

CLASS A DIGESTION FOR SMALL FACILITIES

*Dan Leavitt; City of London
Jack Currie; CB&I
Sid Clark; Biogas, Inc.*



LONDON, OH



UPGRADE FACILITY

- **Original Plant Built in 1936**
- **Upgrades in 1973 and 1986**
- **Wet Weather Flow Exceeded Capacity**
- **Equipment in Need of Replacement**

UPGRADE OBJECTIVES

- **Increase WWTP Capacity**
- **Replace Worn Out Equip't**
- **Replace Existing Digestion**
- **Consider Class A Options**
- **Automated Control System**

USEPA CLASS A CRITERIA

- **Pathogen Reduction**
 - Salmonella Density, < 3 MPN/ 4 Grams
 - Fecal Coliform Density, <1000 MPN/ Gram
- **Vector Attraction Reduction**

Vector Attraction Reduction Alternatives

- **38% VS Reduction**
- **Lab Demonstration if $< 38\%$ Reduction**
- **SOUR Requirements**
- **14 Day Detention @ $> 45^{\circ}\text{C}$**
- **pH Adjustment**

USEPA CLASS A ALTERNATIVES

- **Time – Temperature**
- **pH Adjustment**
- **Pathogen Analysis (Site Specific)**
- **PFRP Process**
- **PFRP Equivalent Process**

AeroTherm (ATP) System

2-Stage Digestion

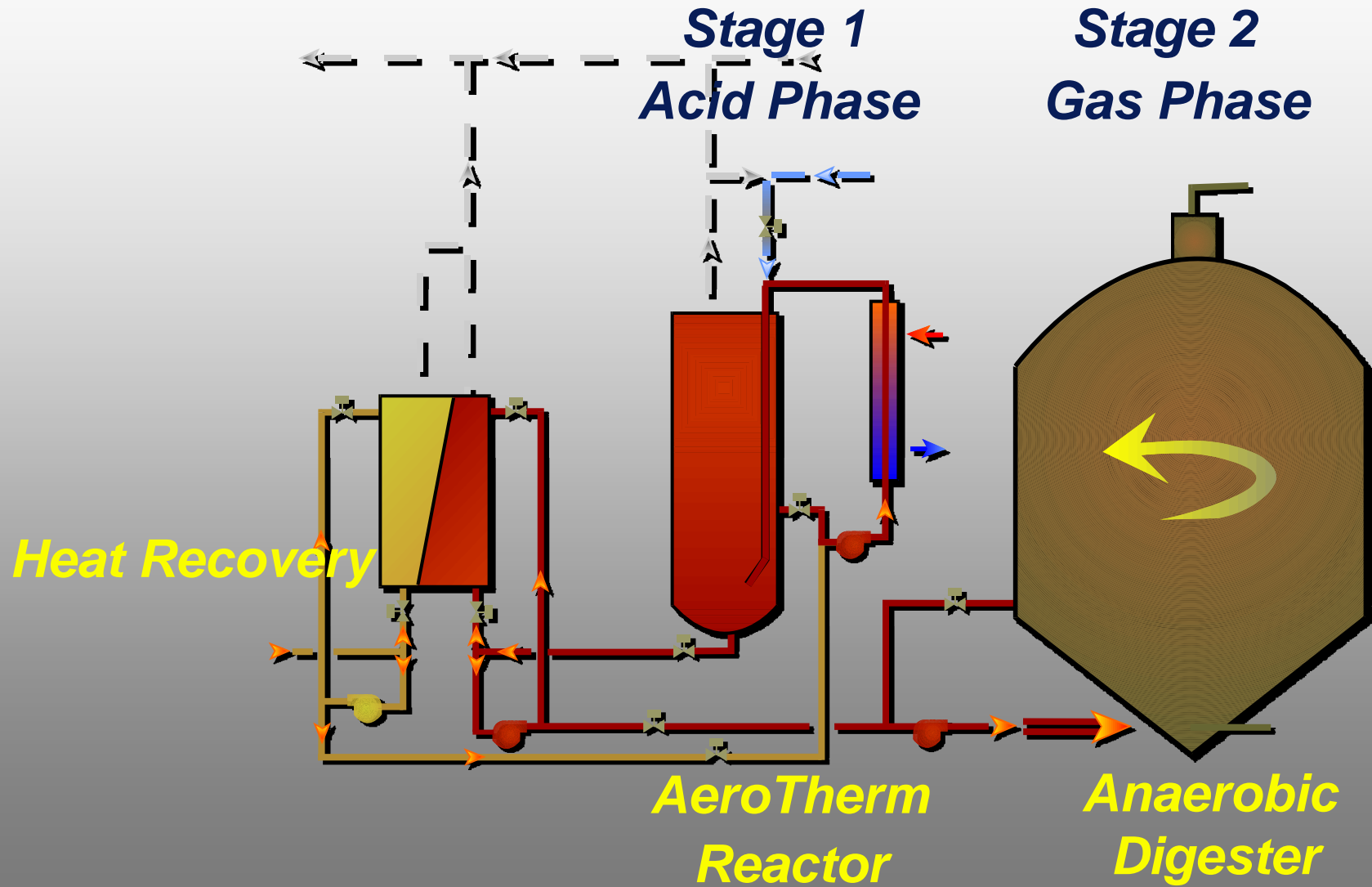
Class A Biosolids



ATP FUNDAMENTALS

- **Stage 1 - Thermophilic Acid Reactor**
- **Anoxic - Minimal O₂ Input**
- **60-65° C Operation**
- **18~24 Hour HRT**
- **Semi-Continuous Feed**
- **Heat Recovery**

ATP SCHEMATIC



USEPA Class A Certification

PFRP – Class A

Basis:

- ✓ Experience
- ✓ Pilot Test
- ✓ Lab Demo
- ✓ Time-Temp



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

November 24, 1992

Mr. John R. Currie, Product Manager
CBI Walker, Inc.
1245 Corporate Boulevard
Suite 102
Aurora, Illinois 60504

Dear Mr. Currie:

Your letter of August 17, 1992 to Mr. Vince Miller in our Region IV office, request for a PFRP equivalency determination on the ATP™ Two Stage Sludge Stabilization Process, and accompanying technical information were referred to our Pathogen Equivalency Committee (PEC) for review and a recommendation.

As we understand it, the CBI Walker ATP System involves a mesophilic anaerobic digestion process that is preceded by a pretreatment stage in which sludge is heated by both external heat exchange and by the bio-oxidation which results from vigorously mixing air with the sludge. There are approximately 30 of these systems now operating in Germany. In the United States, we have called this process anaerobic digestion with pre-pasteurization.

