BULLSEYE™

NUTRIENT REMOVAL PROCESS

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The **BULLSEYE™** nutrient removal process is an unique, proven process designed to provide an enhanced capability to new and existing treatment plants to meet future, stringent discharge permits. New and proposed regulations have begun to require that discharge permits for treatment facilities include low levels of nutrients in the effluent. The biological removal of nutrients can be easily and cost-effectively accomplished by incorporating this patented, concentric-ring process.

The basic principle of operation is to create a specific, biological environment by combining the raw influent with a specific volume of mixed liquor which is transferred from the low-dissolved oxygen area of the aeration basin. Since the mixed liquor contains a large population of very active microorganisms, the wastes are immediately broken-down and practically all of the remaining dissolved oxygen is quickly utilized. Once the dissolved oxygen is consumed, denitrifying bacteria begin to utilize the influent wastes to break-down the oxidized nitrogen compounds, thereby converting the nitrates to nitrogen gas.

Some anoxic designs only incorporate a single tank with multiple mixers (Figure 1-A). However, this configuration allows for hydraulic "short-circuiting". New manuals of engineering practice recommend "two to four compartments", especially in regards to phosphorous removal, for enhanced performance. Multiple compartments can be designed to prevent the short-circuiting allowed by single tank system (Figure 1-B). However, "dead zones" may still occur in the corners of square and rectangular tanks.

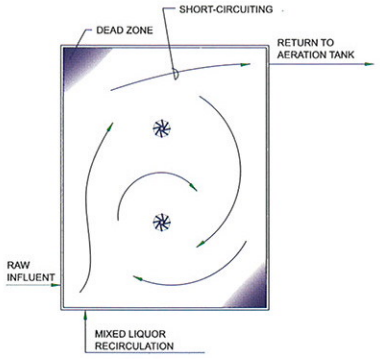


Figure 1-A

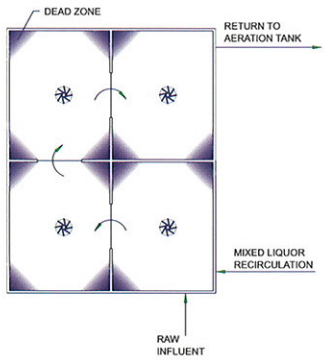


Figure 1-B

The geometric design of external tanks for nutrient removal can vary, along with the results..

The unique geometric design of the **BULLSEYE™** system prevents any hydraulic "short circuiting" and minimizes the potential for any "dead zones" (Figure 2). This multiple ring design can utilize two, three, or four zones depending on the flow rates, influent conditions and effluent requirements. The detention time of each zone varies, with the center ring sized to also act as a "selector".

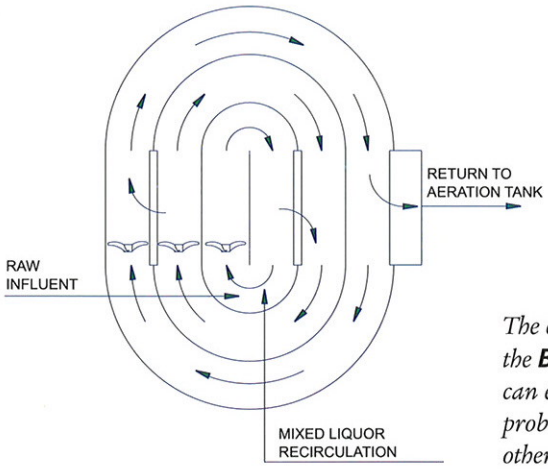
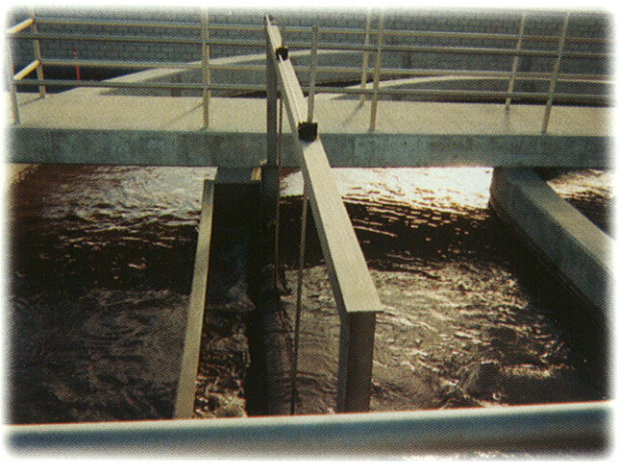


