

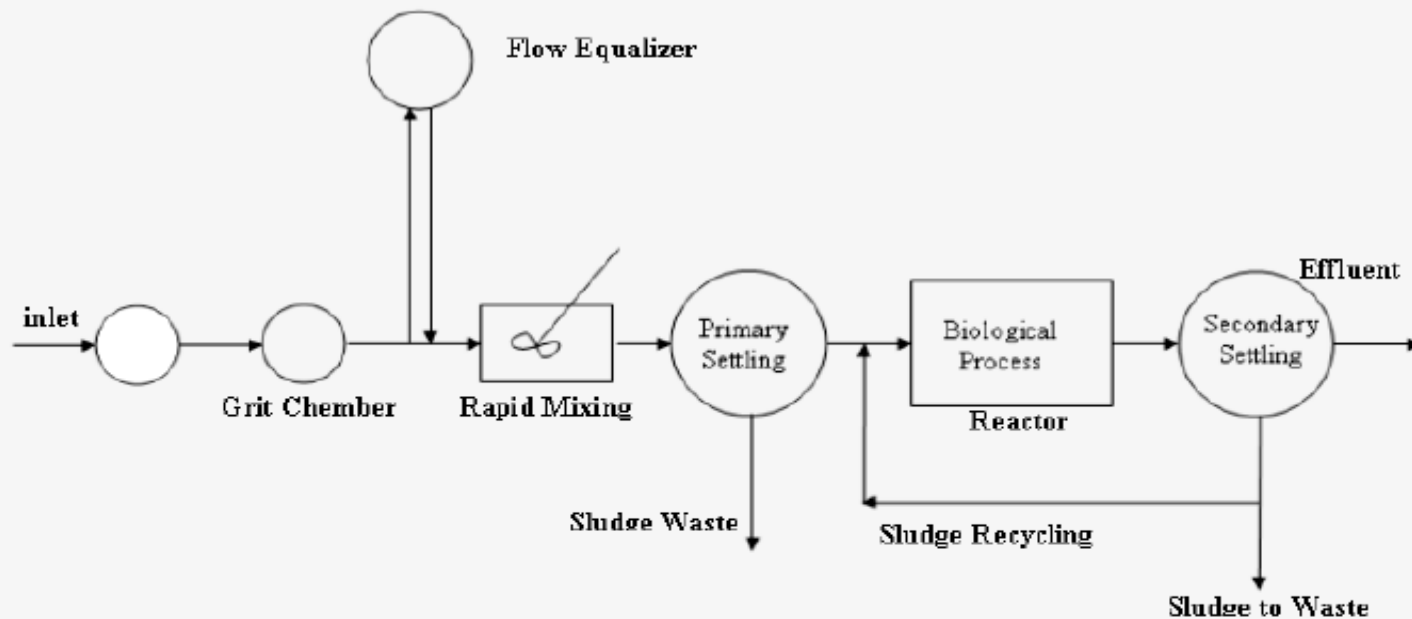
# Introducing ETP-CAD



## ETP-CAD

The software has developed by using the **MATLAB** and **C** programming Languages.

# Simple Diagram of an ETP



**Fig-01: Flow Diagram of Conventional Activated Sludge process**

# Basic Steps to Design an ETP

- Step1 → **Designing Primary Settling Tank**
- Step2 → **Designing Reactor Tank**
- Step3 → **Designing Secondary Clarifier**

## Step - 1

# Designing of Primary Settling Tank

- Required Experiment:

- Jar Test

- Column Test

### Data Acquisition

Jar Test Data

Column Test Data

Data Analysis

Result



## Step - 2

### Reactor Design

- Required Test

- ❖ COD Test
- ❖ MLSS Test
- ❖ BOD Test
- ❖ MLVSS Test
- ❖ Turbidity Test

Data Acquisition

Data from above tests → Data Analysis → Result

## Step - 3

# Designing Secondary Clarifier

### ◆ Required Experiment

→ Zone Settling Test

Data Acquisition

Data from

————→ Data Analysis ———→ Result

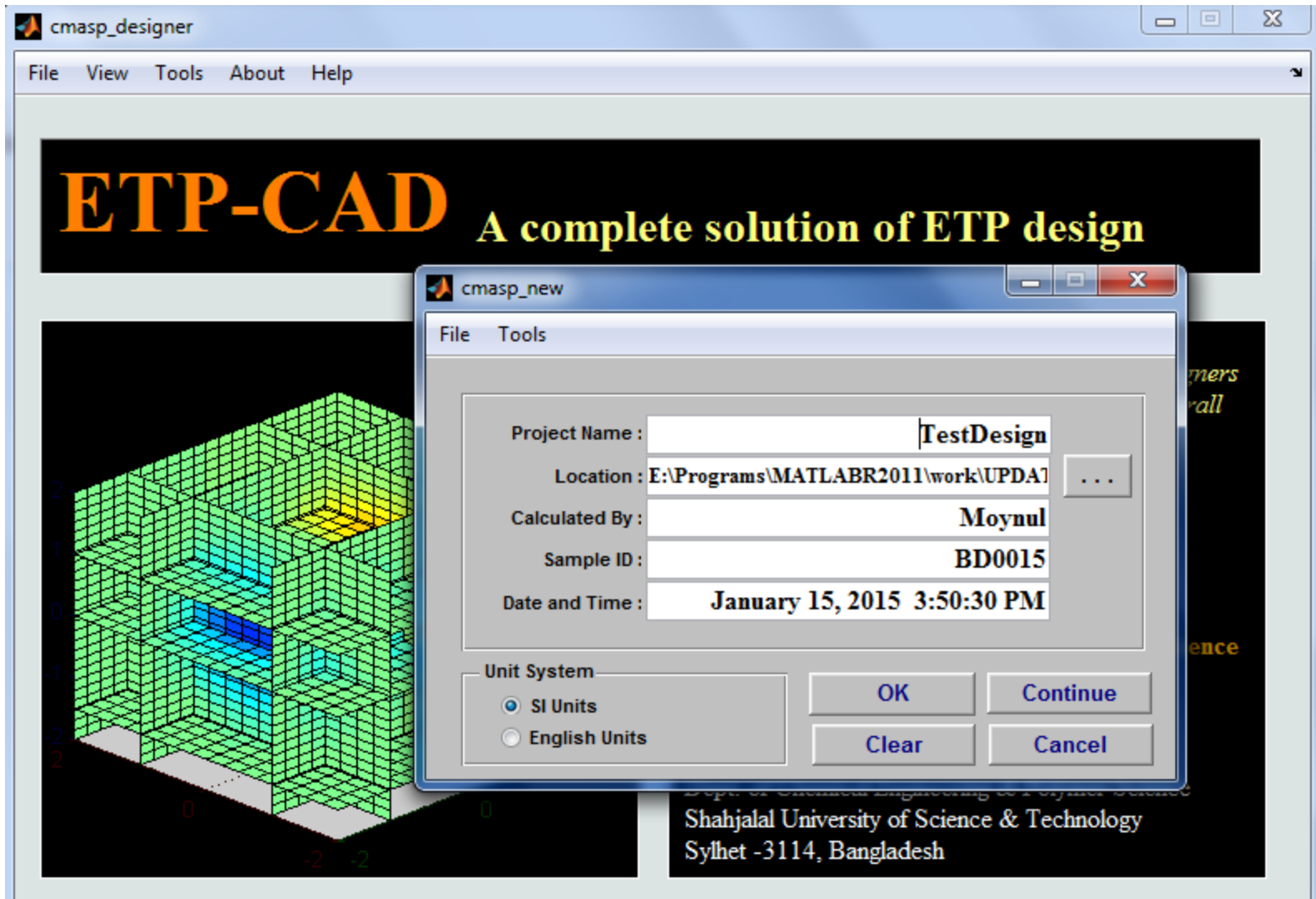
# Purposes to Design the Software

- To enhance the followings
  - Design
    - ▶ Optimization
    - ▶ Performance Analysis
    - ▶ Visualization
    - ▶ Taking Decision
- To increase efficiency and accuracy
- Language Used: MATLAB, C++

