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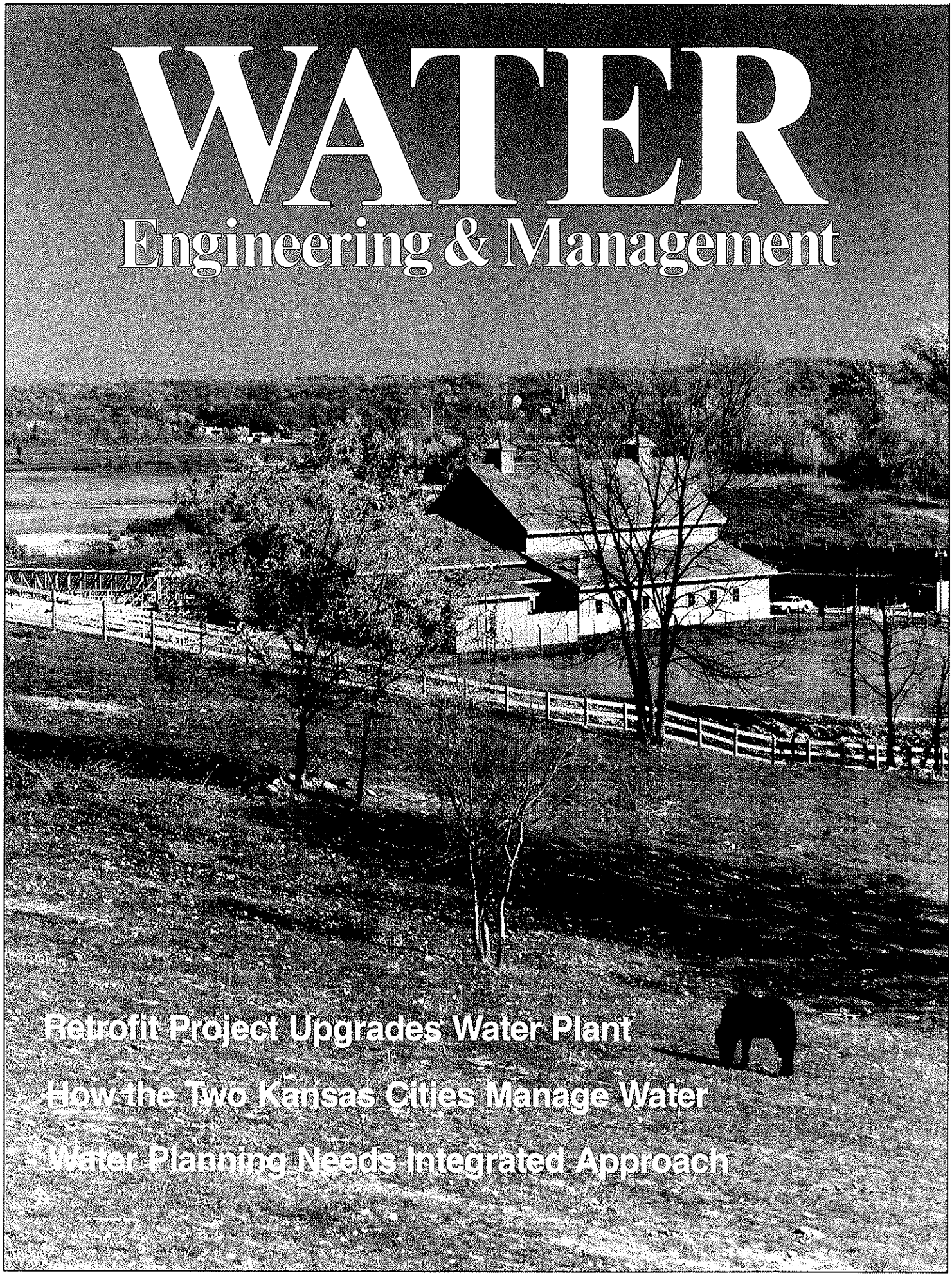
# WATER
## Engineering & Management