Figure 2

*The concentric ring design of the **BULLSEYE™** system can eliminate the potential problems associated with other tank designs.*

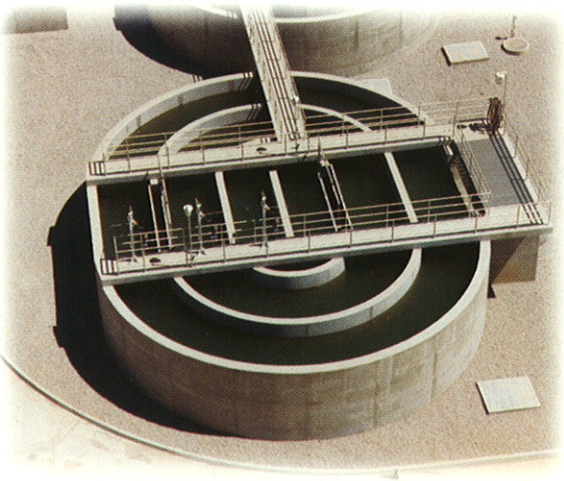
State-of-the-art Technology... eliminating costly manpower.



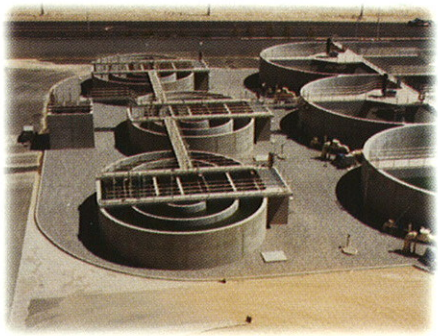
The stainless steel transfer vaults force the flow from the top of one zone to the bottom of the next. Therefore, all "short-circuiting" can be eliminated. An adjustable weir allows for the control of the water level in each zone. The non-corrosive materials of construction eliminate field painting and maintenance.

The conversion of nitrates to nitrogen gas can be visually observed in the later stages of the process as the nitrogen bubbles escape from the water into the atmosphere. Each zone is mixed by a single, sub-surface propeller. Thus, mixing is accomplished without aeration and the circular design of each ring reduces any potential "dead zones" which would allow for the settlement of solids. The flow between each zone is accomplished by gravity through a specially designed transfer vault. Each vault includes an adjustable weir for elevation control and forces the flow from the top of one zone to the bottom of the next. Flow from the last zone is also returned to the aeration basin by gravity. This unique combination of concentric rings and transfer vaults eliminates hydraulic "short-circuiting" which can be found in most single-tank designs. The transfer vaults are fabricated in stainless steel, thereby eliminating the need for field painting and maintenance due to the corrosive environment.

The **BULLSEYE™** nutrient removal system is a biological process that eliminates the need for chemical feed systems for nitrogen removal. Furthermore, since the process removes a percentage of the influent BOD, existing systems which are retrofitted with this process are also provided with increased biological capacity. The power consumption of the existing aeration system can also be reduced by approximately 20%, depending on influent conditions. Phosphorous reductions can also be provided by the inclusion of additional zones and a recirculation system. Thus, complete nutrient reduction can be accomplished within a single system.



A single subsurface mixer is mounted in each zone to allow for efficient mixing, without aeration. A pump transfers the anoxic mixed liquor from the aeration tank to the center of the concentric ring layout.



A concentric-ring tank precedes each aeration vessel. This allows for the anoxic mixed liqour to be combined with the raw influent. The facility shown in the photo is the first phase of what will ultimately be a 28 mgd reclamation facility in Southern California.

