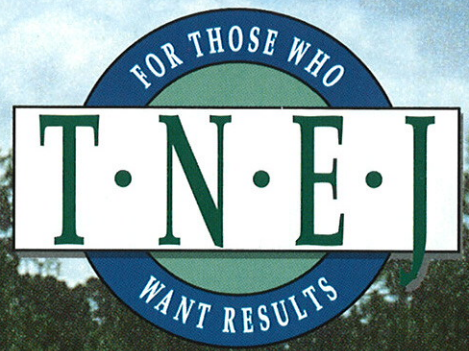


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Featuring:
**Boating
Conditions
in Florida**

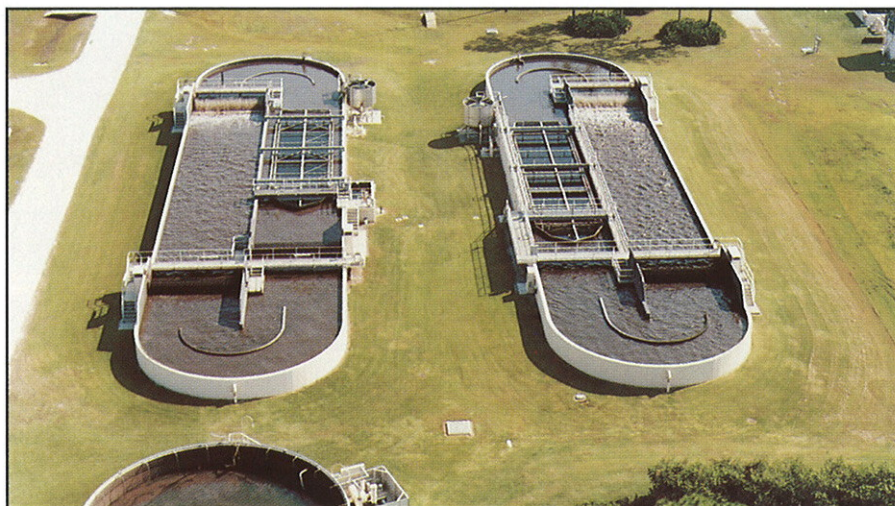
BOATING CONDITIONS

in Florida A CASE STUDY

**TOM GOODELL, P.E.,
President
Central County Utilities
Sarasota, FL**

In November 1985, the first phase of a unique wastewater treatment facility was placed into operation for Central County Utilities, a private investor-owned utility in Sarasota, Florida. This treatment plant was one of the first of its kind in the world. The wastewater treatment system was designed to meet the needs of the large, exclusive, residential community which was being planned and developed by Mr. Hugh Culverhouse. This is one of several projects being developed by Mr. Culverhouse, who also owns the N.F.L. franchise in Tampa Bay, Florida.

The proposed treatment plant had to meet several criteria, since the facility would also serve as the regional plant for a portion of Sarasota County. Low construction costs had to be maintained, along with reduced O&M costs, so that the monthly costs to the consumer would be minimized. In addition, a high-quality effluent was required from the process, since the effluent would be reused for irrigation of the



An aerial view of the unique, oxidation ditch system at Central County Utilities in Sarasota, FL. There are currently over 100 BOAT® intra-channel clarifiers in operation throughout the world.

Prestancia Golf Course within the residential community. Since this golf course was the home of the prestigious Chrysler Cup Senior's Tournament, the effluent would have to be closely monitored. In order to meet all of these requirements, the engineers selected the BOAT® intra-channel clarifier, in lieu of an external clarification system, to be the central element of the treatment process, along with the oxidation ditch.

The oxidation ditch design criteria are typical (Figure 1) and are independent of the intra-channel clarifier. Additional volume was added to make-up for the structural and clear water volume dis-

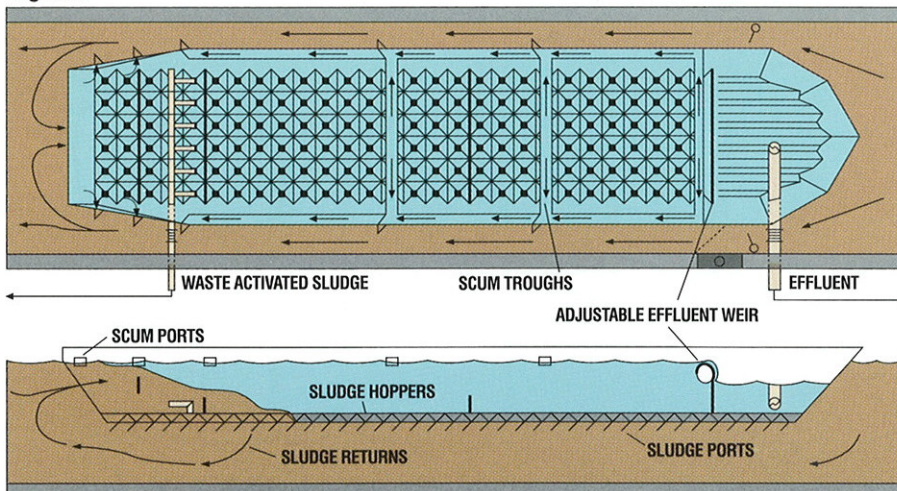
placed by the clarifier, which proved to be minimal. Similarly, no special design considerations were used for the surface aeration system. Conventional brush rotors were designed for the oxidation ditch. The controlling factor for sizing the rotors was the biological load and oxygen requirements. Velocities within the oxidation ditch channel were adequate to assure proper mixing, even with the clarifier installed and at minimum blade immersion.

