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Serpentix Aids Sun In Saving 50,000 Barrels Of Oil From Water Basin Cleanup At Tulsa Refinery

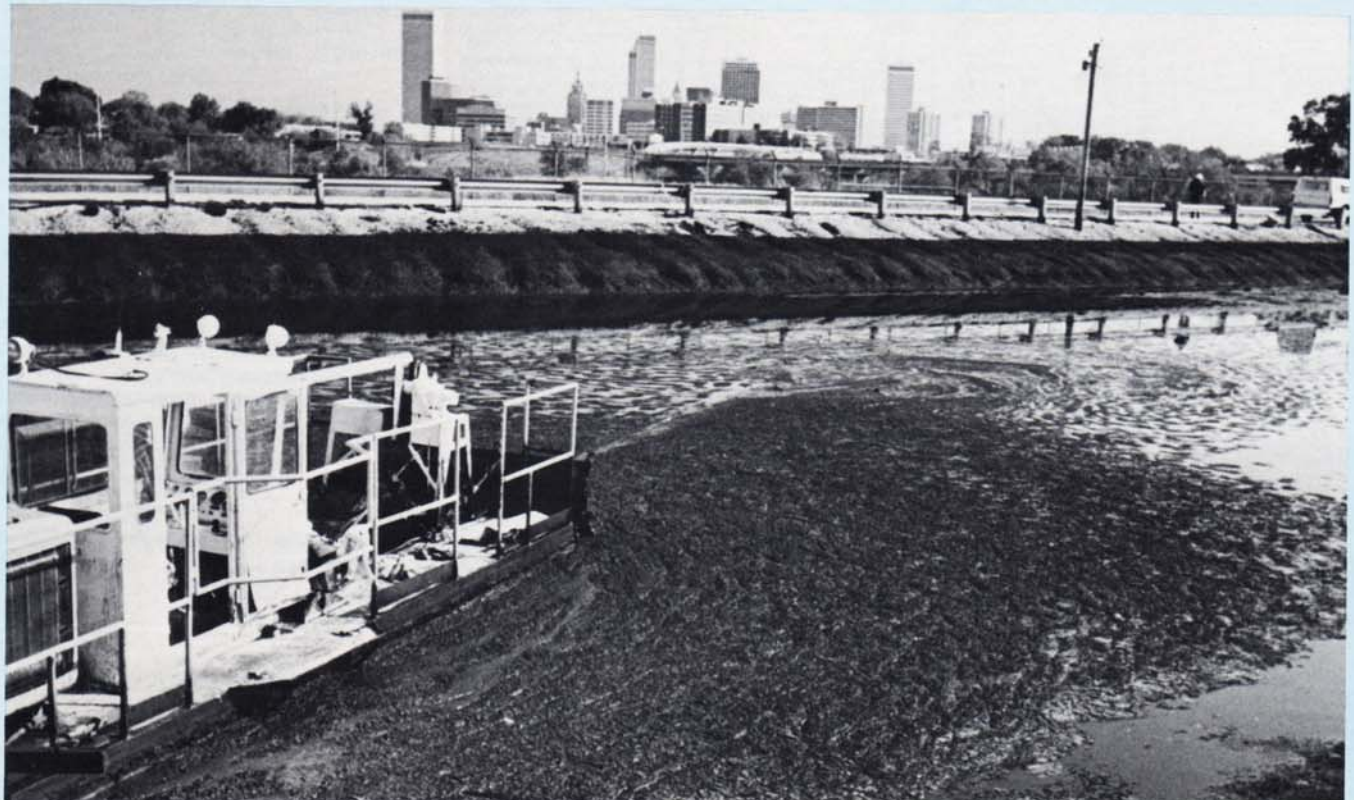
A massive cleanup of an 18 million gallon storm water runoff collection site --- with the subsequent recovery of an estimated 50,000 barrels of crude oil --- is scheduled for completion this fall at the 800 acre refinery operated by Sun Refining & Marketing Company in Tulsa, Oklahoma.

The $4.6 million program involved the design, construction and equipping of a highly specialized dewatering facility and a cleanup/rehabilitation plan. Cindy Klein, project engineer on the program for Sun, is assisted by Project Coordinator Michael Matlock.

Construction and equipment centered around two highly specialized Arus Andritz continuous pressure belt filter presses to dewater oily sludge from the collection site and a three-dimensional, 85-foot Serpentix continuous path conveyor to carry the dewatered sludge to a central disposal point.

