Zero Discharge Plan (ZDP) Initiatives Taken by DOE and It's Present Status

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What is Zero Discharge

- Zero discharge theoretically means there is no discharge of any kind of pollutants into the surrounding environment
- Some time it is also referred as end-of-pipe treatment.
- Quite often, zero discharge and zero liquid discharge are used in the same meaning.
- In the end of the 1980's, together with increased environmental awareness within society and industry, "Zero discharge" changed from a technical description of 100% wastewater recycling to a "goal". The principle of "zero discharge" is recycling of all industrial wastes (including waste water). In other words, Zero discharge means EMS or 3R's/4R's.

Initiation of Zero Discharge Plan (ZDP) in Bangladesh

cUf,wg

- 6ô cÂevwl©K cwiKíbv (SFYP 2011-2015)-i “Chapter 10 : Environment, Climate Change and Disaster Risk Management” Gi Aax‡b Environmental Management Target-G “Promote Zero Discharge of Industrial Effluents” D‡jøL i‡q‡Q (c„ôv-454, cvU©-2)| GQvov, H GKB Aa¨v‡qi AvIZvq Environmental Management Objectives-G “To Promote Zero Discharge of Industrial Effluents” Ges “To Establish Environment Management Systems (EMS) in Industries for Pollution Control” D‡jøL Kiv n‡q‡Q (c„ôv-461, cvU©-2)|

Initiation of Zero Discharge Plan (ZDP) in Bangladesh (contd.)

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Three Years Long Wastewater Recycling & Zero Discharge Plan Based on 3R

Three Years Long Wastewater Recycling & Zero Discharge Plan Based on 3R

S/N	Description	Expected Area/ Use Area	Projection Time											Remarks
			Feb/09	Mar/12	Apl/13	May/13Jan/14	July/14Dec/14	Jan/15 Jun/15	July/15 Dec/15	Jan/16 Jun/16	Jul/16 Jun/16	Jul/16 Jul/17	Aug/17 Dec/17	Jan/18 To Continue	
01	Hot water recovery	Process /dye House	⟷											**Development Work:** **Energy saving Process Development** **EMS certification** **Research project**	**Reduce:** Save H_2O 80m^3/day
02	Medical Solis Waste Management (Day Care)	Health Care Centre		⟷											**Contact with Prisom Bangladesh for medical waste**
03	Bio Gas Plant	Kitchen	⟷												**Reduce** : ton 144.54 CO_2 e/yr.
04	Energy saving practice	Use of T5& LED light, Servo motor, heat recovery from exhaust, condensed & flash stream recovery, heat recovery from economizer, hot water recovery use in dye,		⟷											**Reduce and Reuse:** Reduce electricity consumption and reuse natural resources, **Reduce CO_2 emission : ton 2257.31 CO_2 e/year**
05	Rain water harvesting	Process /dye House			⟷		⟷								**Reduce :** Save H_2O 76m^3/day
06	WTP new reserve tank for backwash water storage ***(Civil & Electromechanical)***	Process /dye House						⟷		⟷					**Reuse:** Save H_2O 95 m^3/day
07	Anaerobic Tank for ETP Sludge treatment **(Experimental)**	Pilot Scale Bio Gas Tank							⟷		⟷				**Reduce:** sludge volume & applicable for crop.
08	Tree Plantation	Open Area								⟷					**40% Greenery Area Coverage**
09	**Wastewater Re-cycle First Phase-** Multi grade filter, Activated carbon filter, Micro filtration & new reservoir for ETP outlet (Civil Work)	Toilet Flash Car Washing ETP Chemical mixing/ Dosing Tank Chemical Drum Washing Gardening/road Watering Floor cleaning Firefighting								⟷					**Reuse :** Save H_2O 360 m^3/day **20% H_2O reuse from ETP**
10	Salt Recovery Plant and Wastewater Segregation	Process /dye House								⟷					Considering to separate color water and salt.
11	**Wastewater Recycling Second Phase** (RO or Better Technology)	Process /dye House										⟷			**Recycle**: 80% H_2O from ETP outlet
12	Magneto Hydro Dynamics	Boiler and Generator										⟷			**Reduce: Gas consumption 15%**
13	Sewage Treatment Plant (STP)										⟷				
14	ETP Sludge Management	Bio Fertilizer/others	Ongoing project with Bangladesh atomic energy commission from June 2012 to continue												Treatment for Land Filling
15	Process Development	Dye Area: 1 Process Modification 2 Chemical Selection 3 Dyes Selection	It's a continuous process. Dyes & chemical selection can reduce water consumption that we developed and still researches are going on.												Any findings or developments, we will apply future.
16	Water Flow Meter Installation	Process House	Continuous process												At present, we have 8 water flow meters.

