WATER TECH 2021

ALBERTA, CANADA

WASTEWATER TREATMENT UPGRADE IN EXISTING LAGOONS WITH NOVEL AERATION SYSTEM SYSTEM DESIGN AND FIELD EXPERIENCE

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June 3, 2021

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WASTEWATER TREATMENT UPGRADE IN EXISTING LAGOONS WITH NOVEL AERATION SYSTEM

The wastewater treatment system outlined herein employs navel aeration technology with high efficiency wastewater effluent pump and air aspirator-mixer. Multiple aeration units can be installed, as required, in aeration pumping station beside the lagoons to be upgraded or new lagoons, or concrete tanks.

Wastewater is pumped through the air aspirator-mixer which aspires air and mixes it with the wastewater pumped. The wastewater and air mixture is discharged to the lagoons for the wastewater treatment or for odour control.

The wastewater treatment is provided with activated sludge treatment process which includes wastewater aeration and activated sludge settling and recirculation to the aeration system. Two small cells with total volume of approximately two-day retention capacity can be used or one small cell can be divided to aeration and clarifier cells.

The wastewater aeration and activated sludge recirculation to the aeration system, and activated sludge waste, are done by the aeration pump.

The aeration cell and the clarifier cell are provided with perforated PVC piping mounted at the cells' bottom on concrete strips or continuous concrete floor, 100 mm thick. There is not any equipment in the cells to break or plug and be replaced which would require draining the cells.

The aerated wastewater can be used to control odour in anaerobic cells by discharging the wastewater into the cells through perforated horizontal pipe laterals installed approximately 1.2 m below the wastewater operating level and located around the cells such that there is a cross flow of the aerated wastewater through the cells. The laterals extend into the cells between 2 and 3 meters and they are spaced between 8 and 15 meters apart, and they are 75 or 100 mm diameter. The wastewater is withdrawn from the cells to the aeration system at the opposite end from the raw wastewater inlet into the cells and discharged in the area of the raw wastewater inlet. The aeration system for the odour control is independent from the aeration system for the wastewater treatment. The odour control system provides aeration and biological activity in the anaerobic cells which control odour.

The attached photograph and layout of four existing anaerobic cells A, B, C and D show existing system of wastewater treatment upgrading and odour control in anaerobic cells A and B.
The treatment system is designed for 4500 m3/day, peak day flow, Phase 1 and 9000 m3/day, peak day flow, Phase 2, Phase 1 was installed.

Two anaerobic cells A and B are retained as anaerobic and cell D is used for aeration and cell C is used as clarifier for activated sludge settling and recirculation to the aeration system. Waste activated sludge is discharged to anaerobic cells A and B.

The aeration system uses four 30 hp high efficiency effluent wastewater pumps, one pump is used for the anaerobic cells A and B odour control and two pumps are used for the wastewater

aeration in cell D and activated sludge recirculation from cell C. One pump is stand-by to both aeration systems.

The treatment system outlined above includes the following features and benefits:

-The treatment system can be designed to secondary treatment level for control of TSS and CBOD or to tertiary treatment level with nutrient control in BNR system.

-The treatment system aeration provided with air aspirator-mixer and wastewater recirculation pump provides high efficiency oxygen transfer to wastewater as the wastewater and air contact begins at the air aspirator-mixer and it continues in the downstream piping and in the aeration cell. The oxygen transfer can be over 50%. Air blowers and diffusers are not used.

-The air supply to the air aspirator-mixer may contain dust or odour from headworks or other treatment units.

-The aeration cell is provided with engineered perforated PVC pipes perforated at the top with small holes for air discharge and at the bottom with larger holes for wastewater discharge to provide uniform supply of aerated wastewater throughout the aeration cell.

