

## Optimization of Waste Water Treatment in Potato Processing Waste Water Lagoon® 2009

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*ECOPROBIOTICS®, of the Bacta-Pur® System, are beneficial communities of natural bacteria, which have been on earth for millions of years and have been selected for their synergistic ability to biodegrade pollutants and to improve water quality. ECOPROBIOTICS® increase biodiversity. Just as people take probiotic yogurt for its ability to assure the presence of the optimal community for digestion and immunity, ECOPROBIOTICS® improve ecosystem health. EVERY PRODUCTION of Bacta-Pur® products is analyzed and cleared for shipment ONLY after passing all performance tests and being CERTIFIED PATHOGEN FREE using techniques from the food industry. ECOPROBIOTICS® are purely natural and beneficial. They NEVER contain added chemicals such as surfactants, emulsifiers or enzymes..., nor do they contain genetically modified (GMO) or deliberately mutated organisms. ECOPROBIOTICS® are safe and beneficial. Disease causing organisms are never used, as others do or permit.*

### Background

A factory in Eastern Canada, manufacturer of potato flakes, upgraded their wastewater treatment lagoon, during the summer of 2007, to handle the high organic loads (BOD up to 12,000 mg/L & TSS up to 9,000 mg/L) and ammonia. The 10,000 m<sup>3</sup> (2.7 million gal US) lagoon was divided into three cells using two curtains. The fine bubble aeration, in the first cell, provided complete mixing of incoming wastewater; the aeration in the second cell provided partial mixing, and there was no aeration in the final polishing cell.

Wastewater was accumulated in the lagoon, during the first year, as the influent flow rate was very low compared to the volume of the lagoon; wastewater from last cell was recycled into the first one. There was no discharge, into the local river, during almost one year. Initial break-in challenges included excessive odors and inadequate reduction of the organic wastes.

It became necessary to start releasing effluent, into the local river, in the summer of 2008; the effluent permit, however, required bioassays on rainbow trout (*Onchorhynchus mykiss*) to demonstrate absence of toxicity. The challenge was to eliminate ammonia, but with levels up to almost 100 ppm, bioassay failure was totally predictable. The company wanted to be as “green as possible” and to optimize the biological wastewater treatment, to reduce total ammonia levels to levels safe for fish and to meet discharge permit requirements. They selected the Bacta-Pur® System to achieve the targeted results.

### Treatment & Results

The initial challenges of complaints of noxious odors, was rapidly overcome with the use of preactivated Bacta-Pur® XLG, which eliminates causes of noxious and toxic odors. 48 L of Bacta-Pur® XLG was preactivated and added approximately weekly to the lagoon from Sept. 27 through Nov. 15<sup>th</sup> 2007. Ten days after the first addition, the company owner called to say that the odors were practically gone and that the pond looked very different. The BOD in Cell #1 was reduced by 90%, by November, from over 5,250 mg/L to 555 mg/L, and by Cell #3 the BOD was reduced to less than 270 mg/L, a reduction of 95%. Total Suspended Solids (TSS) was reduced from average influent values of 2380 mg/L to 890 mg/L in a first cell, a reduction of 63%.

A BACTIVATOR® LS1500, which continuously grows and activates 1.5 L of Bacta-Pur® XLG was installed, on Nov. 15<sup>th</sup>, 2007 in the factory, to supply the beneficial cultures automatically to



the influent of the wastewater treatment plant. The BACTIVATOR® optimizes the preactivation thus saving labor and assures the continual presence of the beneficial cultures in the optimal physiological condition. Use of the Bacta-Pur® resulted in further treatment efficiency; by June 13<sup>th</sup>, 2008, in spite of loading increases in BOD to 6,500 mg/L and TSS to 27,900 mg/L the water in Cell #3 had a BOD of 130 mg/L and TSS was 215 mg/L. These values represent reductions of 98% for BOD and 99.2% for TSS.

The company decided, in the summer of 2008, to address the problem of excess ammonia and its toxicity by using Bacta-Pur® N3000. Bacta-Pur® N3000, which contains communities of nitrifying bacteria not found in Bacta-Pur® XLG, was specifically developed and is used to provide a community to control toxic ammonia and nitrite for use in aquaculture. The Bacta-Pur® XLG was applied one week before Bacta-Pur® N3000 to reduce further BOD levels, before applying Bacta-Pur® N3000.

The lagoon system, with ammonia levels at 98 mg/L was inoculated on July 7<sup>th</sup>, 2008 with 72 liters (approx. 7 ppm) of Bacta-Pur® N3000. One week later, on July 14<sup>th</sup>, 2008 ammonia decreased to 0.23 mg/L – a 99.8% reduction. The benefits of the Bacta-Pur® were not limited only to ammonia reduction. The beneficial cultures of Bacta-Pur® N3000 and Bacta-Pur® XLG were selected to provide synergistic benefits when combined. This clearly seen by the additional reductions of both BOD, from 130 to 17 mg/L and TSS, from 215 to 97 mg/L (Table 1).

TABLE 1: Total Ammonia, BOD and TSS levels in the lagoon wastewater before and with use of Bacta-Pur® N3000

	LAGOON CELL 3	
	BEFORE	WITH Bacta-Pur® N3000
Ammonia-N (mg/L)	98	0.23
BOD <sub>5</sub> (mg/L)	130	17
TSS (mg/L)	215	97

Having successfully lowered ammonia to safe levels, the company proceeded with the static 96 hour LC50 bioassay on the wastewater from last cell to assess the effluent toxicity status. The bioassay test was run at 15°C and was performed on sample with different percentages of wastewater dilution. The species used was rainbow trout (*Oncorhynchus mykiss*). Test chambers were not aerated during experimentation. The dilution water was preaerated 30 minutes before addition of effluent. All conditions, even pure effluent, had 100% survival (Table 2).

TABLE 2: Observed mortality during the bioassay test

Concentration tested	100%	50%	25%	12.5%	6.25%	0% Control
Mortality (#/10)	0/10	0/10	0/10	0/10	0/10	0/10
Percent Mortality (%)	0%	0%	0%	0%	0%	0%



Furthermore, the sample with 50% and 100% of lagoon wastewater, with Bacta-Pur<sup>®</sup> showed slight increases in the dissolved oxygen levels during the test, while all the other samples and even control showed a decrease in the dissolved oxygen levels (see TABLE 3). Use of Bacta-Pur<sup>®</sup> is known to facilitate oxygenation due to the synergistic benefits of an optimal microbial team.

TABLE 3: Monitoring data during the bioassay test

Concentration (% sample)	Initial Measurements			Final Measurements		
	Dissolved oxygen (mg/L)*	pH*	Conductivity (µmhos/cm)*	Dissolved oxygen (mg/L)	pH	Conductivity (µmhos/cm)
Control	10.2	8.15	215	9.5	8.18	218
6.25	10.1	8.24	410	9.6	8.31	403
12.5	10.0	8.31	673	9.7	8.16	640
25	9.8	8.38	1004	9.7	8.40	975
50	<b>9.4</b>	8.39	1776	<b>9.7</b>	8.41	1697
100	<b>8.3</b>	8.37	3200	<b>9.2</b>	8.57	3180

\* values measured at beginning of test

Following the positive bioassay test results the facility could start the discharge of the WWTP effluent into the local river.