Step 01: Hot water Recovery:

Projection Time: ----------

Condensed & Flash steam recovery system:
Condensed & Flash Steam from dye and garments recovered
to feed water tank that use to pre heat the boiler again up to 90-92°C.
Benefits are as follows:

Reduce/ save H_2O	***Natural gas save***	***Reduce CO_2 emission***
24,000 m^3/year	285714 m^3/year	ton 635.86 CO_2e/year

Note: This Carbon calculation have done with a reference of IPCC & Defra /DECC's GHG conversion factors.

Step 02: Medical Solid Waste Management:

Projection Time: ----------

We segregate and label solid waste and store in waste management selected area with maintaining register. For medical waste management, we contacted with Prism Bangladesh which is listed medical waste management organization in Bangladesh.

Volume of Medical waste	10 kg/six months

Step 03: Bio Gas Plant from Kitchen Waste:

Projection Time: ----------

As burning biogas is simply recycling of CO_2 in biosphere & plant use this CO_2 during photosynthesis. So biogas plant automatically reduces CO_2 in atmosphere.

Benefits are as follows:

Reduce global warming by burning CH_4 gas which is 21 times stronger than CO_2

Reduce natural grid gas consumption in cooking area

The slurry increase soil fertility and use in agriculture fields.

Environment sound management by eliminate odors

Name of items	**Amount /volume**
Employees	7000
Kitchen waste	800 kg/day
Plant Capacity	25 m3/day

Step 04 : Energy Saving Practice:

Projection Time: ----------

Practices	Saving electricity/gas/water (yr)	CO_2 reduction
Conventional florescent light replaced by T5 tube	88359 KWh/year	ton 16.22 CO_2e/year
LED in sewing machine	247104 KWh/year	ton 45.36 CO_2e/year
Servo drive with motor in sewing machine	673920 KWh/year	ton 123.73 CO_2e/year
Installation Exhaust in heat recovery unit	292032 m3/year (16% save of total consumption)	ton 649.92CO_2e/year
Condensed & Flash steam recovery	285714 m3 gas/year 24,000m3 H_2O/year	ton 635.86 CO_2e/year
Heat recovery through Economizer	85714m3 gas/year	ton 190.7 CO_2e/year
Hot water Reuse in dye machine	267589 m3 gas/year 49950 m3 H_2O/year	ton 595.52 CO_2e/year

Note: This Carbon calculation have done with a reference of IPCC & Defra (DECC's GHG conversion factors)

Step 05: Rain water Harvesting:

Projection Time: ----------

Roof top area for rain water harvesting.
According to Dhaka meteorological department, for year long data:

Total area	Volume of rain fall	Save/day
11700 m^2 roof top	27799 m^3/year	76 m^3/day

Weather: Annual average temperature of Gazipur district is maximum 36°C and minimum 12.7°C. Annual rainfall is 2376 mm. with a reference of Bangladesh metrological department on 11th November/2013

Step 06: WTP new reserve tank for backwash water storage:

Projection Time: ----------

WTP- 01 (40m^3/day)	WTP- 02 (80m^3/day)
Back wash 10 m^3/day (go to ETP) Rewash **15** m^3/day (go to WTP raw tank) Brain Wash **25** m^3/day (go to reserve tank for regeneration)	Back wash 50 m^3/day (go to ETP) Rewash **25** m^3/day (go to WTP raw tank) Brain wash 60 m^3 2 days interval (go to reserve tank for regeneration)
Reuse volume 95 m^3/day (Rewash + Brain Wash volume + Brain wash volume+ Rewash)	

Step 07: Tree Plantation:

Projection Time: ----------

At present existing green area 30% (164100 Sft)
It will be increased in future, 40% (218800 Sft) green coverage = 303.89 Katha

Total Land area = 547000 Sft
Building area= 200000 Sft
Green 40% (218800 sft) = 303.89 Katha
Open space including road 128200 Sft

Step 08: Anaerobic Tank for ETP Sludge treatment (Experimental):

Projection Time: ----------

Raw materials: ETP sludge

We have contacted with Grameen Shakti for portable crystal biogas plant. Their engineers will conduct the research in pilot scale in ECHOTEX premises.