Retrofit Project Upgrades Water Plant

How the Two Kansas Cities Manage Water

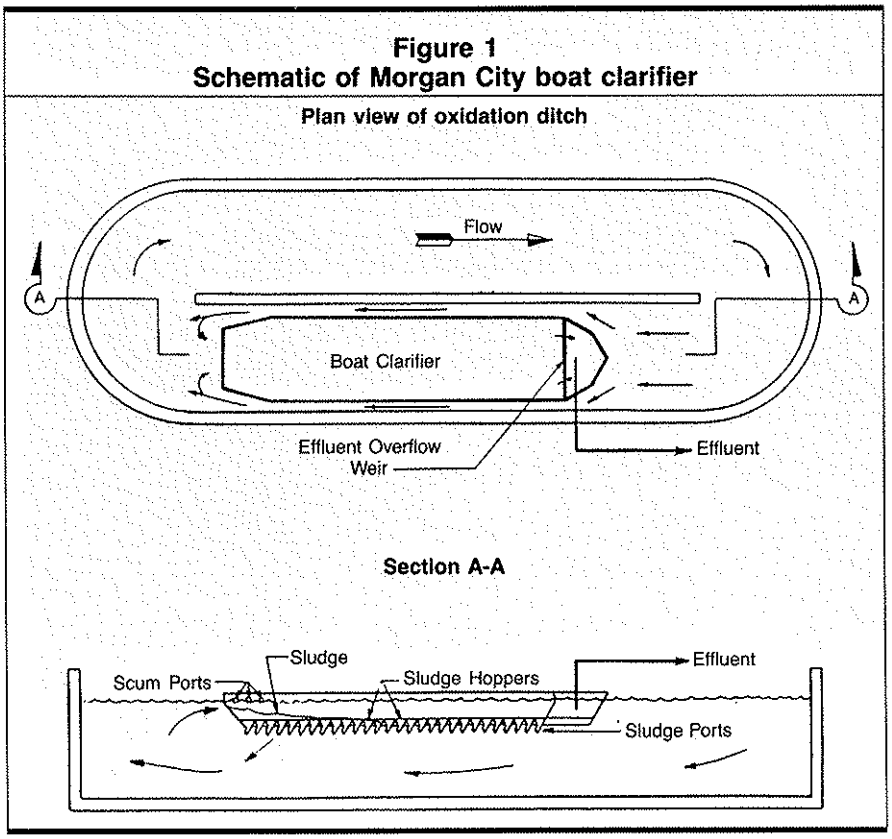
Water Planning Needs Integrated Approach

*Intrachannel clarification is a modification of the oxidation ditch process for wastewater treatment. A number of versions have been developed, and one design of this promising, cost-effective system was tested successfully in full scale conditions last summer in a Louisiana facility.*

# Oxidation Ditch Modification Shows Promise

Full scale performance evaluation of a novel liquid - solids separation system has been conducted with success at a wastewater treatment plant in Morgan City, Louisiana. Known as the Boat Clarifier, this device is based on *phase separation* as opposed to conventional *settling*. Three were installed in oxidation ditches at Morgan City and proved to be effective in improving mixed liquor solids separation rates. Other benefits were also obtained from their introduction.

**Figure 1**
**Schematic of Morgan City boat clarifier**




The device's name was derived from its shape, which was fixed after design work indicated this shape would minimize friction losses in channel flow. **Figure 1** (plan view) shows the "bow" and the "stern" clearly. Since the clarifier does not extend across the full width of the oxidation ditch channel, the flow of liquid along its sides facilitates scum removal from the surface. The mixed liquor flow actually enters the boat at its stern (see arrows in **Figure 1**), producing a low energy inlet zone. This encourages an even laminar flow along its length to the bow, where a weir controls the effluent's exit. Sludge hoppers fitted with removal ports are situated 5 to 6 ft below the surface in the boat. They extend into the channel flow passing below the boat. A head differential is generated by the somewhat higher channel velocities and this promotes the return of settled sludge in the boat to the main stream. Sludge detention time in the boat is relatively short. A limited amount of thickening of the separated solids does occur during this period however.

This system is said to simplify the oxidation ditch activated sludge process, which is already considered to be one of the least-

*Information for this article was provided by H. D. Steusel, Associate Professor of Environmental Engineering, University of Washington, Seattle, Washington in a paper entitled "Evaluation of the Boat Clarifier Performance at Morgan City, Louisiana.*

