File No.:	Environment Act Licence No.: 3158

Legal name of the Licencee: Lactalis Canada Inc

Name of the development: Installation of a Gas Energy Mixing system at Winnipeg facility

Category and Type of development per Classes of Development Regulation:

Agriculture — Dairy plants

Licencee Contact Person: Ray Sinclair

Mailing address of the Licencee: 330 Mazenod Rd

City: Winnipeg Province: MB Postal Code: R2J 4L7

Phone Number: (204) 654-6910 Fax: Email: ray.sinclair@ca.lactalis.com

Name of proponent contact person for purposes of the environmental assessment (e.g. consultant):
Kevin Poirier, Director and Principal Consultant, SCV Consulting Ltd

Phone: (519) 993-8040 Fax:	Mailing address: 5870 6th line, RR1, Rockwood Ontario, Canada

Email address: kpoirier@scvconsultingltd.com

Short Description of Alteration *(max 90 characters)*:
Lactalis Canada Inc plans to install a gas energy mixing system for wastewater treatment.

Alteration fee attached: Yes: ☑ No: ☐

If No, please explain:

Date: 2023-05-10	Signature: [redacted] Printed name: Ray Sinclair

A complete Notice of Alteration (**NoA**) consists of the following components:

- ☑ **Cover letter**
- ☑ **Notice of Alteration Form**
- ☑ **1 hard copy and 1 electronic copy of the NoA detailed report** (see "Information Bulletin - Alteration to Developments with Environment Act Licences")
- ☑ **$500 Application fee, if applicable** (Cheque, payable to the Minister of Finance)

Submit the complete NoA to:
Director, Environmental Approvals Branch
Manitoba Conservation and Climate
1007 Century Street
Winnipeg, Manitoba R3H 0W4
EABDirector@gov.mb.ca

For more information:
Phone: (204) 945-8321 Fax: (204) 945-5229
https://www.gov.mb.ca/sd/permits_licenses_approvals/eal/licence/index.html

Note: Per Section 14(3) of the Environment Act, Major Notices of Alteration must be filed through submission of an Environment Act Proposal Form (see "Information Bulletin – Environment Act Proposal Report Guidelines")

June 9th, 2023

Via Email to: Housseini.Coulibaly@gov.mb.ca

Housseïni D. Coulibaly, PhD
Manager, Research & Program Support
Environmental Approvals Branch
Department of Environment and Climate
Government of Manitoba
Box 35, 14 Fultz Blvd
Winnipeg, Manitoba, R3Y 0L6

Environment Act License No. 3158

Re: Notice of Alteration - Installation of a Gas Energy Mixing (GEM) system at Lactalis's Winnipeg facility

Dear Mr. Coulibaly,

SCV Consulting Ltd. (SCV) has been retained by Lactalis Canada Inc. (Lactalis) to provide support with the submission of a Notice of Alteration (NoA) for the installation of a Gas Energy Mixing (GEM) system at Lactalis's Winnipeg facility.

Lactalis Canada Inc. operates a dairy processing facility at 330 Mazenod Rd, Winnipeg. The facility is located in an industrial area on the east side of Winnipeg. This Lactalis Canada Inc. facility is currently operating under Environment Act License No. 3158, revised on November 25, 2015. As per the Environment Act (Section 14), Lactalis Canada Inc. is required to notify and receive approval from the Director prior to any alterations to the facility regarding this license.

The purpose of installing the GEM system is to add supplementary treatment to process water discharged to the City. The GEM system will increase the removal of fats, oils and greases (FOGs) and total suspended solids (TSS) from the process water wastewater before it is discharged to the municipal sewer.

The accompanying Notice of Alteration form and cheque (numbered 519653) were sent to the Environmental Approvals Branch and received on May 24th.

Kevin D. Poirier, P.Eng, CSR-P.
Director and Principal Consultant
SCV Consulting Ltd.

1 Introduction and Background

Lactalis Canada Inc. (Lactalis) operates a dairy processing facility located at 330 Mazenod Road in Winnipeg (the Facility). The Facility receives raw milk by truck and produces liquid milk products. At present, all process water from the Facility is discharged to an onsite pumping station where it is transferred to a neutralization tank. In this tank, acid is used to neutralize the pH of the wastewater. Once the pH of the water has been neutralized, it is then discharged to the city sewer.

The Facility is currently operating under Environment Act License No. 5158, revised on November 25, 2015. The purpose of this NoA is to request approval for the installation of a new Gas Energy Mixing (GEM) system at Lactalis's Winnipeg facility. The installation of this equipment will improve the quality of process water that is discharged to the City of Winnipeg.

2 Project Description

Figure 1: GEM System (To be housed within the shipping container building). Source: Veolia Water Technologies

The proposed project includes the installation of a Gas Energy Mixing (GEM) system at Lactalis's Winnipeg. The Facility is located at 330 Mazenod Road. The GEM system will be a high-performance flotation alternative to a conventional Dissolved Air Flotation (DAF) system. This GEM system will be housed in a standalone structure on the developed area of the Facility, directly to the north of the existing factory building. A 20m^3 sludge storage tank will be constructed adjacent to the new structure (See site layout in Appendix B). The sludge tank is designed to hold four days of sludge at the system's maximum output of five cubic of sludge meters per day.