In the ATP System, sludge is preheated in a vessel with a nominal residence time of 18 to 24 hours. Sludge is introduced intermittently, amounting to 5 to 20 percent of the vessel volume. This means that the time between feedings of unprocessed sludge could range from 1.2 to 4.5 hours. Exiting sludge is heat-exchanged with incoming unprocessed sludge. This cools the exiting sludge before it is sent to the mesophilic digester and warms the unprocessed sludge. Thus, the digester is not shocked by receipt of material that is too hot, and the preheater is not cooled excessively by the charge of unprocessed sludge.

The PEC considers a process equivalent to a PFRP if it meets EPA's time-temperature requirements and is satisfactorily reduced in vector attraction. The EPA's time-temperature requirement for sludges of 7% solids content or less is given by the following equation:

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A photograph of a wastewater treatment facility in London, Ohio. The image shows several large, cylindrical industrial tanks with spiral staircases, situated next to a building with a stone facade. The sky is clear and blue.

➤ ***2-STAGE DIGESTION FACILITY***

- THERMOPHILIC ACID REACTOR

- MESOPHILIC ANAEROBIC DIGESTER

➤ ***CLASS A BIOSOLIDS TREATMENT***

➤ ***USEPA CERTIFIED PROCESS***

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➤ ***DESIGN PARAMETERS:***

41,580 GPD (WEEKDAYS)

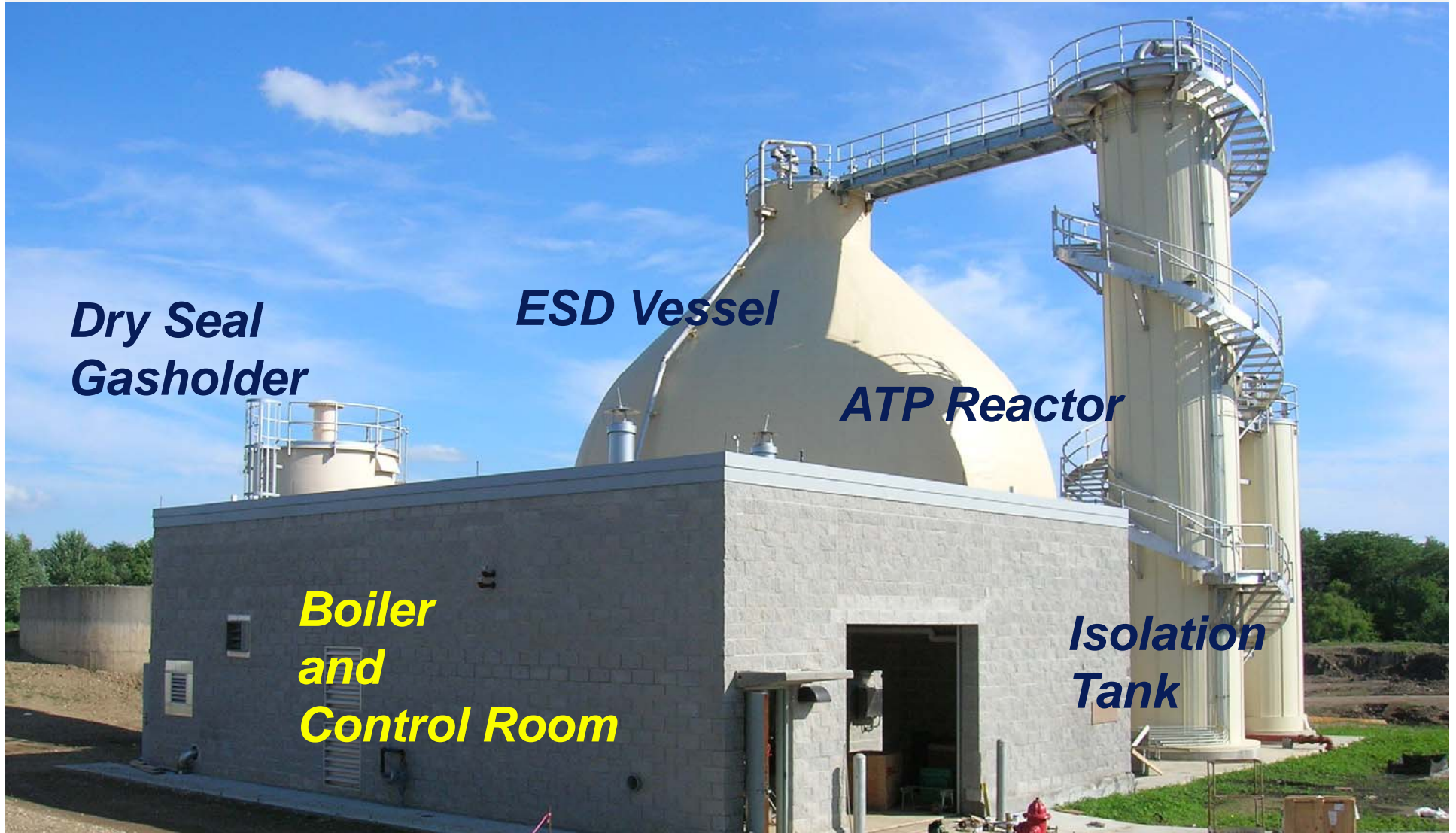
15,660 GPD (WEEKENDS)

➤ ***15,660 GPD THICKENED PRIMARY***

➤ ***25,920 GPD TWAS (5 DAYS/WEEK)***

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2-STAGE DIGESTER FACILITY



ATP REACTOR

- **33,000 GALLON REACTOR**
- **THERMOPHILIC OPER'N**
- **STAINLESS STEEL TANK**
- **VENTED TANK**
- **INTERNAL PIPING**
- **CLAD INSULATION**
- **SPIRAL STAIR ACCESS**



ATP HEATING SYSTEM



AIR INJECTION SYSTEM



HEAT RECOVERY SYSTEM

- *ISOLATION TANK – 304 SS*
- *CLAD INSULATION*
- *ROOF SUPPORTED*
- *INTERNAL PIPING*
- *VENTED TANK*



HEAT RECOVERY SYSTEM

- *ISOLATE ATP/BLEND SLUDGE*
- *CONTROL CYCLES/DAY*
- *CONTROL FEED VOLUME*
- *HEAT RECOVERY EXCH'R*
- *STAGGERED CYCLES*