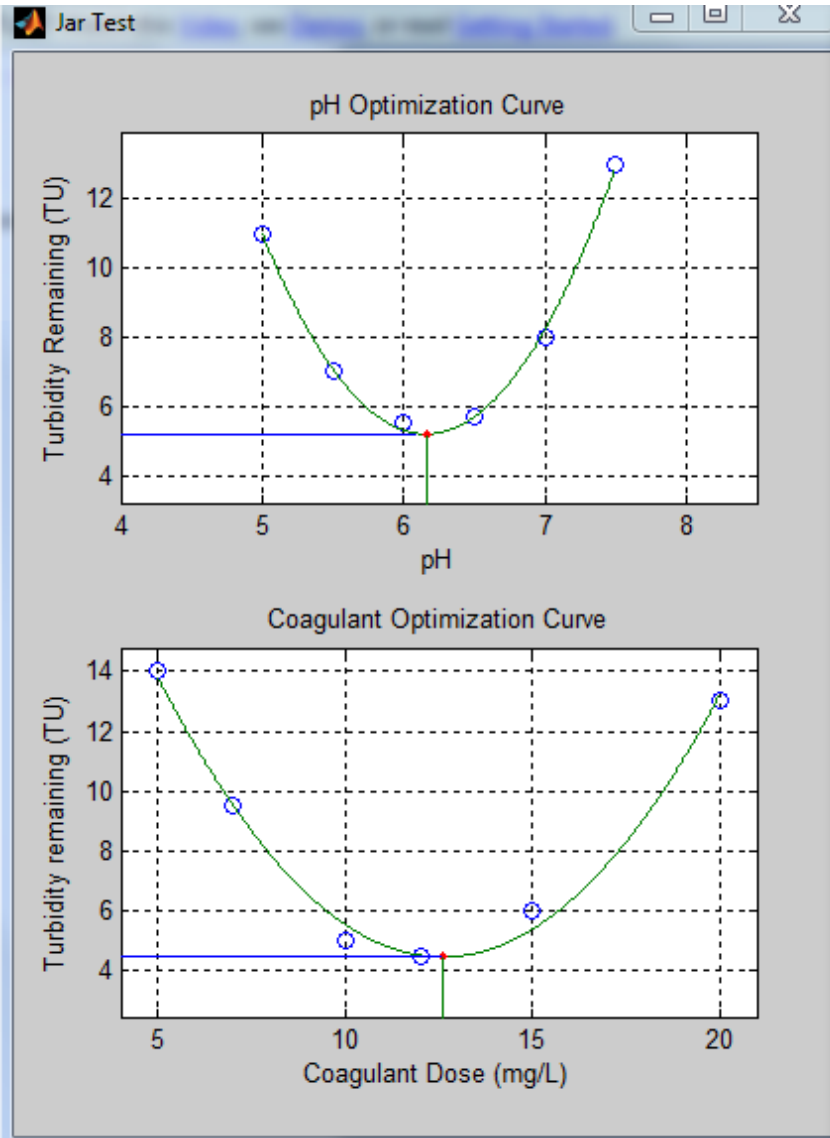
# Software Demonstration

- Let us go to the software demonstration section.....





Opening a New Project



File Tools

Enter Jar Test Data

Experiment No	pH Optimization		Dose Optimization	
	pH	Settled Turbidity (TU)	Coagulant Dose (mg/L)	Settled Turbidity (TU)
1	5	11	5	14
2	5.5	7	7	9.5
3	6	5.5	10	5
4	6.5	5.7	12	4.5
5	7	8	15	6
6	7.5	13	20	13
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