With the proposed project in place, process water will flow from the Facility to the pumping station. From the pumping station, wastewater will be sent through a manual strainer to remove all particles larger than 1mm. Following the strainer, the wastewater will be held and neutralized with acid in the neutralization tank before being processed by the GEM and finally discharged to the municipal sewer system.

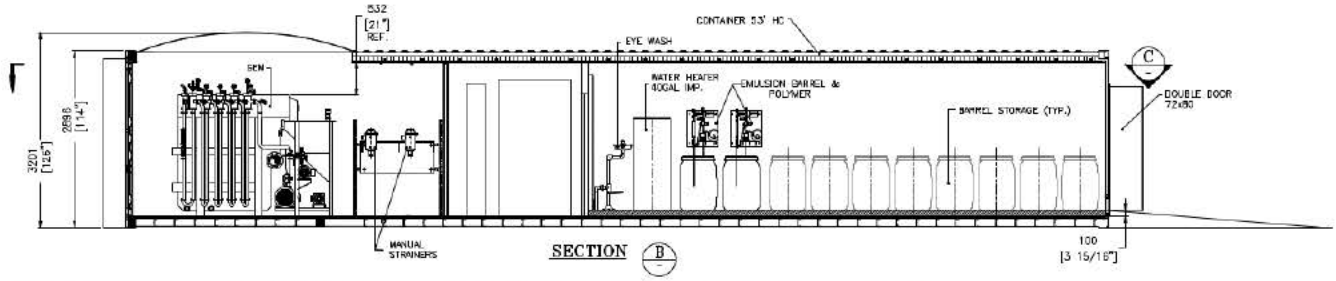


Figure 2: GEM System and auxiliary equipment within enclosure. Source: Veolia Water Technologies

The GEM facilitates the separation of FOGs from the wastewater using dissolved air which attaches to the FOGs and floats them to the surface. This process is aided with a coagulant (ferric sulfate) and anionic and cationic polymers (Hydrex 3508 and Hydrex 6606). Within the GEM system, wastewater is pumped through a series of LSGM heads where the wastewater is mixed with the coagulant, polymers and dissolved air. This process provides homogeneous mixing of the liquid contaminants with the polymers and coagulant. In this process, flocs are formed with air bubbles integrated into their structure. Additionally, the LGSM heads use centrifugal force to lengthen the polymer chains. Upon leaving the LSGM heads, these chains collapse into dense flocs. As these flocs enter the flotation tank, they rise to the surface where the floated flocs (comprised of air, FOGs and TSS) are skimmed off. From here, the sludge is transferred to a holding tank and the treated water discharged to the municipal sewer system. By separating the FOGs from the process water before discharging to the city's sewer system, Lactalis is improving the quality of the water being discharged from its facility and reducing strain on the municipal wastewater treatment plant. See Appendix A for more details.

3 Changes within the Development

Adding this GEM system to the wastewater system at this Winnipeg Lactalis facility is expected to affect the development in the following ways:

1. Addition of 53' shipping container building to house the entire GEM system (approximate size 53'x8.5'x9.5');
2. Addition of a 20m^3 sludge holding tank;
3. Modifications to Facility's process water pipes to divert process water flow to the GEM system before discharging to the City sewer system, and;
4. Minor excavation required to connect the GEM system to the sewer system and connect electrical utilities required to run the equipment.

A site map showing the addition of the GEM within the shipping container is attached in Appendix B.

4 Potential Environmental Effects

This proposed GEM system is designed to improve the quality of the process water discharged from Lactalis's Winnipeg facility to the municipal sewer system. The improved quality of the wastewater will be accomplished by separating and removing FOGs and TSS from the process water. The FOGs and TSS will be removed using a combination of coagulant, polymers, and gas energy mixing which floats the FOGs and TSS to the surface where they are skimmed off and pumped to a sludge holding tank. This improvement to Lactalis's wastewater quality will reduce the processing requirements for the City of Winnipeg's water treatment facility and will further support the Lactalis Winnipeg facility in maintaining compliance with local wastewater regulations.

4.1 Wastewater

The addition of the GEM system to Lactalis Winnipeg's facility will reduce the concentration of FOGS and TSS in its discharged process wastewater. In preparation for this application and the viability of the system, a treatability test was completed by Veolia Water Technologies Canada Inc. using process water from Lactalis's Winnipeg facility. These laboratory bench scale trials were conducted at Veolia's facility in Ville Saint-Laurent, QC. The Wastewater Treatability Test showed that, using the specified coagulant and polymers, the following reductions were achieved:

1. Reduction in total suspended solids of 99.7%;
2. Reduction in chemical oxygen demand of 64.5%, and;
3. Reduction of fats, oils and grease of 98.3%.

These reductions clearly demonstrate a significant increase in the quality of the water being discharged from Lactalis's Winnipeg facility to the municipal sewer system. It should be noted that these tests did not factor in the manual filtration stage that will be included in this installation. This manual filtration will remove particles larger than 1mm before the wastewater is neutralized and processed through the GEM system. More details on the Treatability Tests Report can be found in Appendix C.