HEAT RECOVERY SYSTEM

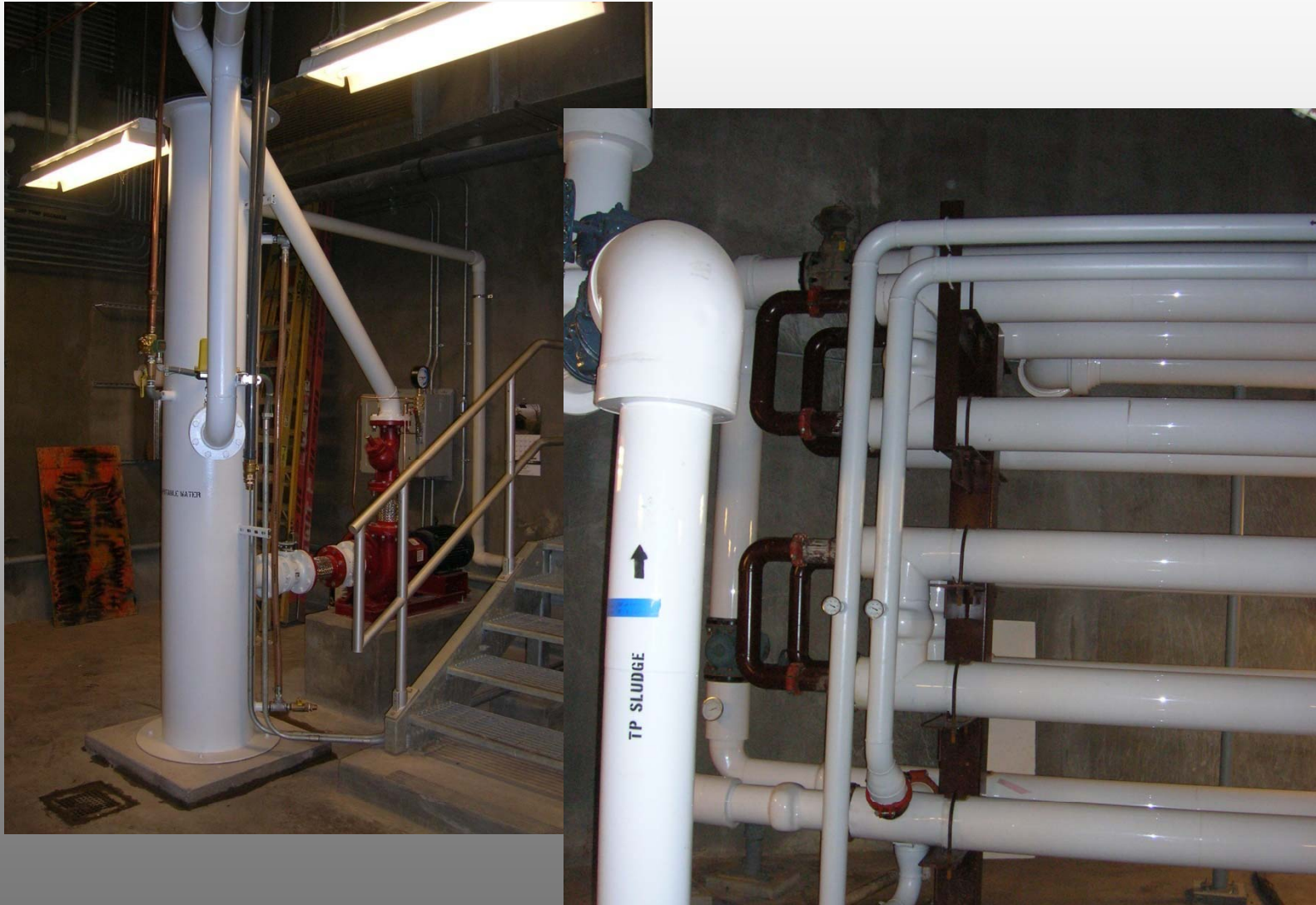


SCREEN OR GRIND?