Constant Dose (mg/L): **12.62**      Constant pH: **6.16**

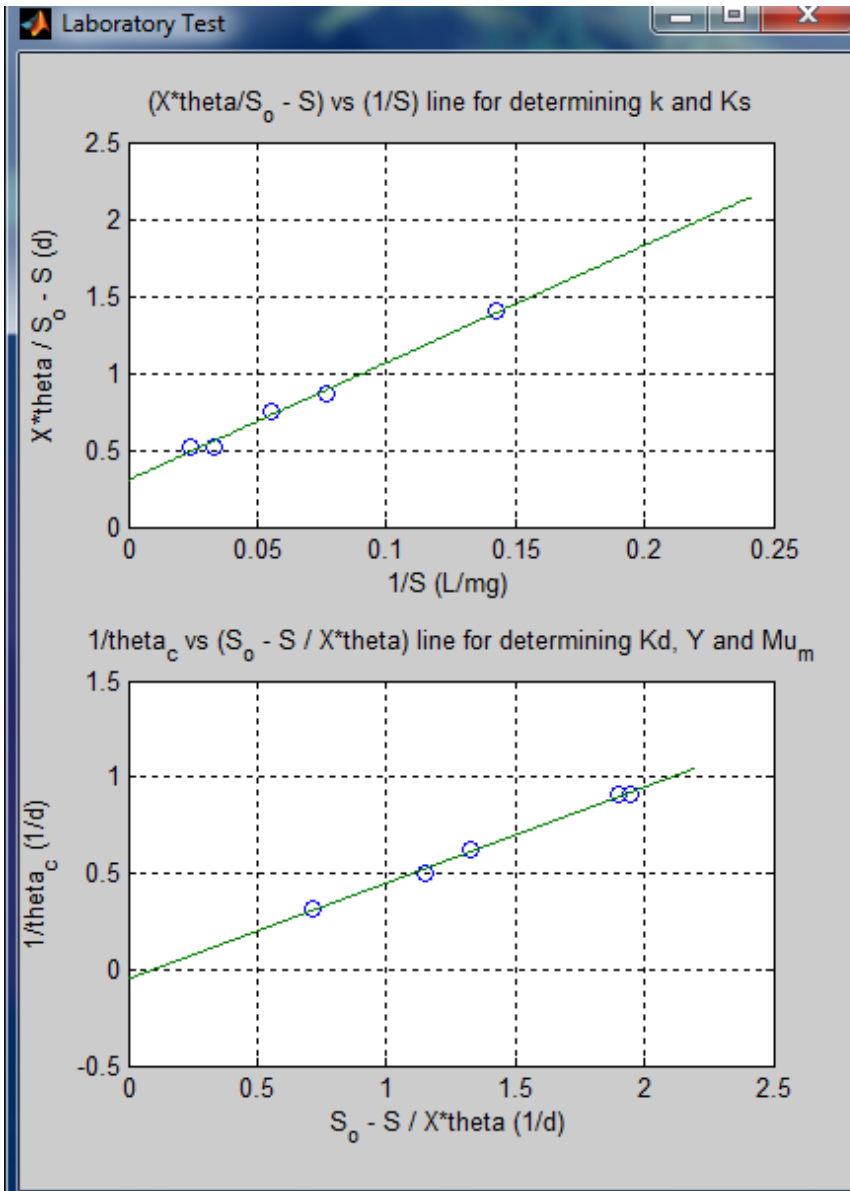
Output Panel

Turbidity: **5.19819** TU  
 Optimum pH: **6.16** mg/L  
 Turbidity: **4.46912** TU  
 Optimum Dose: **12.62** mg/L  
 Mu\_m: **0**

Optimize pH  
 Optimize Dose

Show Column      Next  
 Sample Data      Print Result  
 Reset All      Close All

Jar Test Data Analysis



cmasp\_labtest

File Tools

Enter Lab Test Data

Experiment No	$S_0$ mg/L BOD5	$S$ mg/L BOD5	MCRT $\theta_c$ d	$X$ mg VSS/L
1	300	7	3.2	128
2	300	13	2	125
3	300	18	1.6	133
4	300	30	1.1	129
5	300	41	1.1	121
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