Research period: successful research then large scale anaerobic tank construction.

Benefits:

Suitable for landfill

Step 09: Wastewater Recycling 1st phase:

Projection Time: ----------

20% water reuse i.e., 360 m^3/day. Or 15 m^3/hr.
Multi grade filter, Activated carbon filter, Micro filtration & new reservoir for ETP outlet (civil)

Water Calculation for Toilet Flushing:

Total no of people worker with management = 7000 person
Water require = 30 liter per capita per day. (Working hours 10)
Amount of water = 7000X30 = **210 m^3/day.**

Water Calculation for Gardening and Road Watering:

Total Land area = 547000 Sft, Building area= 200000 Sft
Green 40% (218800 Sft) = 303.89 Katha, Open space including road 128200 Sft
According to the rate of entry of water from surface to the soil, infiltration rate is 1.25 to 2.5cm per hour. e.g. - sandy loam/ silt loam soils.
Infiltration rate, f = 2.0/100 m X 24 day = 0.48 m/day.
Water discharge, **Q = 72 m^3/day.** Area, A = ?
So, Q = Axf, 72 m^3/day = AX 0.48 m/day
A = (72 m^3/day)/0.48 m/day = 150 m^2 = 1614 Sft = 2.24 Katha.

Step 09: Wastewater Recycling 1st phase : (Continued)----------

Water Calculation for Floor and Car Washing:

Total no of Car = 30 Nos. Water require = 200 liter per car.
Amount of water = 30 X 200 = **6 m^3/day**
Area of Total Floor (dyeing + Washing) = 63000 Sft.
Water require = 0.20 liter per sft.
Amount of water = 63000X 0.20 = **12 m^3/day**

ETP Chemical Mixing Tank: 50 m^3/day
Chemical Drum Washing: 04 m^3/day
Fire Fighting (On Demand) and Others: 06 m^3/day

Step 10: Salt Recovery Plant and Wastewater Segregation

Projection Time: ----------

Benefits:

- Reduce pressure in ETP
- Reduce water consumption in dye house
- Reuse salt in Dye

Step 11: Wastewater Recycling 2nd phase

Projection Time: ----------

Benefits:

80% water recycling
Reduce water extraction pressure
80% water reuse i.e., 1440 m^3/day. Or 60 m^3/hr.

Treatment Process:

Treated Water Reservoir cum Sedimentation Tank, Flocculation, Lamila Clarifier, Filter Feed Sump, Multigrade Filter, Activated Carbon Filter, Softner unit, RO & Micron Filter Feed Sump, Micron Filter, Reverse Osmosis Reservoir, UV sterilizer.

Step 12: Magneto Hydro Dynamics

Projection Time: ----------

Benefits:

Reduce Natural Grid gas consumption 20% from present use in Boiler and Generator.

Uses are in Boiler and Generator

Step 13: Sewage Treatment Plant (STP)

Projection Time: ----------

Recently see that our canal and river pollution is occurred not only from Industrial outlet but also from human and house hold wastage. The direct discharge of sewage without treatment makes the water pollution become more and more serious. In order to improve the serious environment and living conditions, the construction of sewage treatment device will be added into the industrial area construction. This measure will produce an indelible effect on environment improvement. So it is exact time to initiate program for minimize water pollution from this aspect. We suggested that where residing above 500 peoples there must be installed STP, instead of conventional septic tank and soak well. It is studied that the installed septic tank and soak well is not properly maintained by the authority and overflowing the human and house hold, house sprayed the nature and pollutes the environment by calculating 1:50 liters (Toilet Flushing 30 Liters and Others 20 Liters) water uses.

Step 13: Sewage Treatment Plant (STP): (Continued)

Wastewater Calculation:

Total no of people worker with management = 740 person

Water require = 50 liter per capita per day

Amount of water = 740 X 50 = 37 m^3/day. = 1.52 m^3/hr.

According to the safety factor, we have quoted for the Sewerage Treatment Plant (STP) that will be capable of treating 48 m^3 of waste-water per day of 24 working hours at the rate of 2 m^3/hr. This waste water has been considering after pre-treatment by individual septic tank and soak wall.