- ✓ **3/8" screen @ Headworks**
- ✓ **Chopper pumps for transfer**

MODIFICATIONS



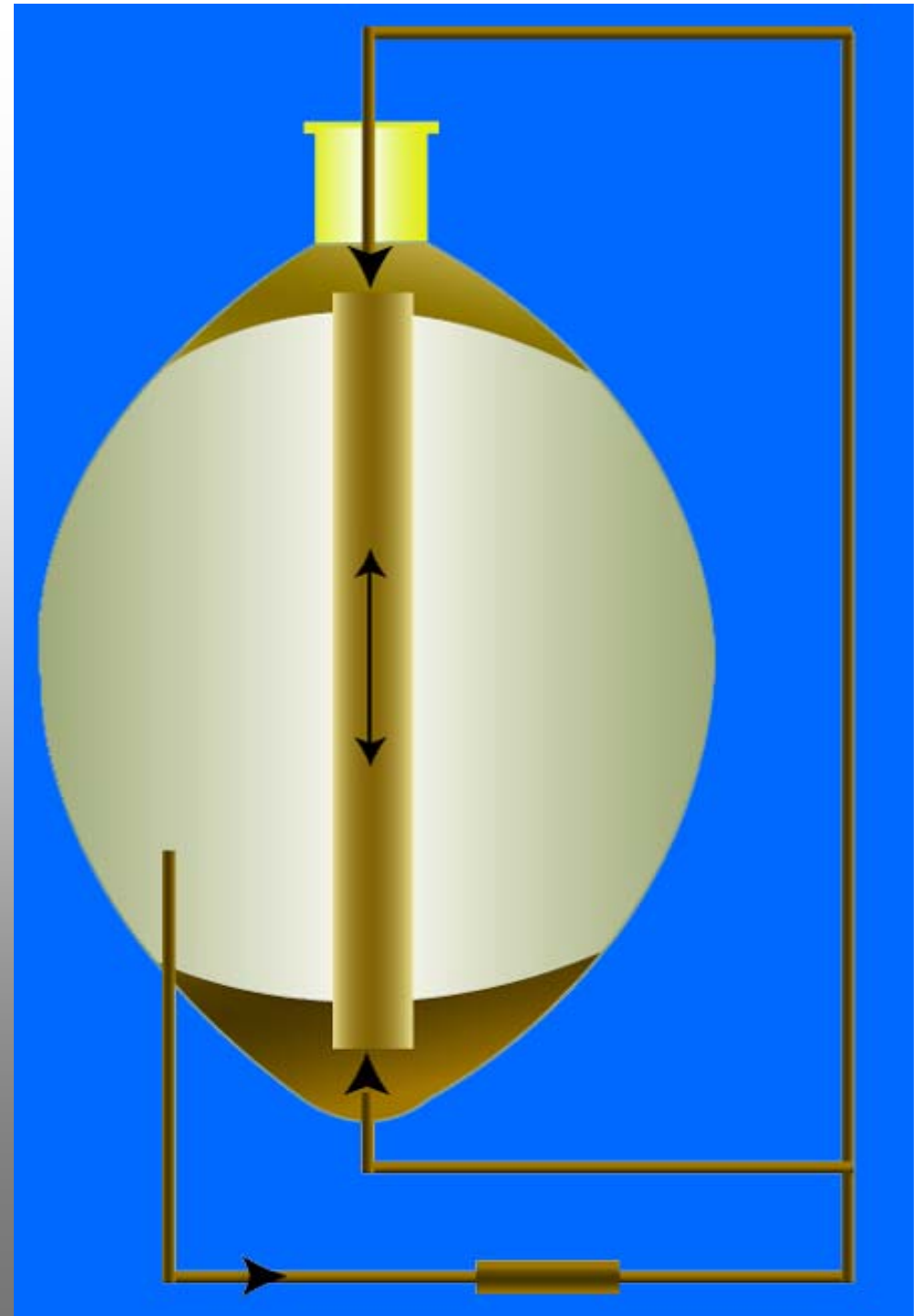
ESD ANAEROBIC DIGESTER

- ***450,000 GALLONS***
- ***MESOPHILIC OPER'N***
- ***CARBON STEEL TANK***
- ***AFIP INSULATION***
- ***INTERNAL PIPING***
- ***BELOW GRADE GALLERY***



JET PUMP MIXING SYSTEM

- ***EXTERNAL RECIRCULATION***
- ***INTERNAL DRAFT TUBE***
- ***VERTICAL AXIS MIXING***
- ***FLEXIBLE OPERATION***
- ***AUTOMATED CONTROLS***
- ***LOW ENERGY REQ'TS***



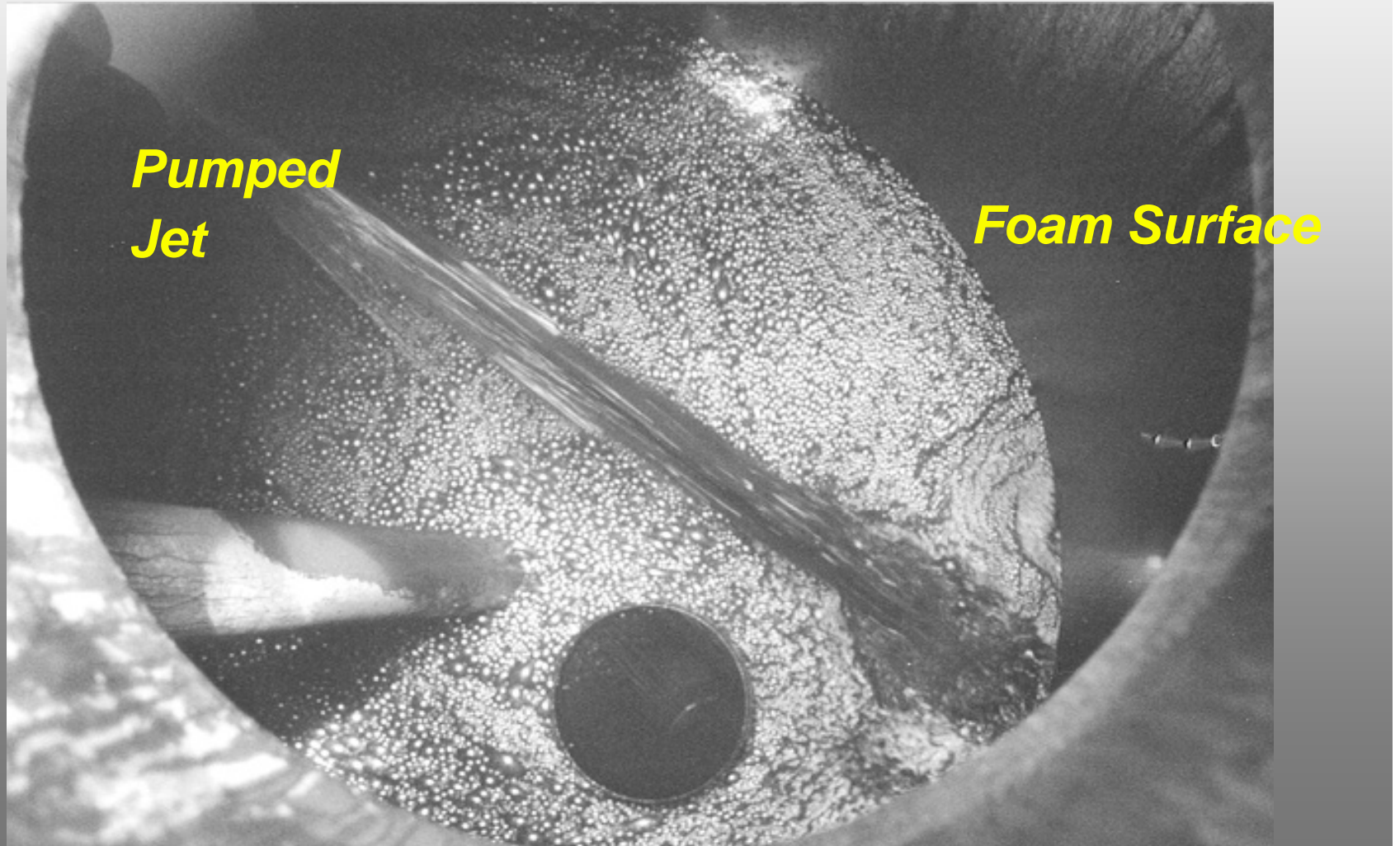
JET PUMP MIXING

***Upflow
Mode***



US Patent No. 5,409,610

FOAM & SCUM SUPPRESSION



ESD TEMPERATURE

CONTROL



ESD MIXING SYSTEM

LOGIN LOGOUT ALARM SUMMARY
London Wastewater Treatment Plant
Stop HMI

Current User: CBI
Active Alarms: 2
COMM'S: PLC4 55 PLC1 1
Set PLC Clock
COLOR CODE: ■ Out of Svcs ■ OFF ■ ON/RUN ■ FAIL
Info...