Oily waste from three collection basins is transferred to the new dewatering facility after an auger-equipped barge churns it into material suitable for pumping. A major milestone in the project was achieved in late March when the first and largest of the three basins was emptied of all pumpable sludge. Bulldozers moved in immediately to

DEWATERED OILY SLUDGE processed from the water collection basin, shown below, is received by the Serpentix conveyor, in photo at left, from two Arus Andritz belt filter presses. In background, the convoluted belt starts a climbing, helical turn to the right. (See Photo, Page 3.) The downtown Tulsa skyline is clearly seen in the photograph below looking across one of three oil-laden basins and the Arkansas River at the large Sun refinery in Oklahoma.



remove remaining debris and sand prior to installing a synthetic liner in the large basin.

In the meantime, Klein explained, activity is concentrated on removing all liquid from the two smaller basins. The entire project should be completed this fall, she added. At this point, company officials stated that recovery of oil from the site has been higher than had been expected earlier. Initially, projections of a 26 percent crude (slop) oil recovery had been anticipated.

Sun's Tulsa refinery was started in 1913 with a capacity of less than 5,000 barrels of crude a day. Today it is Oklahoma's second largest refinery with a daily capacity of 92,000 barrels (4 million gallons). This includes 52,000 barrels of automotive fuels, 8,000 barrels of lubricants, 23,000 barrels of heating oils and LPG products, 200 tons of petrochemicals and 110 tons of waxes.

Twenty-four years ago, a large water collection basin to capture storm runoff was built on the refinery's perimeter 100 yards from the Arkansas River. The 1,377 foot long basin was 300 feet wide and 18 feet deep at the east end, and 125 feet wide and 16 feet deep at the west end.

In 1973 the original basin was redesigned and compartmented into three basins. The western end of the original basin now is divided into north and south basins of equal size. The third basin, largest and deepest of the three, is now referred to as the east basin.

The purpose of the redesign was to channel the initial storm runoff water into the north and south basins. Through a baffle arrangement, overflow from those two would be channeled into the larger east basin.

The intent was to keep the basins emptied by processing the storm water through the refinery's wastewater treatment plant. This would permit the use of that water in the refinery's water system so that in normal times storm water would never empty into the river. However, when storm runoff exceeded the 18 million gallon capacity of the three basins, the excess water could be released into the Arkansas River through two outfall lines.

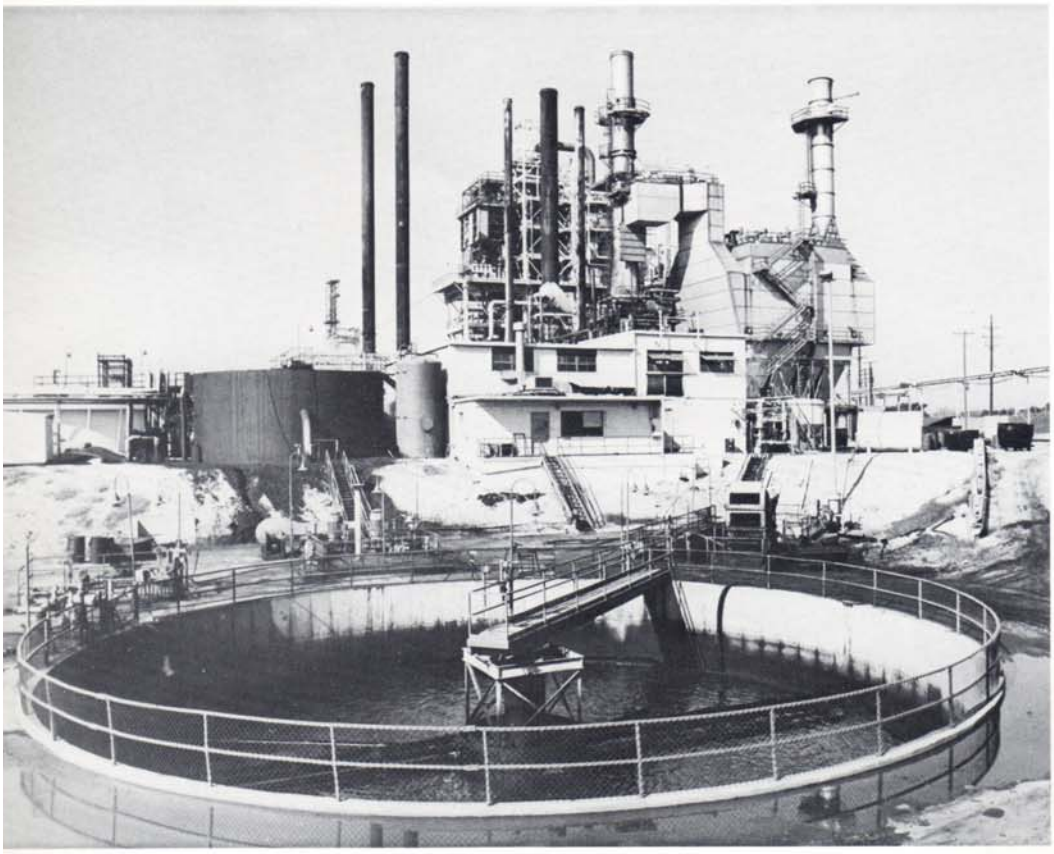
This system functioned well for the next five years, during which oil sludge taken from tank bottoms and from other locations at the refinery was hauled to an off-site dump by an independent contractor. However, from 1979 to 1984, the two smaller basins slowly filled with sludge until, ultimately, the oily waters flowed over into the big east basin. At this point, anytime a rain of any consequence occurred the three basins filled beyond capacity and oily wastes escaped into the Arkansas River.

