- Sedalia, MO - 2.6 MGD
- Gallatin, MO - 0.225 MGD

These proposed innovative facility plans also include modifications such as a shorter hydraulic detention time, peak flow clarifiers, propellor-type mixers, and fine bubble aeration that contribute in part to the projected cost savings for the four facilities shown in Figure 4.

Actual bid costs for the 40 MGD Little Blue Valley project (Jan. 1983 $) were projected to be $23,808,000 for the total treatment plant. Bid costs relative to the Intrachannel Clarifier portion of the project were $6,158,700 for two 10 MGD aeration-clarification basins. This represents a cost of slightly less than $.31 per gallon of treatment capacity.

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United States Environmental Protection Agency

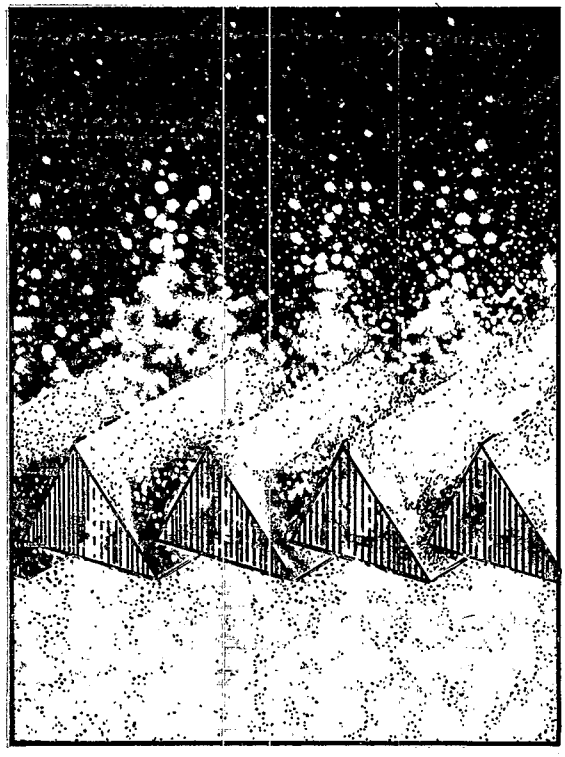
June 1983

EPA

An Emerging Technology

Intrachannel Clarification

A Project Assessment



Intrachannel Clarification - A Project Assessment of a Pi

Introduction

Community leaders are becoming more and more cost conscious when selecting wastewater treatment alternatives. Initial capital investments will continue to be important, but operation and maintenance costs will become a greater consideration in process selection. This cost awareness is leading consulting engineering professionals to seek more innovative solutions to meet their clients' needs. One example of this approach is an Intrachannel Clarifier system developed by Burns & McDonnell of Kansas City, Missouri, in cooperation with the staff of the Little Blue Valley Sewer District, Kansas City, Missouri, Metropolitan Area. This cost-saving approach to modify the oxidation ditch process has become an integral part of the District's planned 40 MGD treatment facility, which will serve a 238 square mile watershed area.