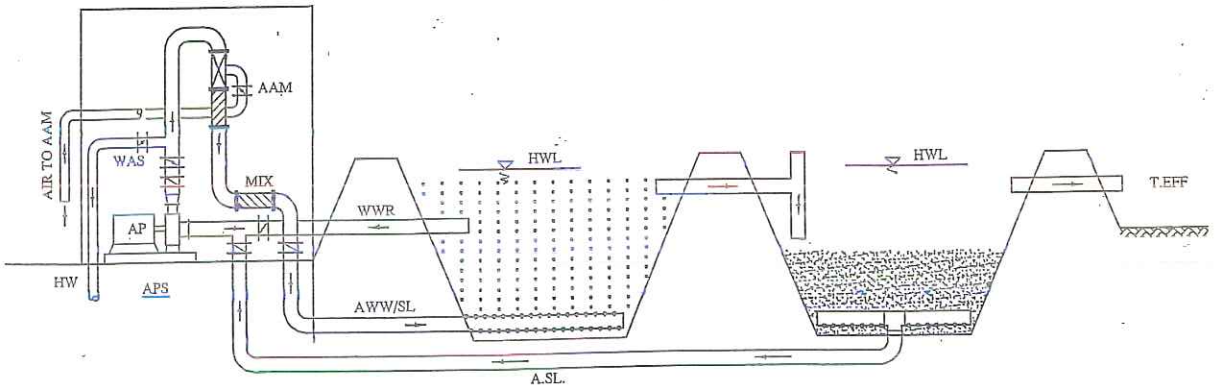
-The secondary clarifier call is provided with engineered perforated PVC pipes perforated at the bottom for uniform collection if activated sludge throughout the cell. Sludge scrapers are not used.

-The wastewater recirculation pump provides three functions; aerates wastewater in aeration cell, returns activated sludge from secondary clarifier to aeration cell and wastes access activated sludge to sludge holding cell.

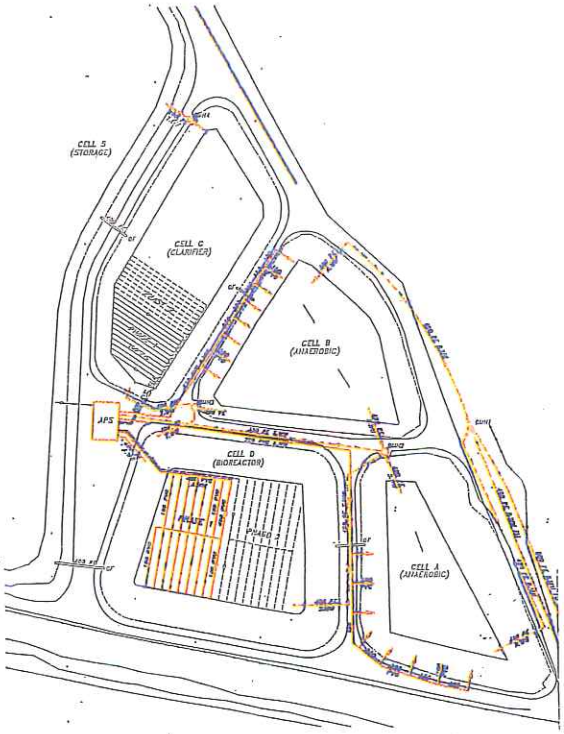
-The multi-function of the wastewater recirculation pump ensures high performance and operating efficiency with less costly and locally available equipment.

-The system is not prone to plugging with suspended solids or dust which eliminate needs for the system shutdown, repairs or replacements and which reduces operating costs.

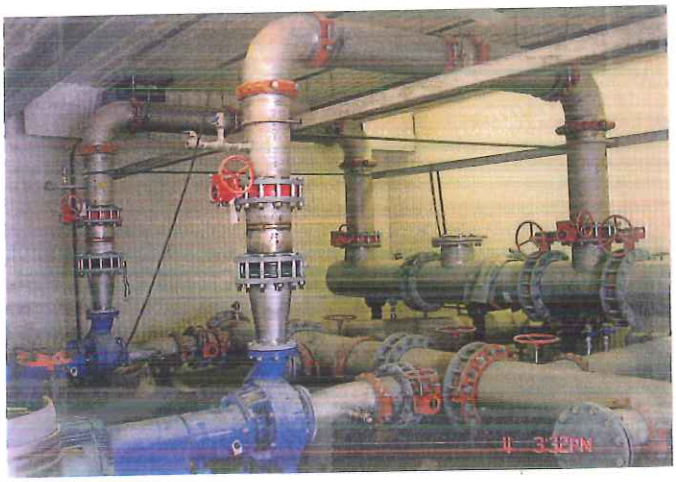
-The overall installation and operating costs are 30 to 40% lower than those of conventional treatment systems.