Calculation of Area for Sewage Treatment Plant (STP):

Effluent flow from Septic Tank = 48 m^3/day (According to the safety factor).

According to the rate of entry of water from surface to the soil, infiltration rate is 1.25 to 2.5cm per hour. e.g. - sandy loam/ silt loam soils.

Infiltration rate, f = 2.0/100 m X 24 day = 0.48 m/day.

So, Q = Axf, 48 m^3/day = AX 0.48 m/day

Area, A = (48 m^3/day)/0.48 m/day =100 m^2

Buildings and structures in this project are: equalization tank and grit chamber, primary sedimentation tank, biological contact oxidation tank, secondary sedimentation tank, disinfection tank, sludge homogenization tank, sludge dewatering house and blower house.

Step 14: ETP Sludge Management:

Projection Time: ----------

Ongoing project with Bangladesh atomic energy commission from June 2012 to continue
Treatment for Land Filling

Step 15: Dye Process Development:

Projection Time: ----------

Continuous process:

Dyes & chemical selection can reduce water consumption that we developed and still researches are going on.

Any findings or developments, we will apply future.

Organic Dyes/Green acid

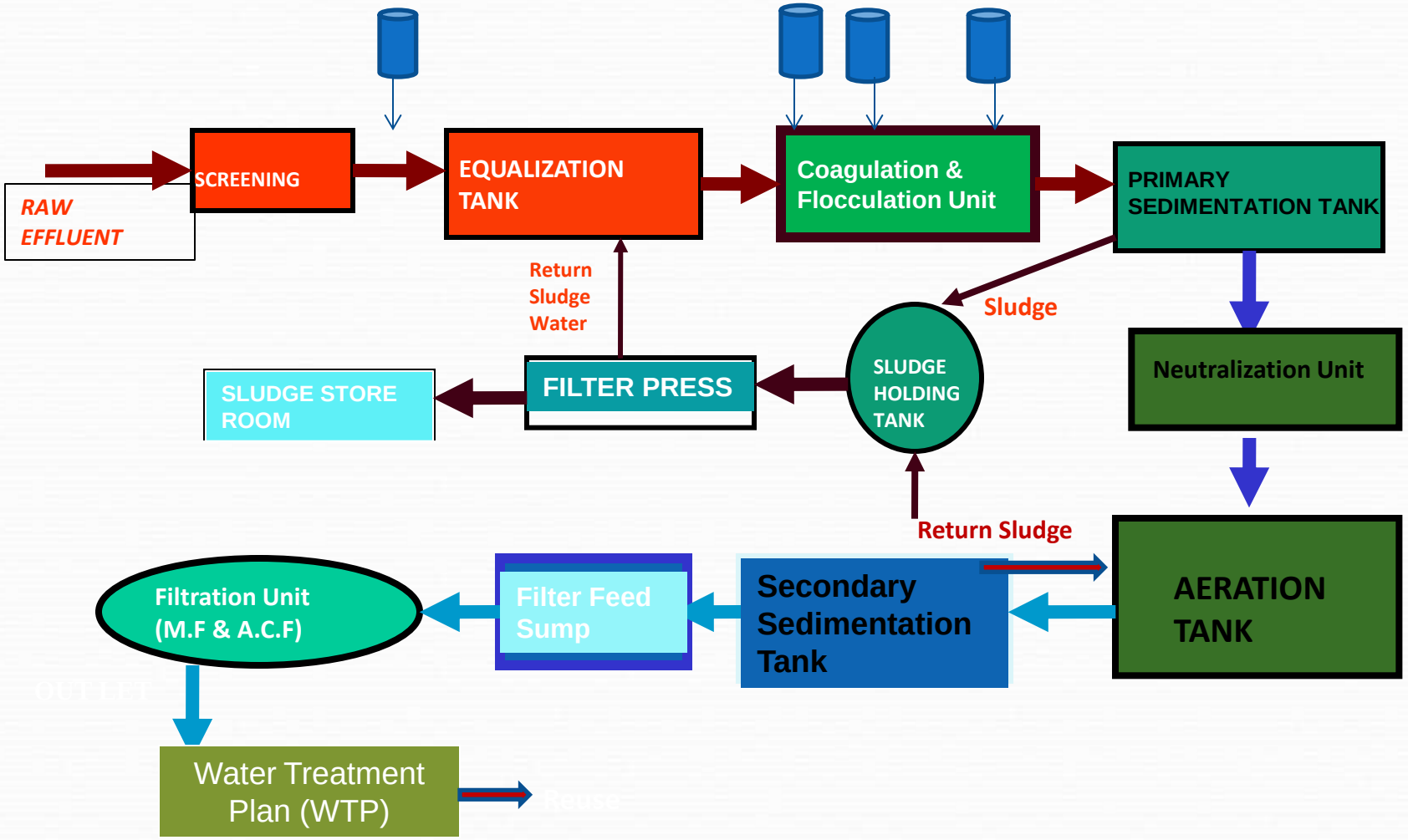
Step 16: Water Flow Meter Installation/Online Monitoring:

Projection Time: ----------

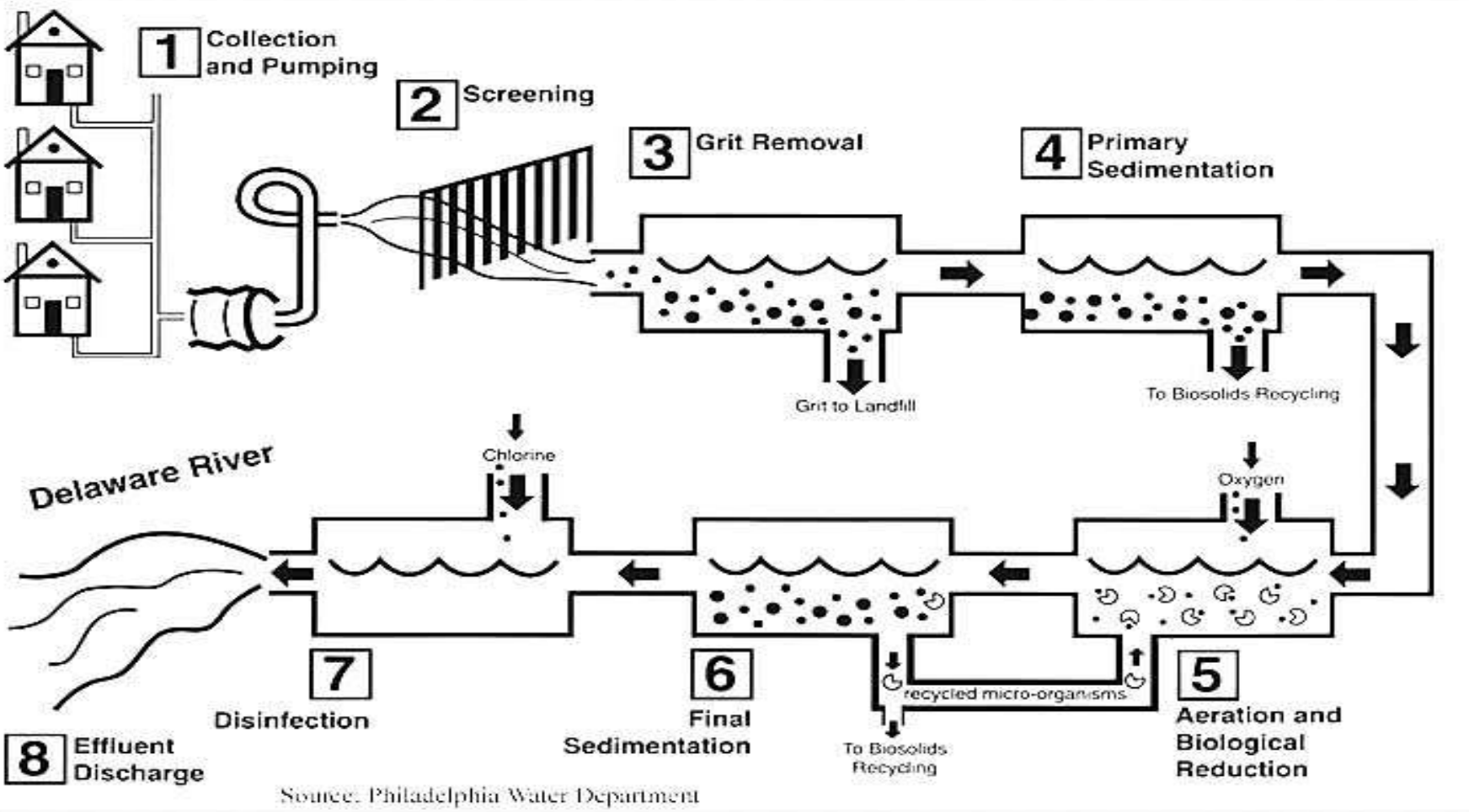
Continuous process

At present, we have 8 water flow meters.