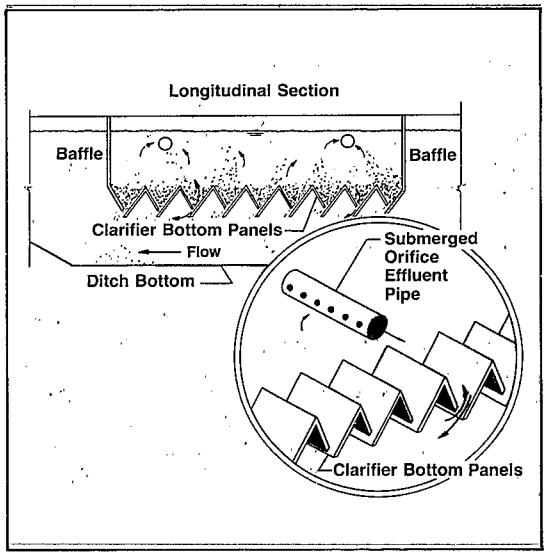


Figure 2 Clarifier Longitudinal Cross-Section

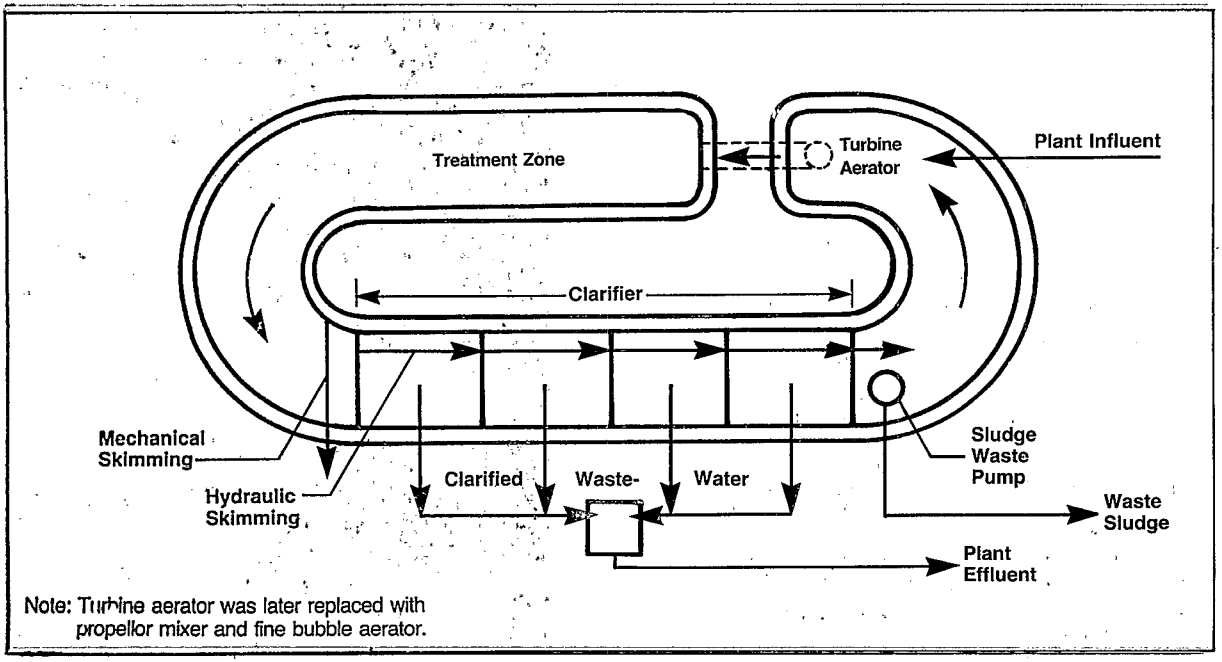


Figure 1 Process Plan View for the original 1.0 MGD Little Blue Valley Pilot Plant

romising Process Modification

Sludge Age	**10 Days**
Overflow Rate	**600-800 gallon per day per sq. ft.**
Mixed Liquor Concentration	**3,000-3,500 mg/l**
Aeration	**10 hr.**
Effluent Quality	**< 20 mg/l BOD_5 < 20 mg/l SS**

Table 1 Typical Pilot Plant Operating Conditions

This process modification was tested and demonstrated as part of a Step II construction grant from the U.S. EPA and was selected as one of the Ten Outstanding Achievements in the National Society of Professional Engineers' 16th Annual Competition.

This fact sheet brings this emerging technology to the attention of potential users. Although the fact sheet describes the Burns & McDonnell Intrachannel Clarifier design, there are currently two other designs for this process which have been developed by EIMCO and Beard Engineering, Inc.

The Process

The Intrachannel Clarifier is a modification of the oxidation ditch process which combines the aeration and clarification processes in one basin. The screened wastewater enters the basin, is aerated, and then passes under the Intrachannel Clarifier where a mixture of the wastewater and activated sludge (mixed liquor) rises through the clarifier bottom panels. As the mixed liquor flows up into the clarifier, solids settle, fall through the bottom openings and return to the continuously flowing mixture. Effluent is removed from the quiescent zone in the upper portion of the Intrachannel Clarifier via the submerged orifice effluent pipe. Figure 1 to the left shows a plan view of the original pilot process. Figure 2 shows a cross-section of the clarifier.

Field Testing

The Intrachannel Clarification concept was tested as a wastewater treatment solution that would reduce capital and O&M costs for the Little Blue Valley Sewer District's planned 40 MGD facility. This concept has been demonstrated via pilot-scale at the site of the District's 20 MGD Interim Treatment Plant. The pilot plant is an oval basin - 110 feet long by 32 feet wide - with a liquid depth of six feet. The pilot plant was designed to treat 1 MGD of screened wastewater and has operated at flow rates from 0.3 MGD up to 1.3 MGD. Table 1 shows typical operating conditions for the pilot plant. A novel aeration system consisting of a slow rpm propellor-type mixer and fine bubble aeration was tested and is proposed for the full-scale 40 MGD system. Figure 3 below shows the process schematic for the planned 40 MGD facility.

Projected Advantages

Pilot results indicate the Intrachannel Clarifier eliminates many of the problems associated with conventional secondary clarifiers. There are no sludge blankets or compression zones, and the full depth of the clarifier is available for maximum settling. As the solids settle in the clarifier, they also act as a nucleus to attract and remove material in the liquor

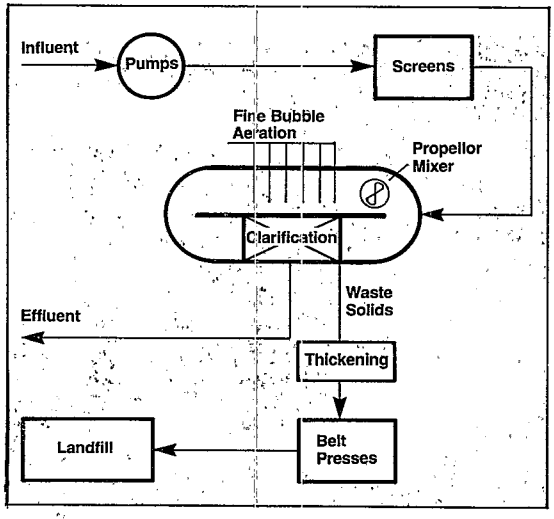


Figure 3 Schematic of Planned Full-Scale System

flowing upward into the quiescent zone. The underflow beneath the clarifier pulls the settling solids back into the mixed liquor stream without the use of a return sludge pump. Thus, no control over sludge return is necessary and sludge age is easily controlled by wasting mixed liquor.