ESD Mix Schedule (Tuesday)

SCHEDULED MODE
 MODE IN PLC

SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY

	12:00 AM	01:00 AM	02:00 AM	03:00 AM	04:00 AM	05:00 AM	06:00 AM	07:00 AM	08:00 AM	09:00 AM	10:00 AM	11:00 AM	12:00 PM	01:00 PM	02:00 PM	03:00 PM	04:00 PM	05:00 PM	06:00 PM	07:00 PM	08:00 PM	09:00 PM	10:00 PM	11:00 PM	12:00 AM	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
MIX	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN	UP	DOWN
FOAM SPRAY	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF	TIMER 1	OFF
	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF	TIMER 2	OFF
FLUSH	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF

FOAM SPRAY TIMERS

	REPEAT PERIOD (MIN)	DURATION (MIN)
TIMER 1:	30	10
TIMER 2:	10	2

FLUSH CYCLE

OPEN FLUSH VALVE WHEN ESD LEVEL IS ABOVE THIS VALUE (FT): 63.0

SAVE SCHEDULE

LOAD SAVED SCHEDULE

COPY SCHEDULE FROM PLC

UNDO CHANGES

WRITE SCHEDULE TO PLC

SET

WWTP Overview

Class A System Overview

INF Pump Station

Class A System Schedule

Headworks

Aeration Basins

Chemical Treatment

Final Clarifiers

RAS/WAS Pump Station

Trends

(Future)

(Future)

UV / Effluent

Flow Totals

Digesters

(Future)

Runtimes (Operator)

(Future)

Runtimes (Main)

Alarms Setup

Clear Clear All

start | RSLogix 500 - LONDO... | RSView32 Works 5K | TagServer | Overview.bmp - Paint | Norton | 2:44 PM

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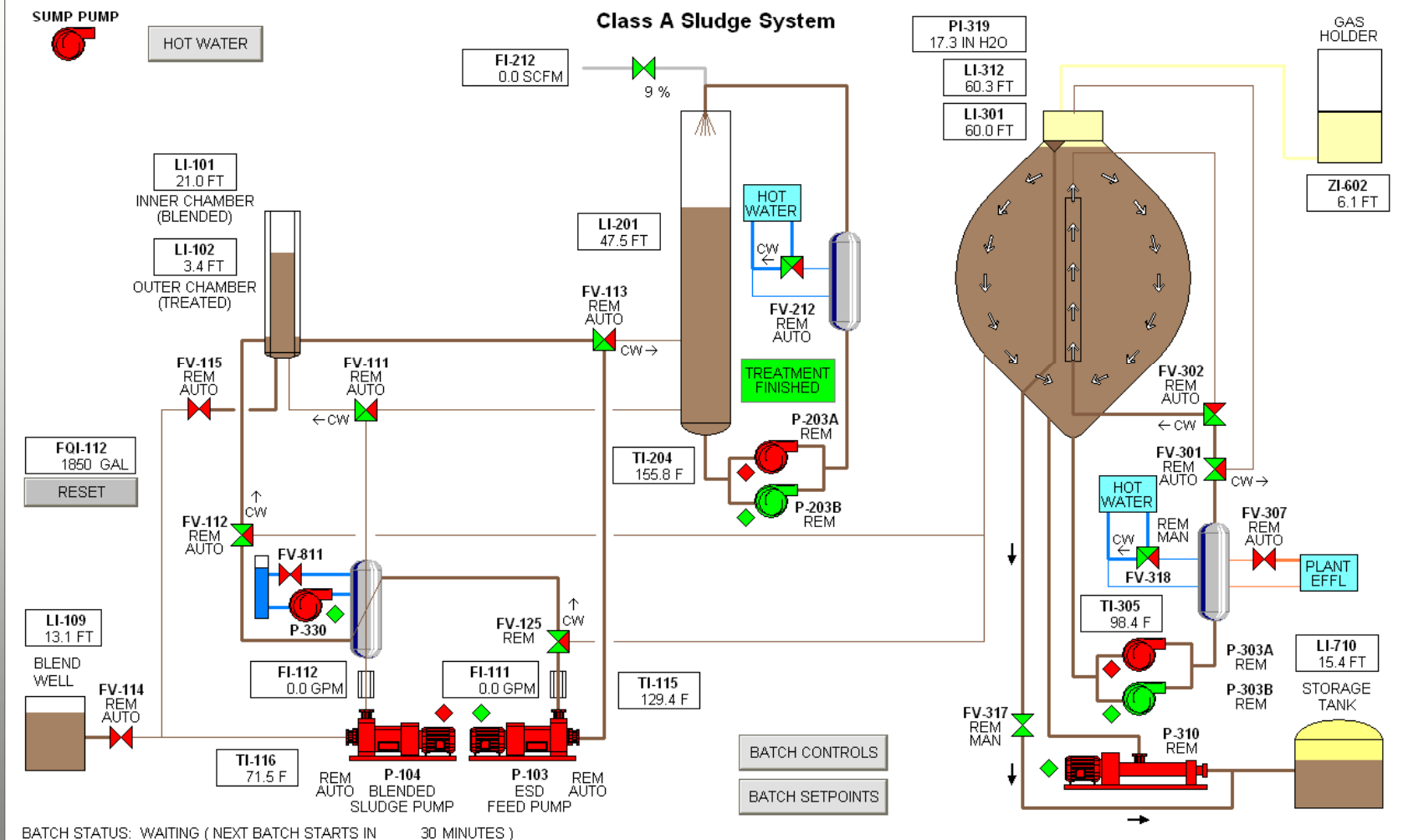
AUTOMATED CONTROL



**Control
Room**

CONTROL SYSTEM FEATURES

- ***MONITOR 2-STAGE PROCESS***
- ***MANUAL OPERATION***
- ***AUTOMATIC OPERATION***
- ***LOCAL/REMOTE CONTROL***
- ***PROVIDE ALARM HISTORY***