4.2 Surface Water

The addition of the GEM system is not anticipated to have any significant effect on either surface water runoff or runoff quality. The GEM system will be place on a currently paved (impermeable) surface and is not expected to alter the flow of runoff. Runoff will continue to be directed to the appropriate catch basins. Any excavation completed during the installation of new process water pipes will be minimal and appropriate best management practices for construction site management will be applied to mitigate any sediment from the excavation from entering the stormwater system.

4.3 Solid Waste

Sludge comprised of FOGs and other suspended solids from wastewater is a product of the GEM system. The sludge is skimmed from the separation tank of the GEM system and pumped to a sludge storage tank. The tank is designed to hold a minimum of four days at the maximum operating capacity of the GEM. This sludge will be trucked off site by an authorized third-party company every two days for treatment.

4.4 Noise Emission

The GEM system is enclosed within a shipping container, dampening any potential noise emissions. It is not expected that the enclosed GEM system will produce any significant changes or will have any significant impacts to the Facility's noise emissions.

Additionally, the Lactalis Winnipeg facility has not received any noise complaints to date.

4.5 Odor Emissions

The addition of the GEM system to the Facility is not anticipated to produce any noticeable odor. The sludge removed from the GEM system will be stored in an enclosed holding tank and trucked off site for disposal every two days. The sludge tank includes a PureAir Filtration Model DS-100 odor control system to filter vented air through an active carbon filter.

The Lactalis Winnipeg facility has not received any odor complaints to date.

4.6 Air Emissions

The addition of the GEM system to the Facility is not anticipated to produce any significant air emissions. The GEM system is not anticipated to generate any meaningful emissions to atmosphere. The chemicals used (coagulant, flocculant) in the process are also not anticipated to generate any significant atmospheric emissions. Beyond this, the system will be entirely contained in a shipping container.

There may be some fugitive dust generation during any minor excavation during the installation phase. The dust from excavation is expected to be minor and not to have any significant impacts to the local environment.

5 Project Milestones

The progress of the GEM system installation will occur in the following order:

1. Definition of Scope - Completed
2. Approval of NoA
3. Approval of building permits
4. Installation of GEM system
5. Testing and Commissioning
6. In-servicing
7. Full Operation

6 Environmental License

Lactalis Winnipeg's current operations are licensed until Manitoba Environment Act License 3158 dated November 25, 2015. This NoA is being proposed as an amendment to this existing license.

7 Closing

As part of the preparation phase for the installation of a GEM system at Lactalis's Winnipeg facility, SCV Consulting Ltd. has been retained by Lactalis Canada Inc. to assist with the completion of this NoA Application.

Lactalis's Winnipeg facility is currently operating under Act License Number 3158 which requires that the Director be notified of any alterations to the Facility regarding this license. This NoA is an amendment to Environment Act License Number 3158 and Lactalis is requesting approval of this NoA so that the Facility can begin installation of the GEM system. The proposed installation at Lactalis Canada Inc.'s Winnipeg facility will improve the quality of process water that is discharged to the city by removing fats, oils, and greases and total suspended solids from the wastewater. Lactalis has included the required processing fee and a drawing of the proposed installation in this package.

Thank you for taking the time to consider this application. We look forward to receiving your approval for this alteration to our facility. Please do not hesitate to contact Kevin Poirier at SCV Consulting Ltd. for any questions or concerns regarding this project or Notice of Alteration.

Yours Sincerely,
SCV CONSULTING LTD.

[redacted]

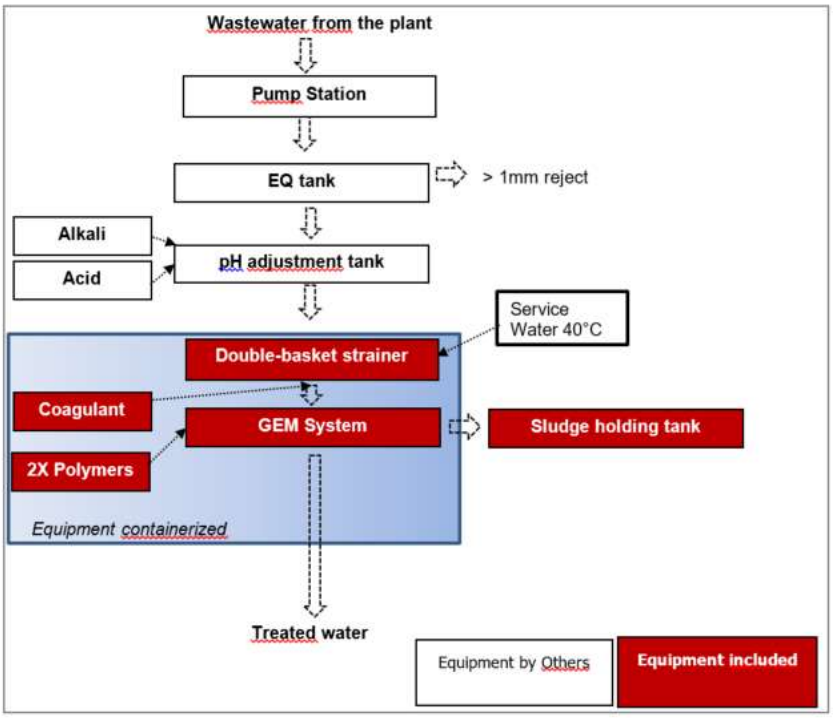
Kevin D. Poirier, P.Eng, CSR-P.
Director and Principal Consultant
SCV Consulting Ltd.