Many pieces of equipment associated with conventional activated sludge processes are not needed with this system. The system also has a major advantage over the conventional oxidation ditch because the hydraulic detention time is lower (10 hrs. vs. 24 hrs.), resulting in a smaller basin volume and associated cost savings.

Cost Comparisons

Projected capital and first year operation and maintenance (O&M) costs for proposed facilities which incorporate Intrachannel Clarification and for conventional oxidation ditch technology are shown in Figure 4. These curves are based on estimated costs (1982 $) for the following four proposed municipal wastewater treatment plants:

- Little Blue Valley Sewer District (Jackson County, MO) - 40 MGD
- Storm Lake, IA - 3.34 MGD

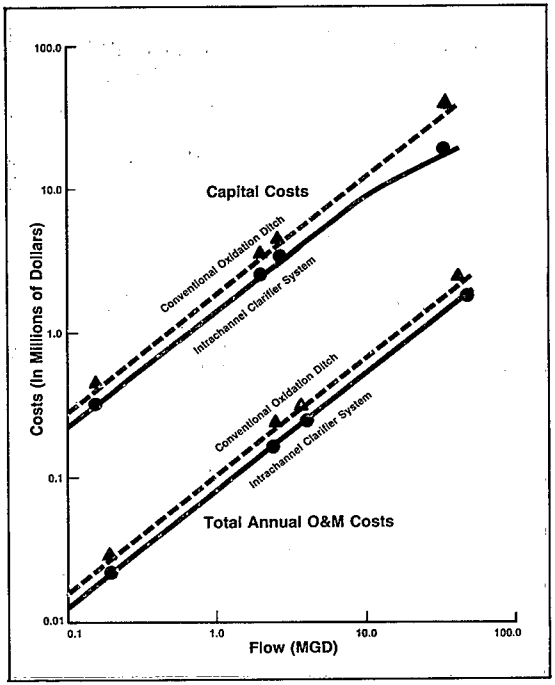
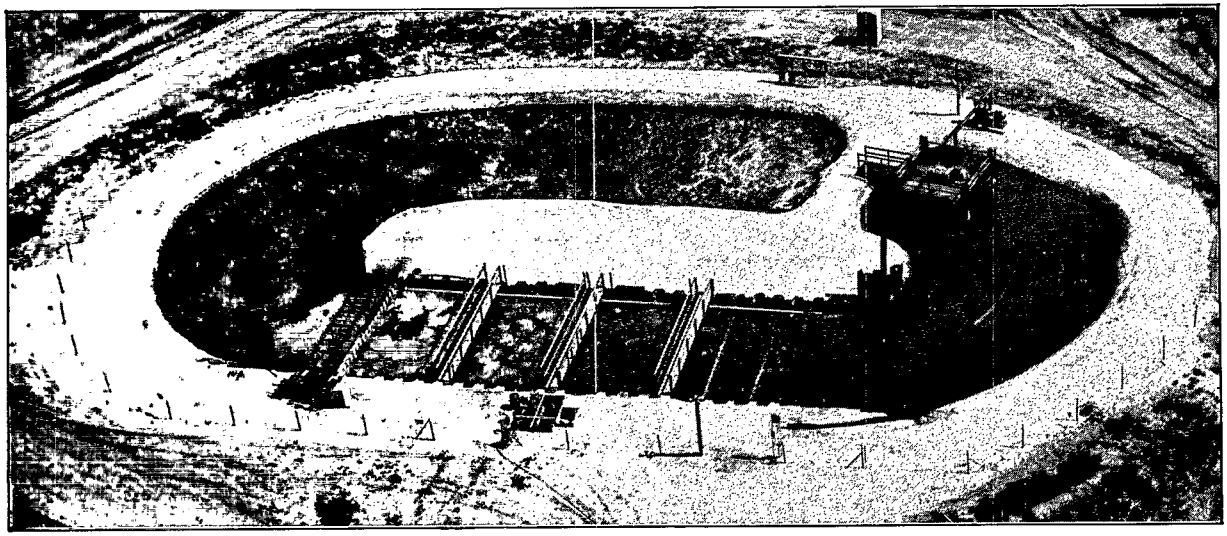


Figure 4 Cost Curves



Original 1 MGD Pilot System at Little Blue Valley Sewer District