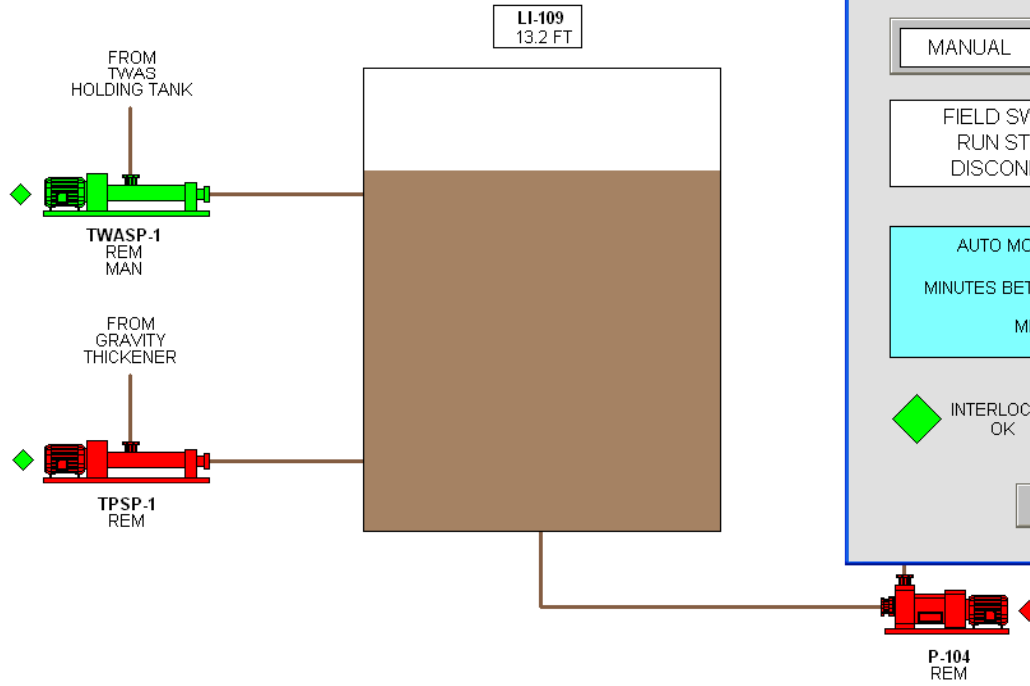


WWTP Overview	INF Pump Station	Headworks	Aeration Basins	Final Clarifiers	RAS/WAS Pump Station			IIV / Effluent	Digesters	Runtimes (Operator)	Runtimes (Maint)
Class A System Overview	Class A System Schedule		Chemical Treatment		Trends	(Future)	(Future)	Flow Totals	(Future)	(Future)	Alarms Setup

CONTROL SYSTEM FEATURES

- ***TPS & TWAS PUMPS***
- ***MAINTAIN BLEND WELL VOLUME***
- ***2-STAGE FEED SYSTEM***
- ***HEAT RECOVERY***
- ***FLARE OPERATION***

Blend Well



Pump Controls

TWASP-1

AUTO
START

MANUAL
STOP

FIELD SWITCH: REMOTE
RUN STATUS: RUNNING
DISCONNECT: CLOSED

AUTO MODE TIMER SETTINGS

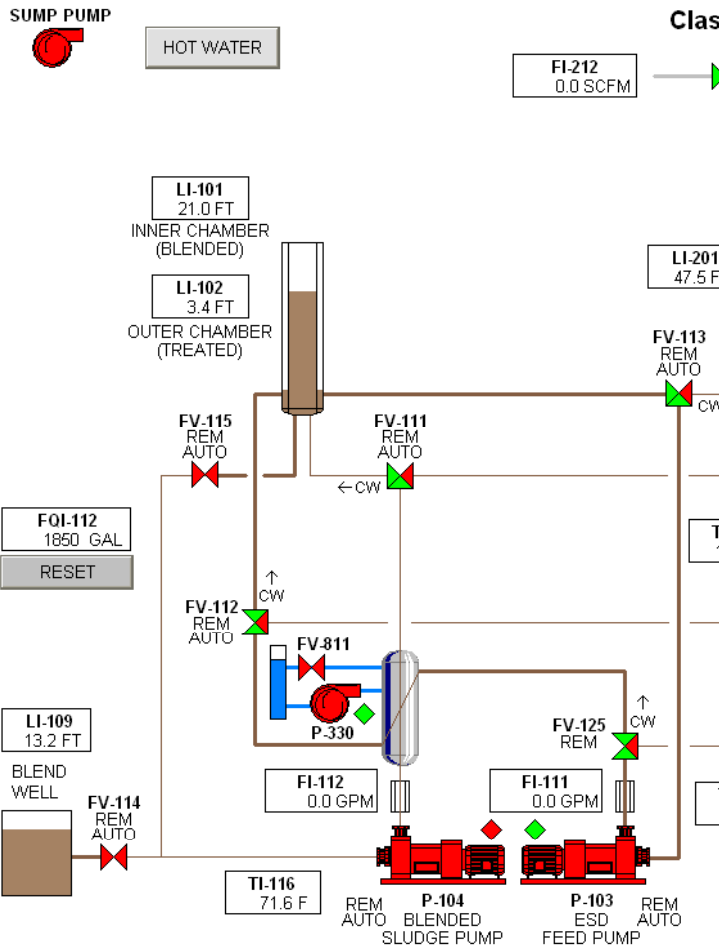
MINUTES BETWEEN STARTS:

MINUTES TO RUN:

◆ INTERLOCKS OK
 RESET ALARMS

Close WINDOW

WWTP Overview	INF Pump Station	Headworks	Aeration Basins	Final Clarifiers	RAS/WAS Pump Station			UV / Effluent	Digesters	Runtimes (Operator)	Runtimes (Maint)
Class A System Overview	Class A System Schedule		Chemical Treatment		Trends	(Future)	(Future)	Flow Totals	(Future)	(Future)	Alarms Setup



Batch Controls - Display

BATCH CONTROLS

STEP #	FUNCTION
0	WAITING TO START (NEXT BATCH STARTS IN 25 MINUTES)
1	WAIT FOR ATP REACTOR SLUDGE TREATMENT CYCLE TO FINISH
2	PUMP TREATED SLUDGE FROM ATP REACTOR TO ISOLATION TANK
3	HEAT RECOVERY CYCLE 1 - HEAT BLENDED SLUDGE
4	PUMP BLENDED SLUDGE FROM ISOLATION TANK TO ATP REACTOR
5	PUMP BLENDED SLUDGE FROM BLEND WELL TO ISOLATION TANK
6	HEAT RECOVERY CYCLE 2 - COOL TREATED SLUDGE
7	PUMP TREATED SLUDGE FROM ISOLATION TANK TO DIGESTER
8	BATCH CYCLE SHUTDOWN

STEP TIMER (MIN): 0.0

ENABLE

DISABLE

BATCHES PER DAY:

GALLONS PER BATCH:

GALLONS PER DAY: 15000

Close WINDOW

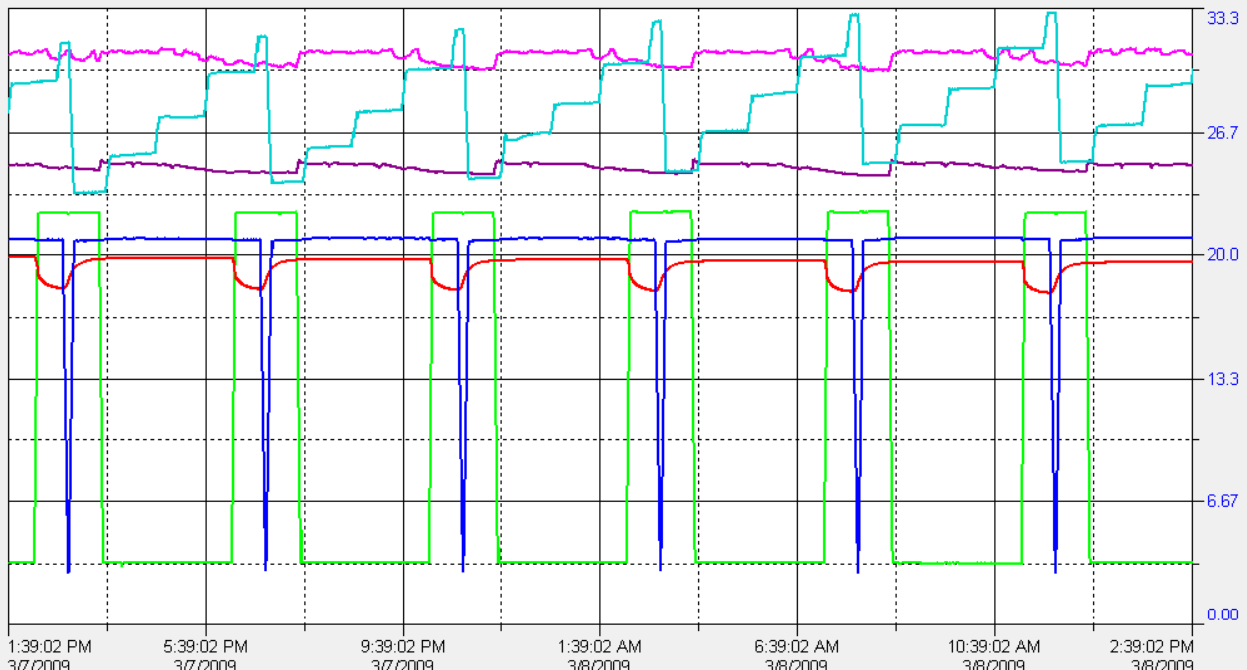
BATCH CONTROLS

BATCH SETPOINTS

BATCH STATUS: WAITING (NEXT BATCH STARTS IN 25 MINUTES)

WWTP Overview	INF Pump Station	Headworks	Aeration Basins	Final Clarifiers	RASWAS Pump Station			UV / Effluent	Digesters	Runtimes (Operator)	Runtimes (Maint)
Class A System Overview	Class A System Schedule		Chemical Treatment		Trends	(Future)	(Future)	Flow Totals	(Future)	(Future)	Alarms Setup

Sludge Level



20.9072	LT101 - Isolation Tank Inner Chamber Level (Blended Sludge) (FT)
3.36978	LT102 - Isolation Tank Outer Chamber Level (Treated Sludge) (FT)
48.9929	LT201 - ATP Reactor Level (FT)
62.1977	LT301 - Egg-Shaped Digester Level (FT)
60.1248	LT312 - Egg-Shaped Digester Level (FT) (Radar)
15.1736	LT109 - Blend Well Level (FT)

Trend Control Menu

Pick Trend Start Date/Time

2009

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

Date:

Subtract one hour for Daylight Savings Time

Zoom Y-Axis: (x1.5 to x5)

Trend Length: hrs.

WWTP Overview	INF Pump Station	Headworks	Aeration Basins	Final Clarifiers	RAS/WAS Pump Station			UV / Effluent	Digesters	Runtimes (Operator)	Runtimes (Maint)
Class A System Overview	Class A System Schedule		Chemical Treatment		Trends	(Future)	(Future)	Flow Totals	(Future)	(Future)	Alarms Setup