In May, 1984 the oil laden basins caught fire. The flames, easily seen from downtown Tulsa (just across the river), were visible from about 10 miles away. A clean up order on the basins was issued immediately by the EPA and, Sun management responded quickly.

At this point there was an estimated 16 million gallons of oil sludge present in the 18 million gallon capacity basin complex. The contents represented 20 percent solids, 10 percent oil and 70 percent water. The refinery's water treatment facility, using old centrifuge equipment installed in the mid-1940s, could not cope with the problem.

Startup of the new dewatering facility and all support operations took place in September, 1985. Now oily waste from the basins is pumped from the barge, through a filter then underground to two large holding tanks adjacent to the dewatering facility. There its temperature is increased to 150 degrees, polymer is added and the mixture is pumped to the presses where the oil and water is squeezed out.

Sludge from the dewatered oil



NESTLED BETWEEN THE SUN refinery's catalytic cracker and the primary clarifier, in foreground, is the present building housing the centrifuges used in the wastewater treatment plant operation. When cleanup operations are completed on the water collection basins the present treatment plant will be replaced by the facility installed for the cleanup.

AFTER RECEIVING SLUDGE from the belt filter presses, the three-dimensional Serpentix, at left, makes a climbing 90-degree helical turn to the right and carries the oily sludge to a structure 23 feet above floor level. There the material is discharged onto a conventional flat belt conveyor which transports it to a truck load out hopper.

THE AUGER EQUIPPED barge that churns oil waste in the collection basins to a pumpable consistency can be seen in the background. Inspecting the basin site is Sun Project Coordinator Michael Matlock. He is assisting Project Engineer Cindy Klein with the cleanup program.

waste is fed from the filter presses onto the continuous path Serpentix conveyor. The sludge then is carried the length of the structure where the conveyor starts a climbing, 35 degree helical turn to the right. After completing the 90-degree right turn for an elevation gain of 23-feet from floor level, the Serpentix enters a structure that spans the top of the two large holding tanks.

The sludge is discharged onto a conventional troughing conveyor that carries it to a truck load out hopper for transport to an on-site land farm area.

The water and oil removed from the polymerized basin waste is diverted from the filter presses via lines to a large underground tank. There they come to a center section where the oil floats to the top and goes over a baffle into the other side of the tank, and the remaining water is then channeled to the refinery's water treatment plant for reprocessing.

The recovered oil in the other section of the tank is diverted to the refinery for reprocessing and conversion to the wide range of products produced by Sun, Klein explained.

Synthetic liners will be installed in all three of the rehabilitated basins. With completion of the project Sun management hopes to make the water collection site a "showplace" type installation that will never again pose a threat to the Arkansas River flowing nearby.

The new dewatering facility constructed for the cleanup operations will become the refinery's new sludge treatment plant and will replace the present facility that has been operating since 1945. This will give the 73 year old refinery one of the most modern wastewater treatment plants of its type in the industry.

Sun celebrates its 100th anniversary this year. It is one of the world's largest energy companies with crude oil exploration and production operations in North and South America, Europe, the Middle East, Africa and Australia.

Refining facilities in addition to Tulsa are located in Marcus Hook, Pa., Toledo, Ohio, Sarnia, Ontario, Canada, Yabucoa, Puerto Rico, and a tar sands crude oil recovery plant in Fort McMurray, Canada. ■