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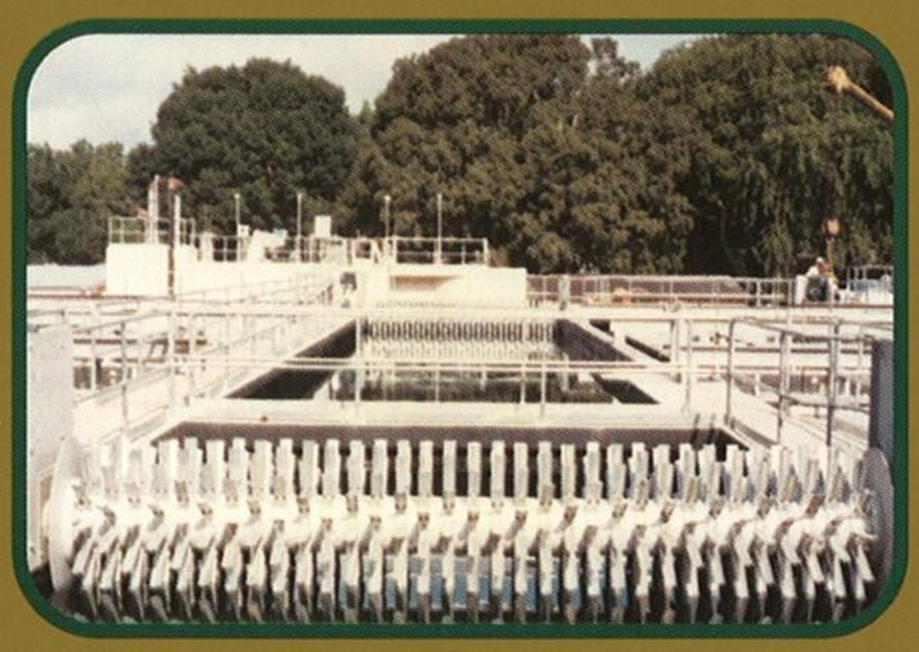

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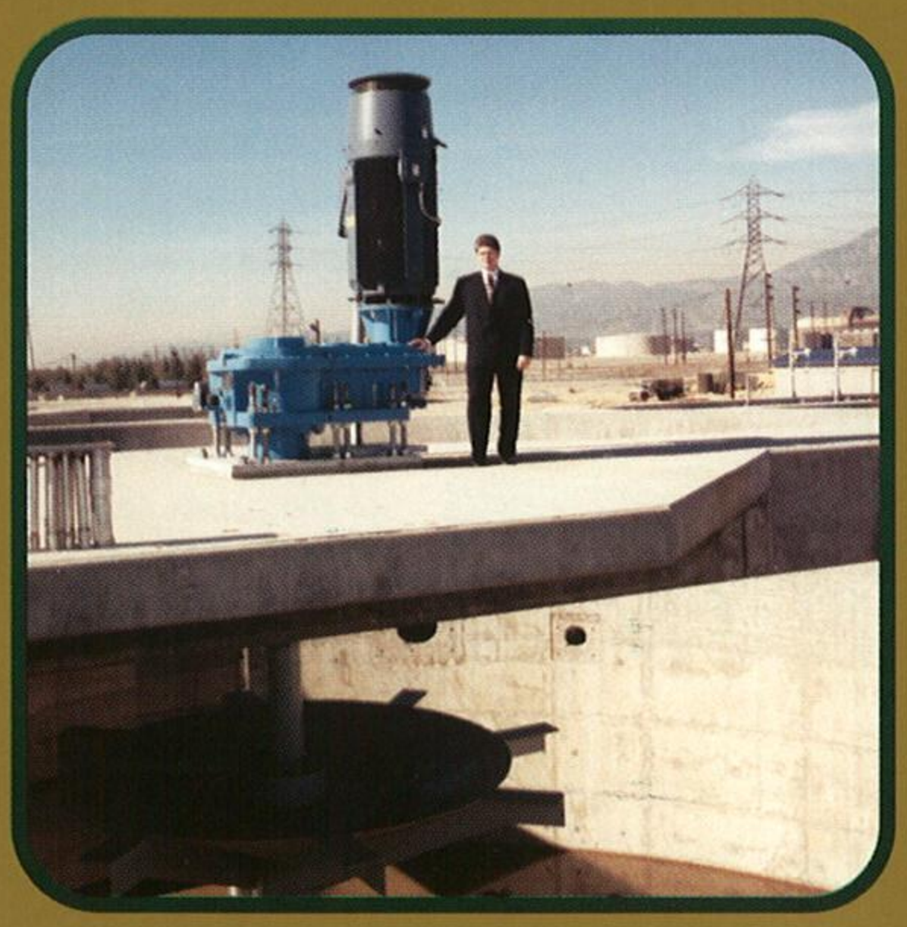

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