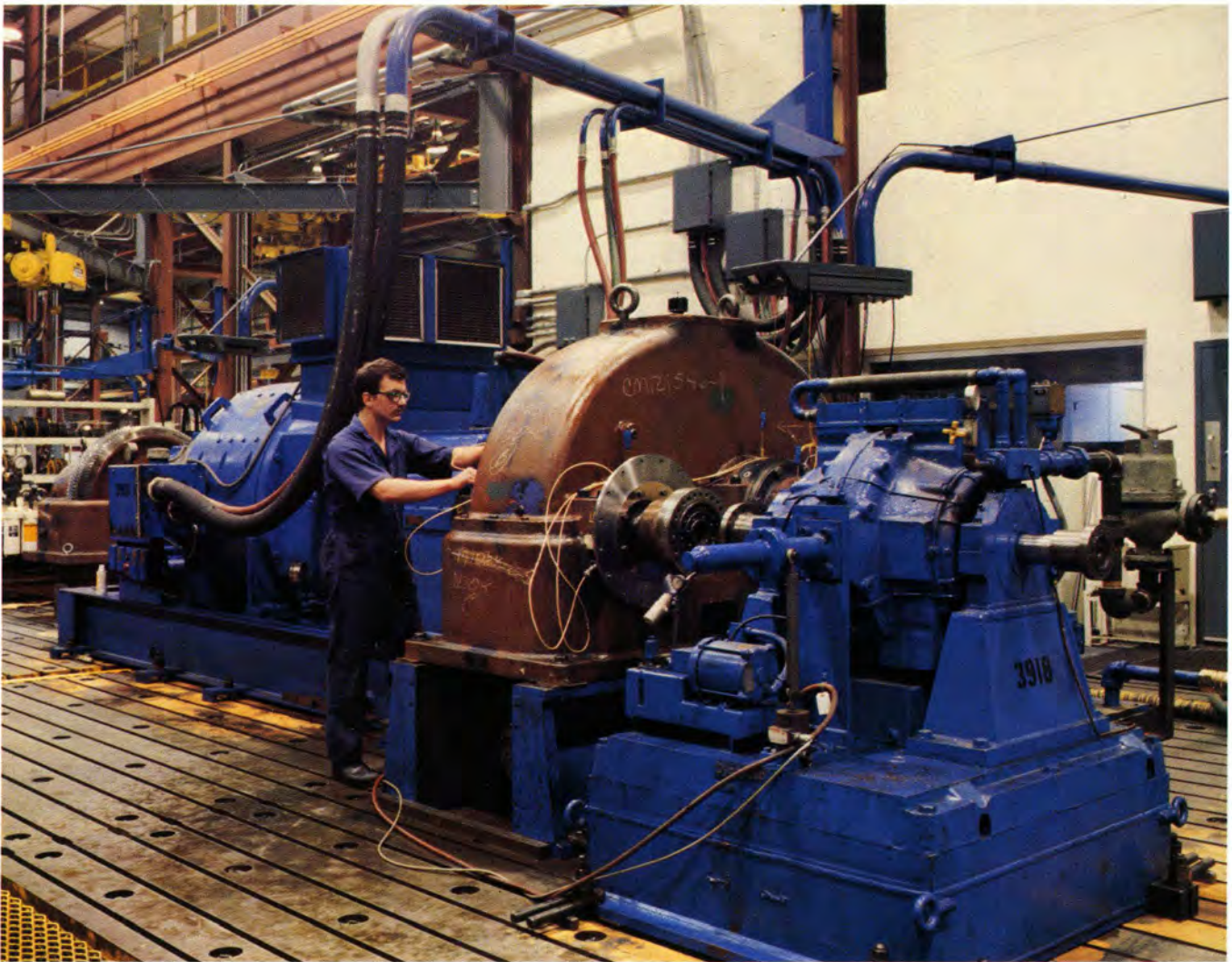
(Left) Each of these three LUFKIN Combination Gear Reducer Pinion Stands in an Alabama steel mill is powered by an 800 HP D.C. motor.



In a container ship owned by a Florida shipping company, a LUFKIN RHS2524 Marine Reverse-Reduction Gear transmits 1,950 HP from a 900 RPM engine with an output speed of 257 RPM.



In a Georgia chemical plant, a LUFKIN D315-921C Extruder Drive operates at 1,750 RPM input, driving an extruder screw at 74 RPM.



Conservatively-rated high speed gears for long service life.

Since 1939, we've supplied gears for speed reducing or increasing applications in refineries, power generation systems, sugar, rubber and paper mills as well as marine propulsion systems. In every application, gear reliability is our prime concern.

High speed gears are engineered to the customer's application

LUFKIN engineers conservatively design the gear system components for every Type N High Speed gear to meet or exceed each customer's application requirements, such as API 613 2nd Edition specifications.

Precision gear elements ensure smooth operation and long life

Precise tolerances on tooth profile, spacing, runout and lead are maintained to assure trouble-free and quiet operation. Type N gear elements, designed for high operating speeds, are lapped together or finish ground to further improve surface finish.

All these features, and more, are designed to exceed the requirements for the gear's rated service so you always get a little more than you asked for when you specify LUFKIN High Speed gears.

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