If you have any questions concerning the project of this NoA, please do not hesitate to contact **Kevin Poirier**, Project Manager, at **519-993-8040** or via email at **kpoirier@scvconsultingltd.com**.

Appendix A - GEM Description

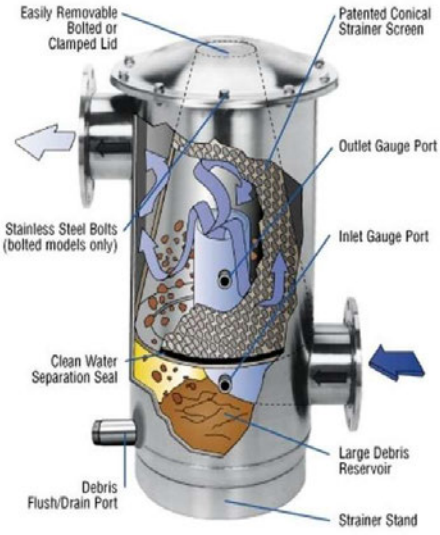
5. VEOLIA'S PROPOSED TREATMENT CHAIN

The treatment system that we propose will consist of the following steps:



5.1. PRECONDITIONING OF THE RAW WATER

5.1.1. Manual Strainer



Veolia recommends the water to be pre-screened at 1mm. To that end we are proposing a manual strainer upstream of the GEM.

As part of this project, we are assuming that the presence of large debris (> 1mm) will be very occasional and that the proposed sieve will only serve to protect the GEM sporadically.

To maintain the filtration capacity, our system includes one duty strainer and a second one as a spare. The latter will operate when the primary is being cleaned. To ease their maintenance, these strainers are equipped with a port from where hot water can be injected to clean the strainer surface.

These strainers will be installed by Veolia in the container on the pipe between the pump station and the equalization tank.

5.1.2. Equalization and pH adjustment tank ("EQ tank") (by others)

As in most food and beverage facilities, the effluent wastewater of Lactalis Winnipeg will be subject to significant variations in flow rate and water quality. The equalization tank ensures a homogeneous water quality and to regulate the flow of water reaching the downstream GEM. As in any wastewater treatment chain, the equalization tank is the "life insurance" of the system, guaranteeing stabilized and optimal operating conditions.

An EQ tank also provides some storage of raw water during maintenance of the downstream treatment equipment.

It is our understanding that the EQ tank already exists at the Winnipeg facility with a proper pH adjustment system. We consider that the existing EQ tank will allow feeding the GEM pump by gravity at constant pressure.

5.2. CLARIFYING UNIT

5.2.1. GEM system

We have selected the GEM flotation process as the core of our pre-treatment chain. The GEM system is a high efficiency, compact **flotation-dewatering** system particularly well adapted to food processing effluent. With over 350 installations worldwide (among which 120 in the F&B industry), the GEM system is a **unique** yet **fully proven** technology (refer to our references list in Appendix).

As a matter of fact, Lactalis has already 2 GEM units in operation in its Winchester and Montreal facilities.

The GEM system aims at clarifying wastewater by removing FOG and TSS using dissolved air flotation. **It is a high-performance flotation alternative to a conventional DAF system**.

Free on-demand webinar (45 minutes presentation) about the GEM technology at https://register.gotowebinar.com/register/2553573280706754829?source=website

The GEM system differentiates itself from the conventional DAF processes thanks to its unique flocculation and flotation techniques that make obsolete the conventional DAF process.
The GEM system generates **better effluent quality**, can **handle higher contaminant loads** and has the possibility to generate **highly concentrated sludge** with a **much smaller footprint**.

The reasons for these differentiating advantages of the GEM are easy to understand and can be summarized as follows:

While conventional DAFs use the simple **collision method** between air bubbles and the contaminant particles (TSS and FOG), the GEM System **integrates fine bubbles into the structure of the flocs**.

The integration of the fine bubbles into the structure of the flocs is done as follows:

- The air is dissolved in **100%** of the wastewater stream (vs. 10 to 30% for conventional DAFs) through the **L**iquid **S**olid **G**as **M**ixing ("LSGM") heads (see Figure 2) at high pressure (100-120 psi).
- The LGSM heads provide homogeneous mixing of liquid contaminants and coagulant and polymers.
- Flocs are formed under pressure in a waste stream saturated with dissolved air so that air bubbles literally get trapped within the floc structure.