AERATION CELL CLARIFIER CELL



PIPING LAYOUT IN AERATION AND CLARIFIER CELLS



AERATION PUMPING STATION

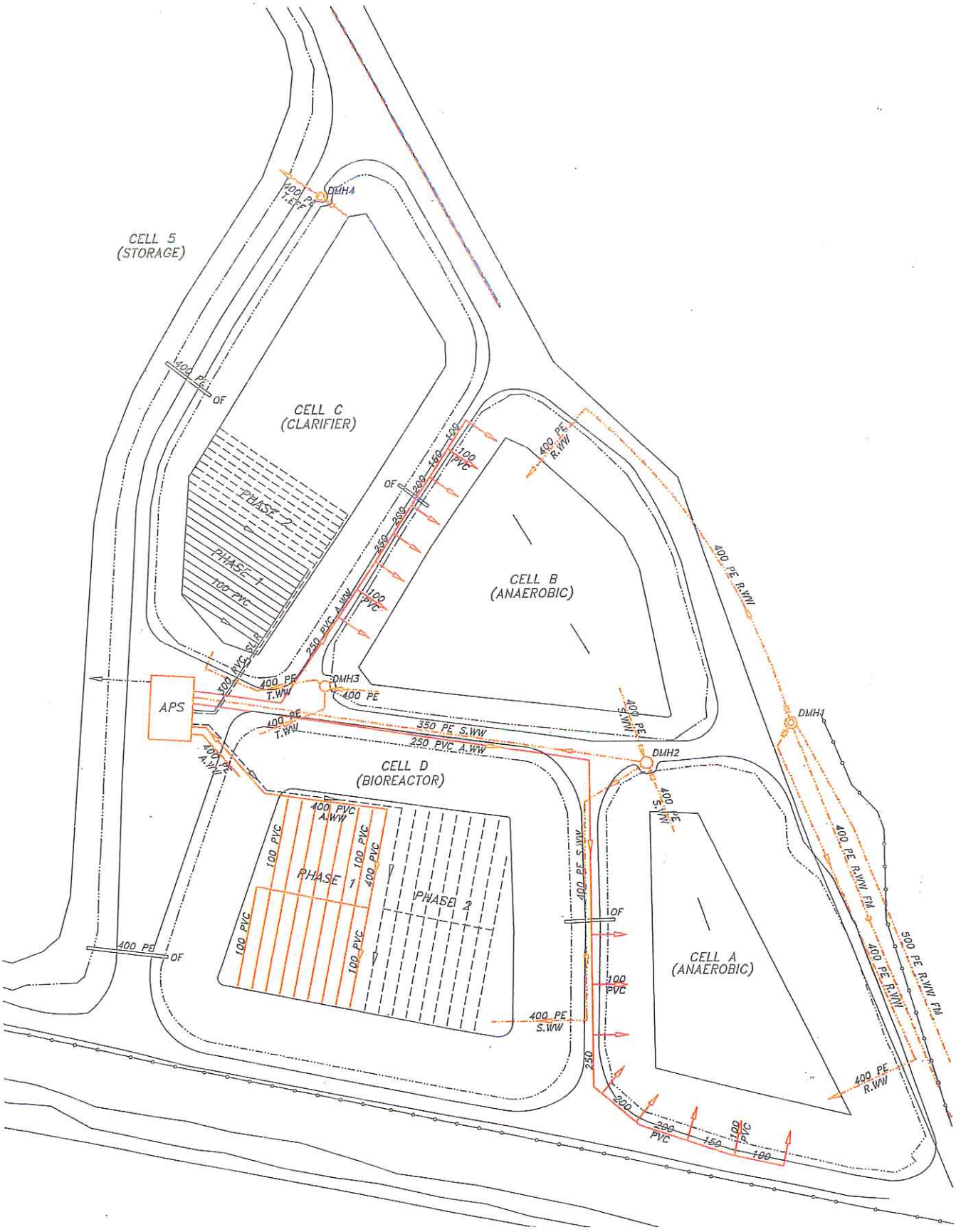
ABBREVIATIONS:

AAM - AIR ASPIRATOR-MIXER
A.SL - ACTIVITED SLUDGE
AWW/SL - AERATED WASTEWATER AND SLUDGE
HW - HEADWORKS
HWL - HIGH WATER LEVEL
T.EFF - TREATED EFFLUENT
WWR - WASTEWATER RETURN

WASTEWATER AERATION WITH PUMP AND AIR ASPIRATOR - MIXER IN ACTIVATED SLUDGE TREATMENT PROCESS DEVELOPED IN LAGOON CELLS

ANAEROBIC LAGOON AERATION WITH AIR
ASPIRATOR-MIXER AND PUMP TO ELIMINATE ODOUR

LAGOON AERATION SYSTEM WITH
AIR ASPIRATOR–MIXER AND PUMP



EXISTING LAGOON ANAEROBIC CELLS USED FOR
DEVELOPMENT OF ACTIVATED SLUDGE TREATMENT SYSTEM