Output Panel

$k$ : 3.2764 1/d

$K_s$ : 24.9576 mg/L

$K_d$ : 0.0502772 1/d

$Y$ : 0.498363

$\mu_m$ : 1.63284 1/d

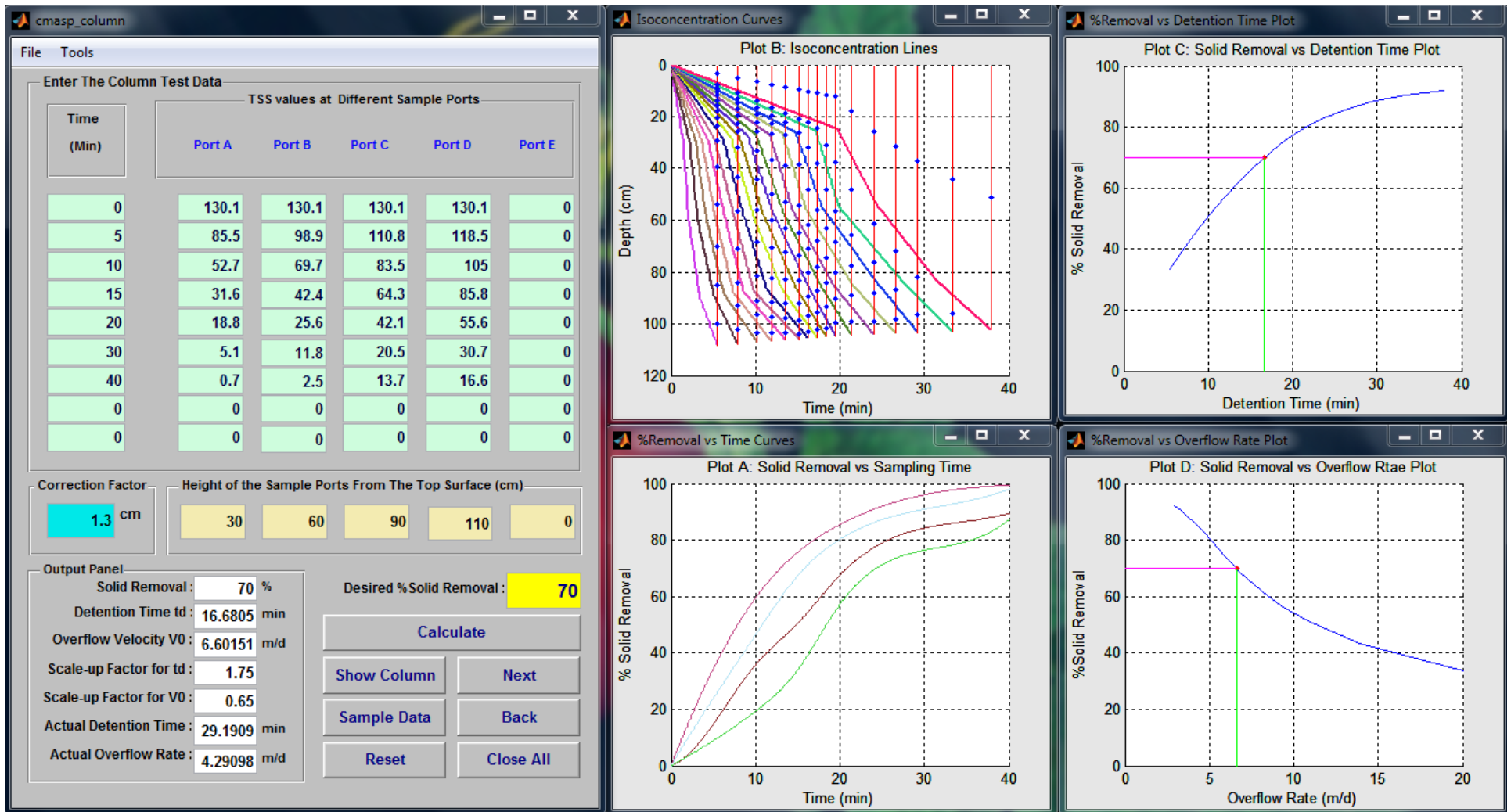
Calculate

Show Column Next

Sample Data Print Graph

Reset Close All

Lab Test Data Processing



Column Test Data Processing to Design Primary Clarifier

cmasp\_reactor

File Tools

**User Input Panel**

Inlet BOD5 S<sub>in</sub> : 250 mg / L

Outlet BOD5 S<sub>out</sub> : 20 mg / L

% BBS : 65 Unit3

%VBS : 80 Unit4

Kinetic co-efficient Y : 0.5 Unit5

Inlet flow rate Q<sub>in</sub> : 5.71 Mgal / d

Outlet BS : 22 Mgal / d

Monod Constant K<sub>d</sub> : 0.06 Unit8

MLVSS X : 3500 mg / L

Outlet VSS X<sub>e</sub> : 17.6 mg / L

Return VSS X<sub>r</sub> : 8000 mg / L

Mean Cell RTime : 10 days

**Output Panel**

Reactor Volume V : 1.23659 Mgal

Sludge WR Q<sub>w</sub> : 0.0949455 Mgal / d

Recycling rate Q<sub>r</sub> : 4.44111 Mgal / d

Recycle ratio R : 0.777778 Unit4

Hydraulic R-Time : 5.19756 hr

F/M ratio : 0.329825 per day

Volumetric Loading : 72.0144 lb BOD / d

Oxygen Required : 11876.7 lb O<sub>2</sub> / d

Theoretical Air Flow : 682568 ft<sup>3</sup> air / d

Designed Air Flow : 11850.1 ft<sup>3</sup> air / d

Calculate Next

Sample Data Print Plant

Reset Close

cmasp\_secondary

File Tools

**Enter The Zone Settling Test Data**

Sludge Conc X (mg/L)	Initial Settling Velocity V <sub>i</sub> (ft/hr)
1000	13.2
1500	11.5
2000	9.2
2500	5.9
3000	3.7
4000	1.8
5000	1
6000	0.66
7000	0.43
8000	0.31
9000	0.23

**Output Panel**

Limiting Solid Flux L<sub>sfl</sub> : 0.701809 (mg/L)

Underflow Concentration X<sub>u</sub> : 9000 (mg/L)

Settling Tank Area : 0 (sq-ft)

Settling Tank Depth : 0 (ft)

Surface Overflow : 0 (g/ft<sup>2</sup>)

Find Limiting SolidFlux At 9000

Calculate Show Graph

Sample Data Print Graph

Reset Close

Data Processing for Reactor and Secondary Clarifier Sizing