Process flow diagram of ETP:



Process Flow Diagram of Sewage Treatment Plant (STP):

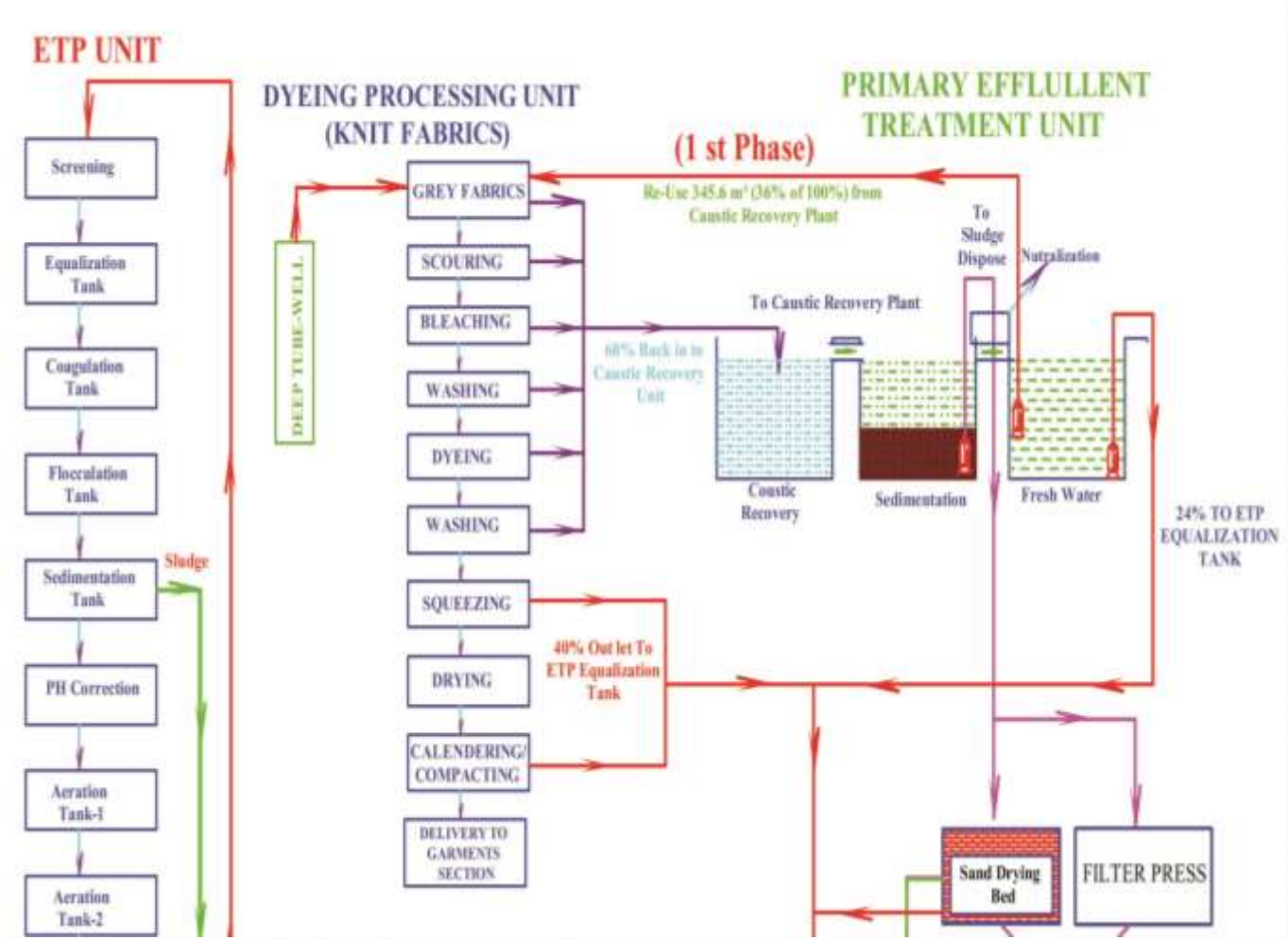


Wastewater Re-cycling 1st Phase.