**Table**
**Intrachannel clarification performance at Morgan City**

| | July 1986 | | August 1986 | |
|---|---|---|---|---|
| | Influent | Effluent | Influent | Effluent |
| **Flow,** mgd | 4.3 (3.3-8.0) | | 4.5 (2.9-8.7) | |
| **BOD,** mg/l | 124 (106-149) | 7 (3-12) | 140 (71-243) | 7 (5-15) |
| **TSS,** mg/l | 253 (148-356) | 7 (3-15) | 162 (52-348) | 6 (2-19) |
| **Temp C** | 28 | | 28 | |
| **Reactor** | | | | |
| **MLSS,** mg/l | 3040 (2500-3513) | | 2740 (2370-3240) | |
| **MLVSS<** mg/l | 1424 (1226-1673) | | 1254 (1093-1507) | |
| **% Volatile Solids** | 47 | | 46 | |

*Parentheses indicate range of values*

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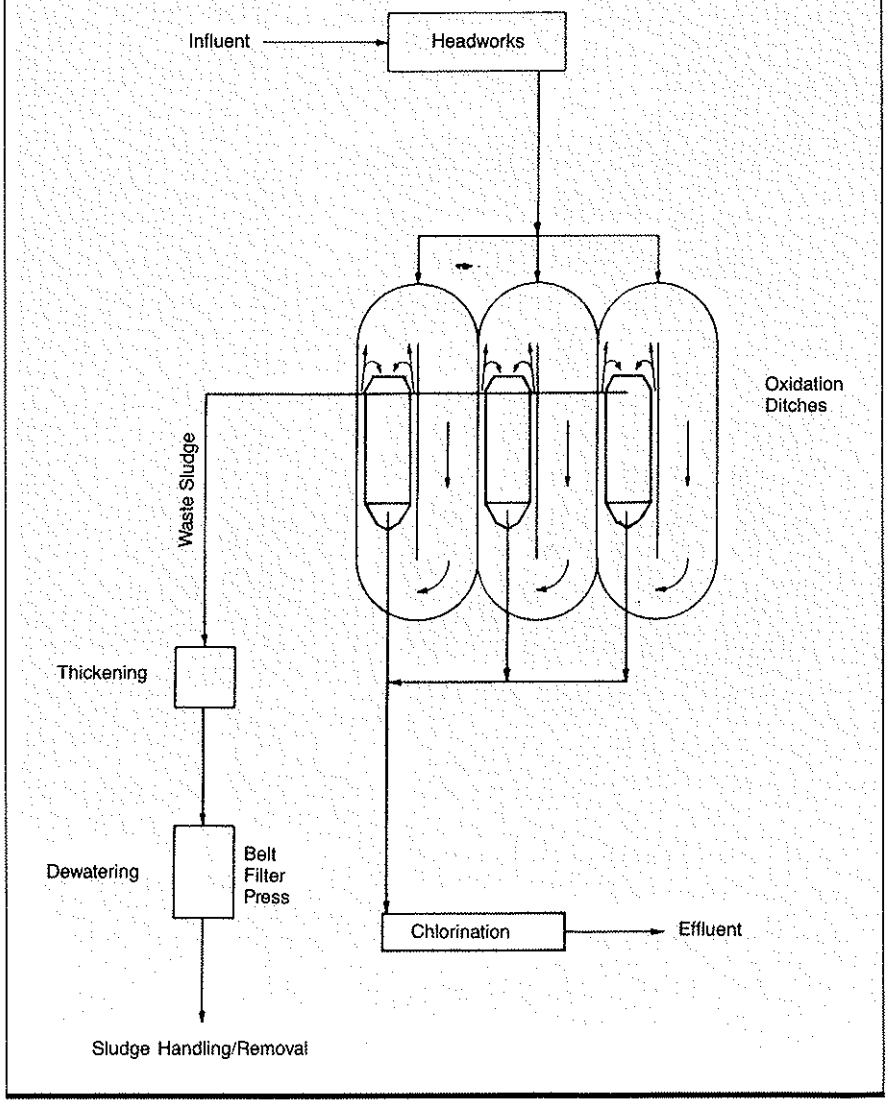
complex biological treatment methods. Mounting it within the ditch eliminates the need for an external clarifier with accessory piping and pumps for sludge removal. Operation and maintenance requirements are reduced, and the engineers who developed the scheme believe it will operate with fewer problems than conventional designs in cold weather area applications.

A schematic of Morgan City's wastewater plant is shown in **Figure 2**. Three oxidation ditch units with a surface aerator at each end have been retrofitted with three Boat Clarifiers. The stainless steel units were designed and built by United Industries, Inc. of Baton Rouge, Louisiana. Ditch channels are 24 ft wide while the boats are 22 ft wide and just under 100 ft long. Each has 31 rows of sludge hoppers located 30 in. apart. Average design flow for each modified ditch is 1.0 mgd. After heavy rainstorms much higher flows have been encountered, and rates between 10 and 20 mgd have been experienced for several hours.