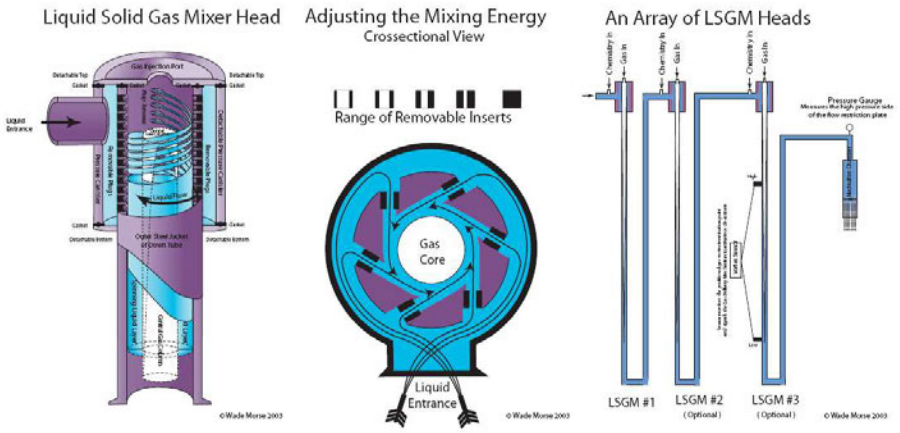
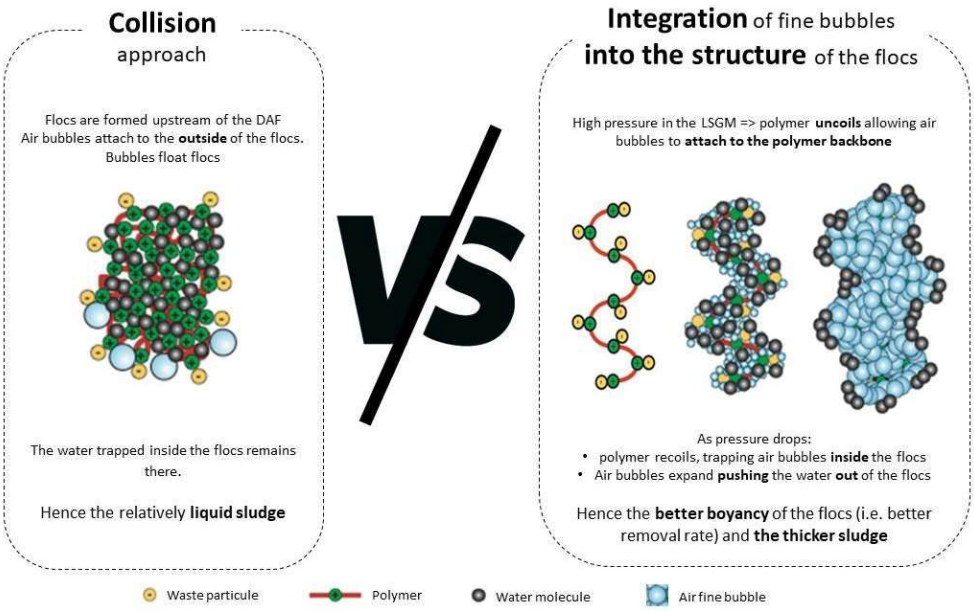


Figure 2 : Schematic of the LGSM heads

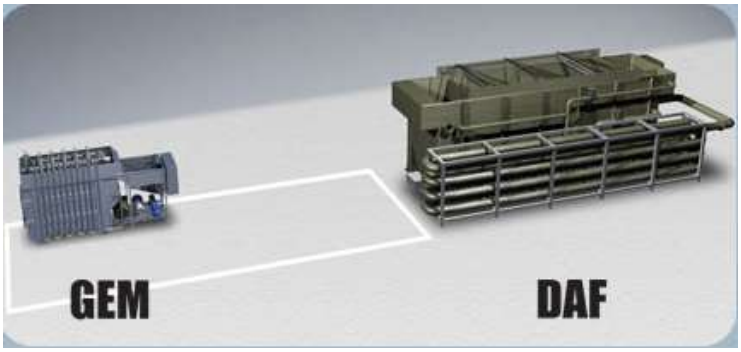
Through the LGSM heads, the GEM System uses centrifugal forces to extend the dosed polymer into long polymer chains. When extended, the polymer chains bond with the microflocs generated by upstream coagulation. When leaving the LSGM heads, the centrifugal force drop and the polymers recoil into very compact flocs, full of micro air bubbles.



With up to six LGSM heads in series, and flexibility to adjust each head to allow a specific mixing energy, the GEM system offers the flexibility to change the mixing energy to the specific wastewater characteristics and changing wastewater conditions to optimize the mixing, the chemical usage and the floc formation.

Since **100% of the wastewater** stream goes through LGSM heads, the flotation tank has the sole purpose of separating the flocs from the water. The flocculation does not occur in the flotation tank, which is different from conventional DAF systems. In addition, since the GEM system generates flocs with trapped microbubbles, flocs generated are **very buoyant** (see picture against), allowing for high flotation velocity.

As a result, the size of the GEM flotation tank is **significantly smaller** than that of a typical DAF system and is only driven by the maximum hydraulic capacity of the system. Even with high pollutant loads, the size of the flotation tank usually remains the same since no air/solids contact time is required within



the flotation tank. This allows the GEM system to handle a large range of contaminant loads, within a small footprint.
The GEM flotation system is thus a unique technology on the water treatment market. It offers considerable advantages compared to other flotation devices, the main advantages being:

- Very high TSS and FOG removal efficiency;
- Exceptional robustness due to its ability to face wide ranges of contaminant loads;
- Very small footprint;
- Process simplicity;
- Ability to generate sludge with a thickness ranging from 8% to 20%+.

Following the requirements of the RFP, we have selected a GEM model with a maximum hydraulic capacity of **17 m3/h**.