***Boiler
and
Control Room***

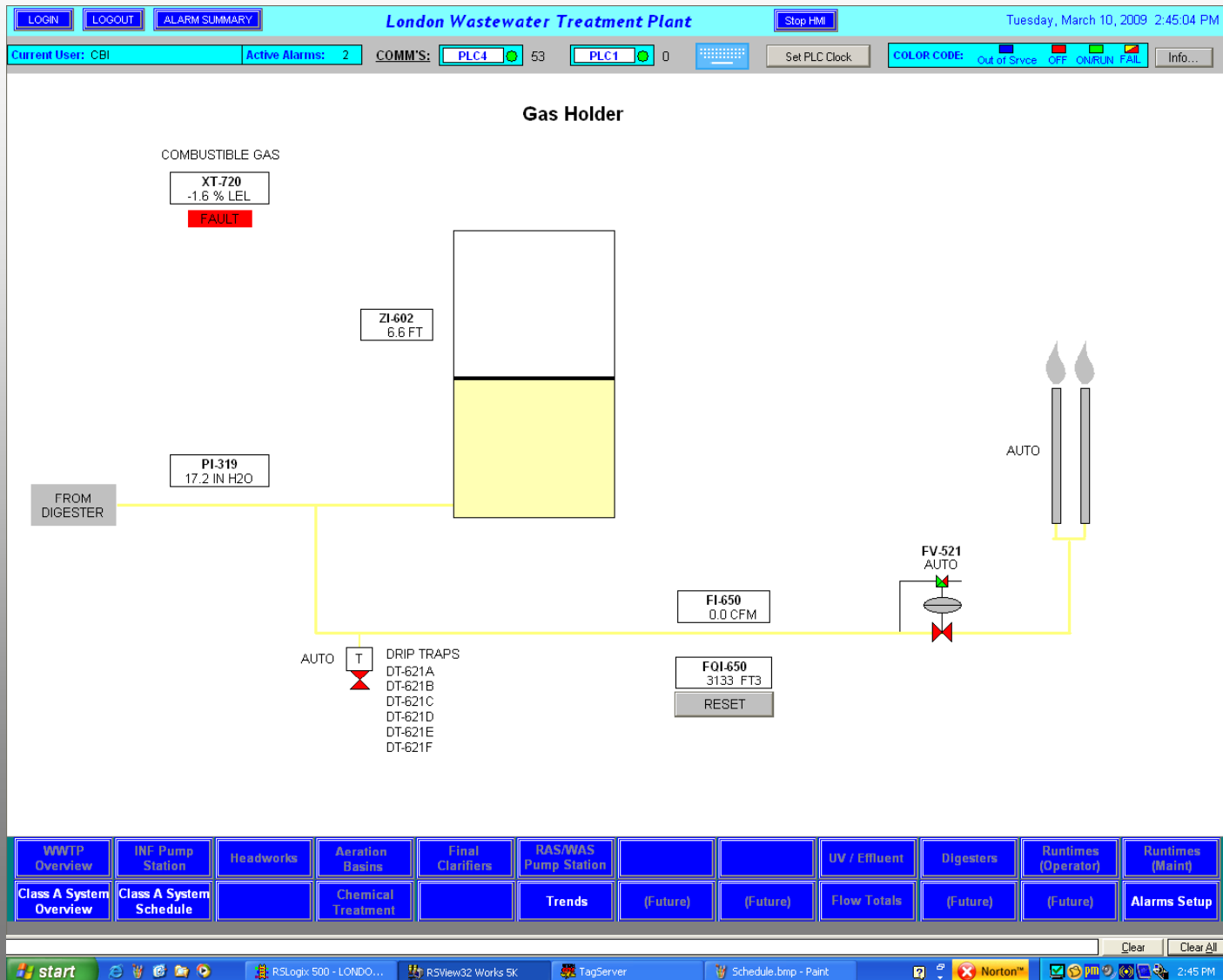
Waste Gas Flares

DRY SEAL GASHOLDER

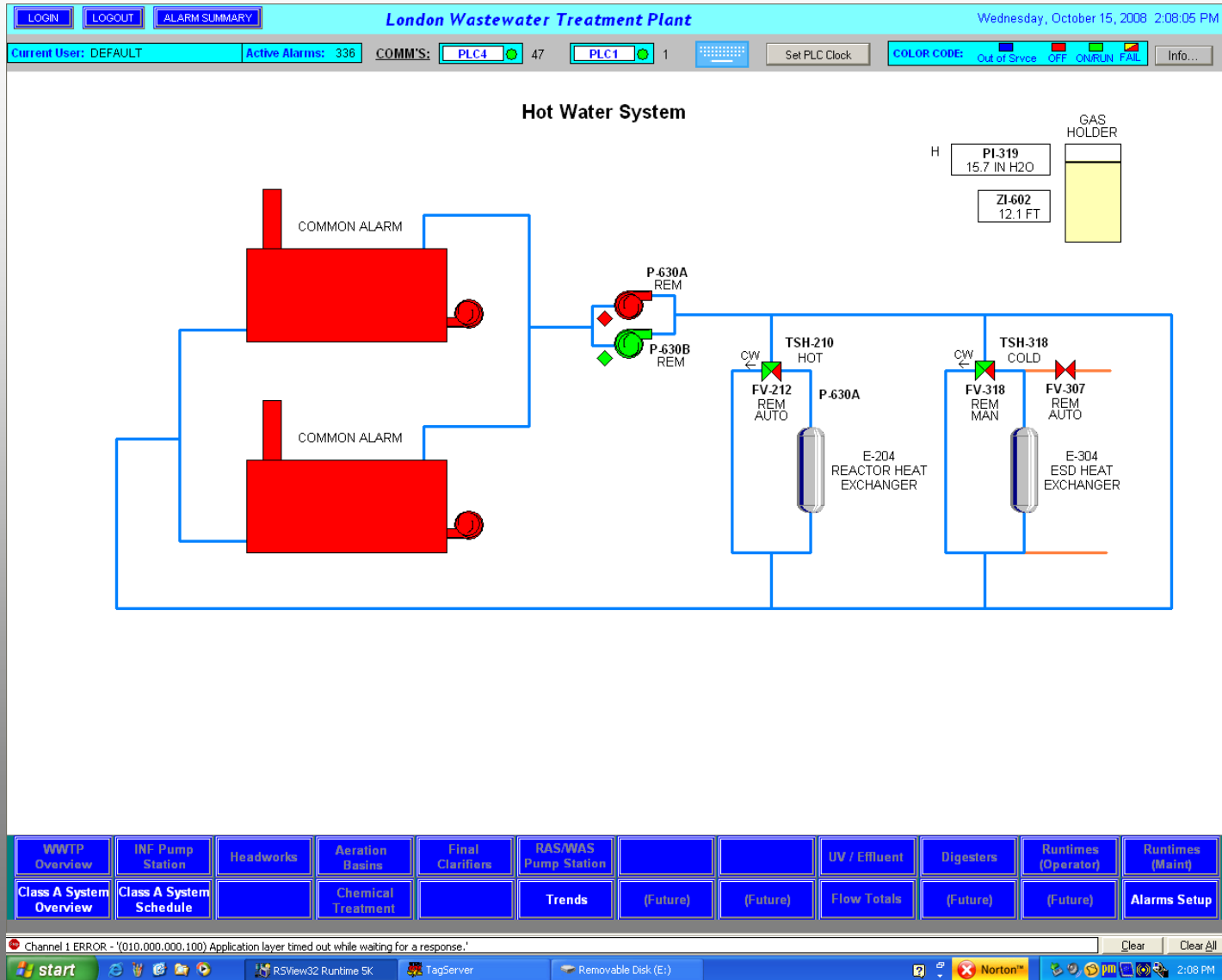
- *1,000 FT³ GASHOLDER*
- *CONTAIN EMISSIONS*
- *CONSTANT PRESSURE*
- *OPTIMIZE BOILER USE*
- *FLARE CONTROL*



FLARE CONTROL



BOILER ASSEMBLY



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STARTUP



"MICRO-DIGESTER" STARTUP

- **Seed ESD Vessel – *JUNE 2008***
- **Seed from Existing Digester**
- **ESD feed based on 20 Day detention**
- **Monitor and adjust**

"MICRO-DIGESTER" STARTUP

- **Test ESD for pathogens**
- **Seed ATP Reactor from ESD**
- **System fed based on ESD detention**
- **Monitor and adjust**
- **Test for Pathogen Reduction**

"MICRO-DIGESTER" STARTUP

- **Gas Available within 10 Days**
- **Test Flare system on methane**
- **Boiler operational on methane**
- **Full Operation – *AUGUST 2008***
- **Class A Results – *AUGUST 2008***

LONDON, OH ATP/ESD FACILITY

- **8,200 GPD FEED – 7 DAYS**
- **< 3 MPN, FECAL COLIFORM**
- **< 1 MPN, SALMONELLA**
- **55% VSS REDUCTION**
- **≥ 11,000 FT³ PER DAY**
- **68% METHANE CONTENT**
- **15-18 % DEWATERED CAKE**



QUESTIONS?