How the plant performed with the intrachannel clarification retrofit in place can be seen in the table. The time period involved was July and August of last year. The average suspended solids concentration was achieved at flows that were 3-and-a-half times the design flow. Results also indicated the system performed in a manner that would place it in the upper 50 percentile group when the data were compared to those from studies of a number of other oxidation ditch systems. Complete nitrification and partial denitrification were also obtained. A well-flocculated, rapid-settling sludge was produced during the performance testing. □

**Figure 2**
**Schematic of Morgan City wastewater treatment facility**



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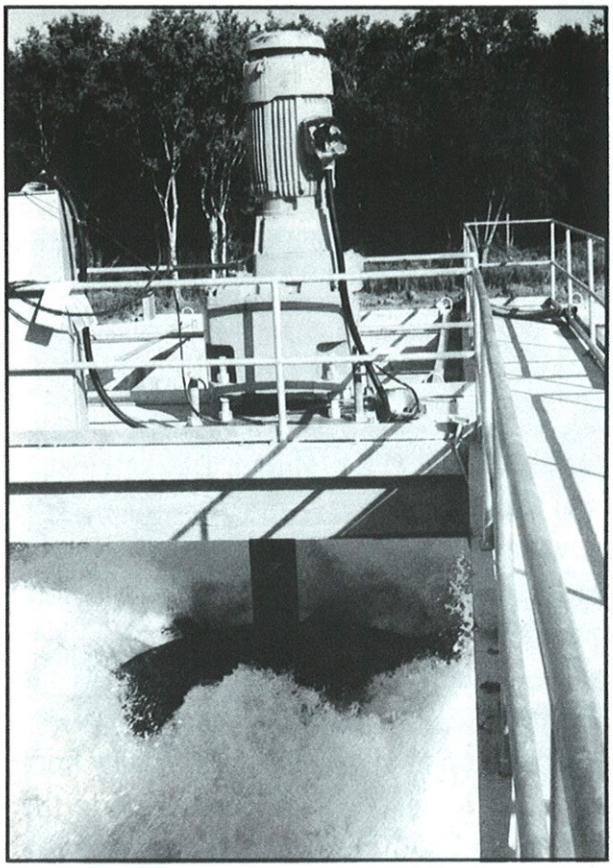

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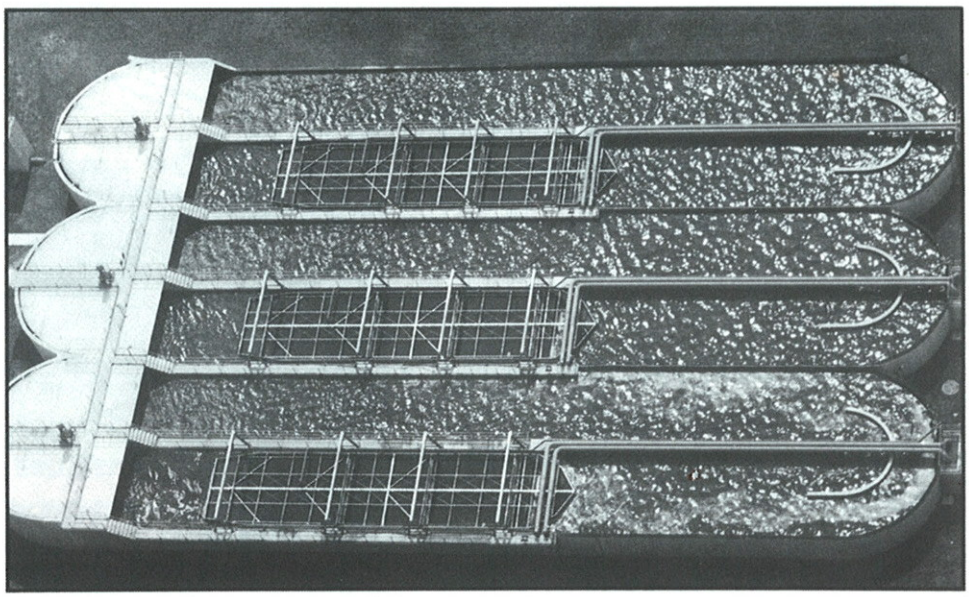

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