5.2.2. Sludge storage tank

The sludge floating in the GEM system is skimmed off into a sludge hopper, before being pumped to a sludge storage tank. The tank is designed to hold a minimum of 4 days at maximum capacity.

Parameter	Unit	Value
Maximum treatment flow	m^3/h	17
TSS in maximum (from Lactalis Montreal)	mg/L	1 100
TSS out (supposed 95% removal)	mg/L	55
%solid in GEM sludge	%	8
Sludge flow	m^3/d	5

Aeration of the tank is not proposed in the present offer.

5.3. CHEMICAL PREPARATION AND DISTRIBUTION SYSTEMS

An optimal water treatment process depends on reagents selection and the quality of the preparation and dosing systems. Here is a summary of the reagents we typically select for the current processes.

Coagulant

Ferric sulfate

The selected coagulant is Hydrex 3253, a ferric sulfate coagulant. It will be received in 45 USG barrels at 12.2 % concentration as iron. Hydrex 3253 has a freezing point of -18 °C. The product is stored in the barrel and can be used as is. The dosage will be performed using a mechanical diaphragm metering pump.

In case the operators want to generate high solid content sludge, then the coagulant should be changed to Hydrex 3423, an EpiAmine with low molecular weight coagulant. It will be received in 45 USG barrels. The dosage will be performed using a mechanical diaphragm metering pump.

The client may choose to use one or the other coagulant depending on the sludge management approach chosen.

Polymer

Anionic Polymer

The use of a flocculation agent is required for this application. A polymer is required in order to obtain good process performance and to improve the dryness of the sludge produced. The **Hydrex 6508** has shown good results on similar wastewater. **Hydrex 6508** is a liquid anionic polymer used to enhance flocculation and will be received in 45 USG drums. One Hydrapol-N unit, Veolia's automatic preparation system, will be supplied to prepare a 0.5 % solution. Warm water is used for the polymer preparation. The automatic polymer preparation/dilution system is an automatically controlled batching unit capable of preparing polymer. The system uses a high shear system allowing the oil phase of the polymer to be reverted into an emulsion and mixed with the water phase.

Cationic Polymer

The use of a flocculating agent is essential for a MES removal process. The polymer is necessary for good performance. The **Hydrex 6606** polymer was selected during the laboratory tests. Hydrex 6606 is a cationic liquid polymer used to enhance flocculation and will be received in 45 USG drums. A Hydrapol-N automatic preparation system will be provided to prepare a 0.5% solution. Lukewarm water is used for the preparation of the polymer. The Automatic Polymer Preparation / Dilution System is an automatically controlled dosing unit capable of preparing a liquid polymer. The system uses a high shear system allowing the reversion of the oily phase of the emulsifying polymer and mixing with the aqueous phase.