The BOAT® intra-channel clarifier, manufactured by United Industries of Baton Rouge, Louisiana is a modification of the oxidation ditch process and

Figure 1

OXIDATION DITCH DESIGN CRITERIA	
Parameters	Range
Influent BOD ₅	100-250 mg/l
Mixed Liquor Suspended Solids	1000-3000 mg/l
Percent Organics	60-80%
F/M Ratio	0.06-0.10
Sludge Retention Time	20-30 days
Temperature	10°C-25°C
Dissolved Oxygen Level	2.0-2.5 mg/l
pH	6.5-8.5
Channel Velocities	0.7-1.2 ft/sec
Organic Loading	7-15 lbs/day/1000 cu. ft.
Sludge Volume Index (SVI)	50-100 ml/gr
Zone Settling Rate (ZSR)	15-25 ft./hr

Figure 2



is based on phase separation rather than conventional settling. It was selected for the project because it minimized land area and energy requirements. It also reduced construction, operation and maintenance costs.

As illustrated in Figure 2, the clarifier is installed in the oxidation ditch channel. Wastewater flows around and underneath the clarifier, and then into the "stern" of the unit. Due to the quiescent zone within the clarifier, solids immediately begin to settle.

A series of hoppers runs the full length and width of the clarifier floor. Each hopper has a port that extends from the bottom of the BOAT CLARIFIER® unit into the flow of the oxidation ditch channel. This lets the sludge be drawn back into the oxidation ditch for further digestion, without the need for return activated sludge pumping.

Mixed liquor in the aeration basin is maintained at the desired concentration by using a continuous flow thickener for each oxidation ditch, which were also provided by United Industries. This type of thickener allows the sludge age to be maintained at a constant level, even under fluctuating influent strengths and flows. The sludge is removed from the stern of the clarifier and transported to the sludge digester/holding tank. Eventually, it is hauled off for land application.

Sludge return pumps and associated mechanical equipment are eliminated, along with their operation and maintenance expense. Another advantage to this clarifier is its material of construction. The entire unit is fabricated in stainless steel, which eliminates the need for field painting.

Clear water travels horizontally into the "bow" of the clarifier, where the water level in the ditch is controlled by an adjustable weir. Total Suspended Solids (TSS) effluent from the clarifier, usually in the range of 6 to 8 milligrams per liter (mg/l), is chlorinated and filtered, prior to re-use.

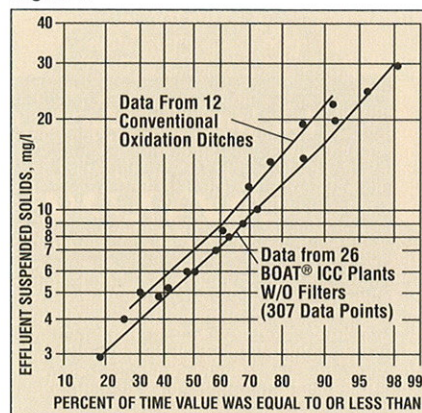
From the first day of operation, effluent has been excellent. Discharge levels from the filter have remained under 4 mg/l for BOD and 2 mg/l for TSS (Figure 3). High-quality effluent was main-

tained during periods of peak hydraulic flows, and there never has been a violation of the discharge permit.

Because the facility was designed around the BOAT® intra-channel clarifiers rather than an external system, a comparison of effluent qualities between the two was performed. In 1978, EPA funded a research study that included effluent from a number of oxidation ditch plants using external clarifiers. Data from the resulting technical report were included in the Manual Of Practice (MOP-8) recently issued by the Water Environment Federation. Effluent from the BOAT® intra-channel (before the filters) can be compared to effluent data reported from external clarifier facilities. In fact, effluent data from the facility at Central County Utilities is very similar to other treatment plants in the United States, which also use BOAT® intrachannel clarifiers. Effluent results from treatment plants using external clarifiers have been compared to those facilities using BOAT® intra-channel clarifiers (Figure 4).

The first stage, of construction for the plant at Central County Utilities consisted of a 1 million gallon per day oxidation ditch with brush rotors and an intra-channel clarifier system. The process

Figure 4



phase of this facility (consisting of the ditch, aerators, clarifier, and sludge holding tank) was constructed for about \$1 million, or about \$1 per gallon. Due to potential growth in the area and the availability of low-cost financing, a second oxidation ditch system was constructed in 1988. A single eight-hour shift is the only manpower required to operate and maintain the plant, thus minimizing operating and maintenance costs. The facility in 1989 won the coveted Earle B. Phelps Award presented yearly to the best treatment and re-use system in the state of Florida.



This treatment plant was the first of its kind in the world. The wastewater treatment and re-use system was designed to meet the needs of the exclusive Prestancia residential community, which was planned and developed by Mr. Hugh Culverhouse. Mr. Culverhouse also owns the Tampa Bay Buccaneers of the National Football League.

Figure 3

Year	BOD ₅	TSS
1986	8.70 mg/l	2.30 mg/l
1987	4.46 mg/l	4.00 mg/l
1988	3.28 mg/l	1.67 mg/l
1989	1.77 mg/l	1.98 mg/l
1990	2.23 mg/l	2.05 mg/l
1991	1.43 mg/l	1.11 mg/l
1992	0.93 mg/l	0.67 mg/l
Average	3.26 mg/l	1.97 mg/l

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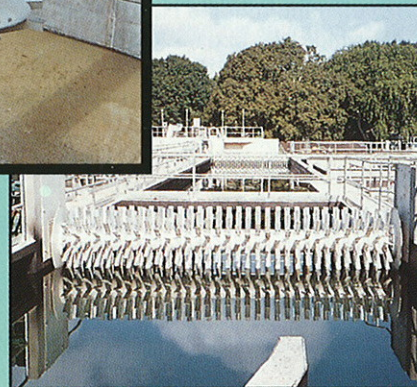
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