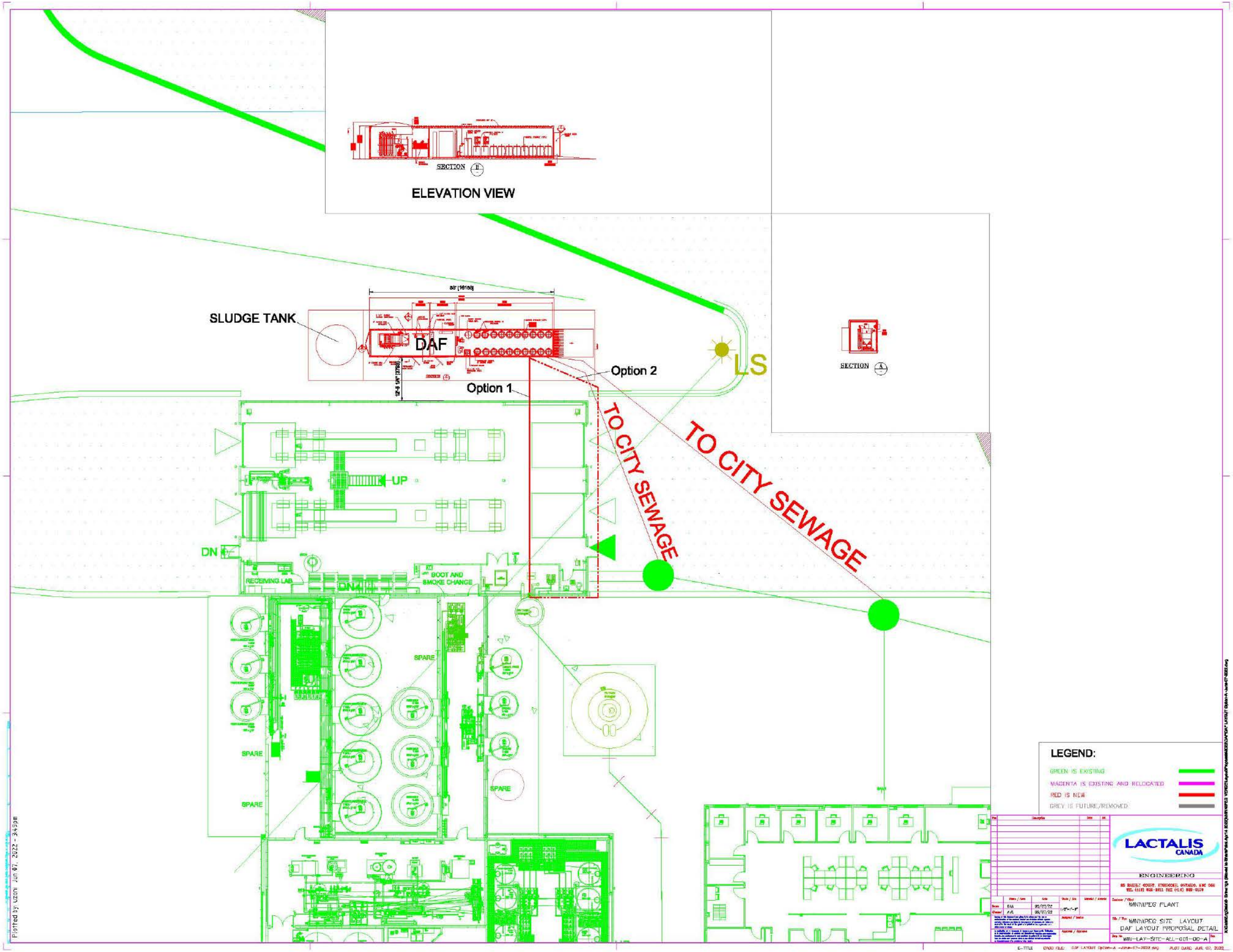
Acid & Alkali

The system will utilize the client's existing acid and caustic supply and dosing systems, which will be controlled by the new effluent treatment control panel (motors starters by others).

5.4. ELECTRICITY AND CONTROL

The treatment plant will be equipped with one PLC in a main control panel. Please refer to SECTION 5.4 for more details.

Appendix B - Site Layout



ELEVATION VIEW
SECTION B
SLUDGE TANK
DAF
Option 1
Option 2
LS
SECTION A
TO CITY SEWAGE
TO CITY SEWAGE
UP
DN
RECEIVING LAB
BOOT AND SMOKE CHANGE
SPARE
SPARE
SPARE
SPARE
SPARE
LEGEND:
GREEN IS EXISTING
MAGENTA IS EXISTING AND RELOCATED
RED IS NEW
GREY IS FUTURE/REMOVED
LACTALIS CANADA
ENGINEERING
WINNIPEG PLANT
WINNIPEG SITE LAYOUT
DAF LAYOUT PROPOSAL DETAIL
WIN-LAY-SITE-ALL-001-00-A
09/07/22
09/07/22
E-TITLE
PLOT DATE: JUN. 07, 2022

Appendix C - Wastewater Treatability Test

ASSESSMENT OF PERFORMANCE: GEM PROCESS
LACTALIS – Winnipeg, Manitoba

LABORATORY TRIAL SUMMARY

Prepared by: Josée LALONDE, Laboratory Coordinator.

1. INTRODUCTION

Veolia Water Technologies Canada Inc. (VEOLIA) performed a series of laboratory bench scale trials on water from Lactalis located in Winnipeg for total suspended solids (TSS), Chemical oxygen demand (COD) and Oil & Grease (FOG) removal using the Gaz Energy Mixing Technology (GEM).

Additional testing was performed using a conventional DAF technology in order to compare both technologies and evaluate the difference with results achieved.

This summary report presents the treatment performance obtained during jar tests carried out by VEOLIA at its laboratory in Ville Saint-Laurent, Qc.

2. METHOD

Samples were received in Ville Saint-Laurent in December 2021; samples were immediately refrigerated at 4 °C to preserve the integrity of the samples and the trial began upon reception. Many parameters were analyzed in order to characterize the effluent, most of the parameters were analyzed by VEOLIA except for the FOG which were analyzed by an external accredited laboratory

The following parameters were performed on the raw water as well as the clarified water:

- Total suspended solids;
- Chemical oxygen demand;
- Oil & Grease.

The bench scale GEM test work was conducted at the optimum chemical dose rates for achieving the best performance for TSS, COD and FOG removal. The main objectives of the trial were:

- pH: 6 – 10.5;
- COD: 40% removal;
- FOG: Less than 80 mg/L;
- Sludge concentration: Less than 8 %.

3. RESULTS

Two samples (sampled on different days) were tested, the raw waters were characterized and the results are:

Sample 1: Sample 2021/12/06

- pH: 6.21;
- Total suspended solids: 614 mg/L;
- Chemical oxygen demand (total) : 2690 mg/L;
- FOG: 400 mg/L.

Sample 2: Sample 2021/12/07 22h00 to 2021/12/18 10h00

- pH: 6.01;
- Total suspended solids: 966 mg/L;
- Chemical oxygen demand (total) : 3616 mg/L;
- FOG: 750 mg/L.

3.1 Trial with the GEM technology

The trial began with the simulation of the GEM technology on Lactalis's samples on both samples received with two coagulants, one ferric based coagulant (Hydrex 3253) and an organic coagulant (Hydrex 3423). The major concern was the thickness of the sludge produced with the GEM process, according to the City of Winnipeg, the sludge produced by the treatment should be liquid (supposed less than 8-10% solid).

Results obtained showed that the ferric based coagulant (and observed on prior trials) tends to produce sludge less concentrated than sludge produced with an organic coagulant; see results in Table 1.

Table 1: Parameters for the simulation for the GEM technology

Parameters	Sample 1		Sample 2	
	Hydrex 3253	Hydrex 3423	Hydrex 3253	Hydrex 3423
pH adjustment	NaOH	NaOH	NaOH	NaOH
Dosage (mg/L)	200	80	200	80
pH value	6.75	6.75	6.61	6.80
Coagulant (ferric based)	Hydrex 3253	Hydrex 3423	Hydrex 3253	Hydrex 3423
Dosage (mg/L)	775	57.5	775	172.5
Cationic polymer	Hydrex 6606	Hydrex 6606	Hydrex 6606	Hydrex 6606
Dosage (mL/L as neat)	0.2	0.1	0.225	0.1
Anionic polymer	Hydrex 6508	Hydrex 6508	Hydrex 6508	Hydrex 6508
Dosage (mL/L as neat)	0.05	0.025	0.1	0.025
Turbidity (UTN)	8.62	17.3	12.5	19.5
Sludge solids (%)	***4.64***	***17.5***	***10.1***	***12.6***

Raw water analysis as well as best results obtained while simulating the GEM process with the ferric based coagulant for the two samples tested are presented in Table 2. Results shows that all objective criteria are met with the combination of Hydrex 3253 coagulant and liquid polymers Hydrex 6606 and 6508. Table 2 presents the results.

Table 2: Raw water characterization and clarified water results

Parameters	Units	Raw water Sample 1	Clarified water Sample 1	Removal %	Raw water Sample 2	Clarified water Sample 2	Removal %
pH	-	6.21	6.75	--	6.01	6.61	--
Total suspended solids, TSS	mg /L	614	<2	**> 99.7**	966	<2	**> 99.8**
Chemical oxygen demand, COD	mg/L	2690	955	**64.5**	3616	1197	**66.9**
Oil & Grease (total), FOG	mg/L	400	7.0	**98.3**	750	9.3	**98.8**

3.2 Dissolved air flotation system (DAF)

Additional testing were performed on sample 2 with the Dissolved air flotation technology (DAF) in order to compare the sludge produced with both technologies. Table 2 presents the results.

Table 2: Parameters for the simulation for the DAF technology

Parameters	Sample 2	
	Hydrex 3253	Hydrex 3423
pH adjustment	NaOH	NaOH
Dosage (mg/L)	200	80
pH value	6.75	6.75
Coagulant (ferric based)	Hydrex 3253	Hydrex 3423
Dosage (mg/L)	775	172.5
Cationic polymer	Hydrex 6606	Hydrex 6606
Dosage (mL/L as neat)	0.4	0.1
Anionic polymer	Hydrex 6508	Hydrex 6508
Dosage (mL/L as neat)	--	--
Turbidity (UTN)	10.9	--
DCO	1299	--
FOG		--
Sludge solids (%)	***4.64***	--

The DAF technology was simulated with the same coagulants tested for the GEM technology; results showed that it was possible to treat the effluent with the same dosage of ferric based coagulant with the combination of a cationic liquid polymer. As for the organic Hydrex 3423 coagulant, although the dosages were increased, the treatment remained of poor quality.

Moreover, the test with the DAF technology demonstrate that the quality and quantity of sludge is totally different for the two cases. The quantity of sludge produced by the DAF is significantly higher than the amount produced with the GEM technology. Figure 1 shows the results with the two technologies

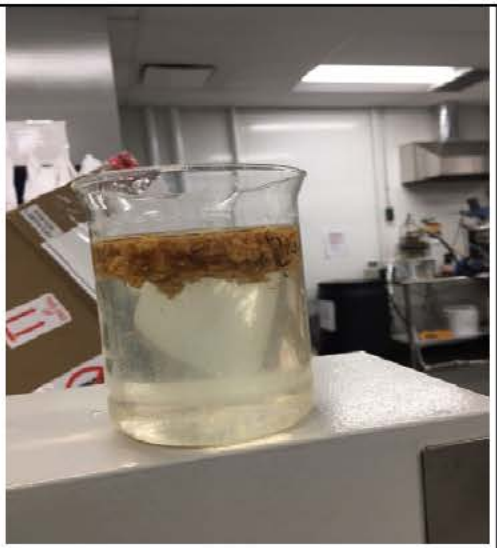
	
DAF Technology	Gem Technology

Figure1: Sludge comparison with both technologies

4. Conclusion

The jar testing program performed on Lactalis's effluent samples confirmed the efficiency of a treatment chain using the GEM technology to remove TSS, COD and FOG concentrations within the sludge concentrations required. Moreover, the results show:

- The GEM simulation was able to achieve the following removals:

Sample 1: Sample 2021/12/06

- TSS : from 614 to less than 2 mg/L;
- COD: from 2690 to 955 mg/L;
- FOG: from 400 to 7.0 mg/L
- Sludge concentration: 4.64%.

Sample 2: Sample 2021/12/07 22h00 to 2021/12/18 10h00

- TSS : from 966 to less than 2 mg/L;
- COD: from 3616 to 1197 mg/L;
- FOG: from 750 to 9.3 mg/L;
- Sludge concentration: 10.1 %.