- Total Waste water Generation in this factory 960 m^3/day.
- 36% Water re-use in 345.6 m^3/day or 14.4 m^3/hr.

Continued

1st Phase-36% of 100% Re-cycle Process



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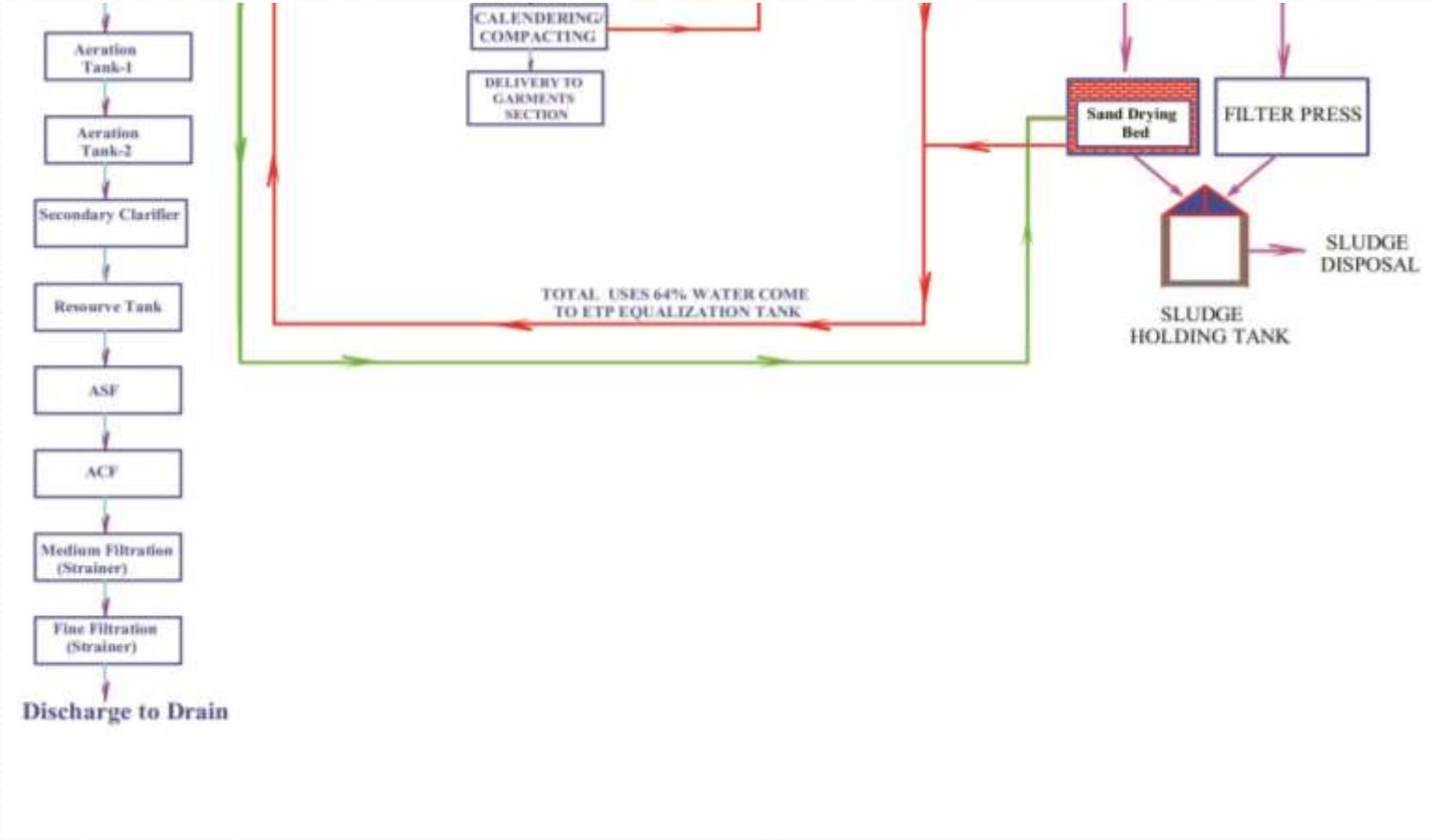
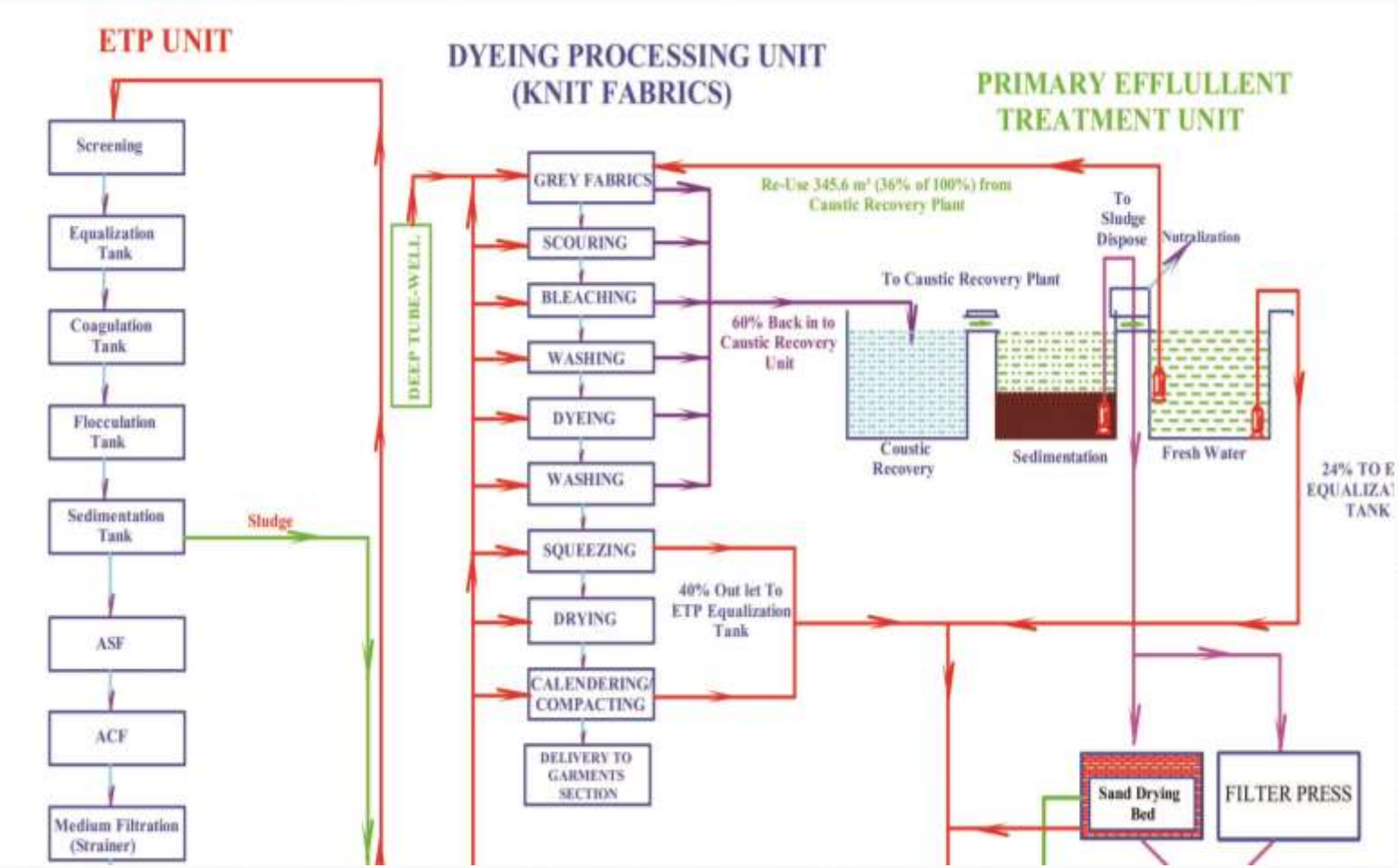

Aeration Tank-1
Aeration Tank-2
Secondary Clarifier
Resourve Tank
ASF
ACF
Medium Filtration (Strainer)
Fine Filtration (Strainer)
Discharge to Drain
CALENDERING/ COMPACTING
DELIVERY TO GARMENTS SECTION
TOTAL USES 64% WATER COME TO ETP EQUALIZATION TANK
Sand Drying Bed
FILTER PRESS
SLUDGE DISPOSAL
SLUDGE HOLDING TANK

Wastewater Re-cycling 2nd Phase .

- Total Waste water Generation in this factory 960 m^3/day.
- 55% Water re-use = 528 m^3/day or 22 m^3/hr.

Continued

2nd Phase-55% of 100% Re-cycle Process



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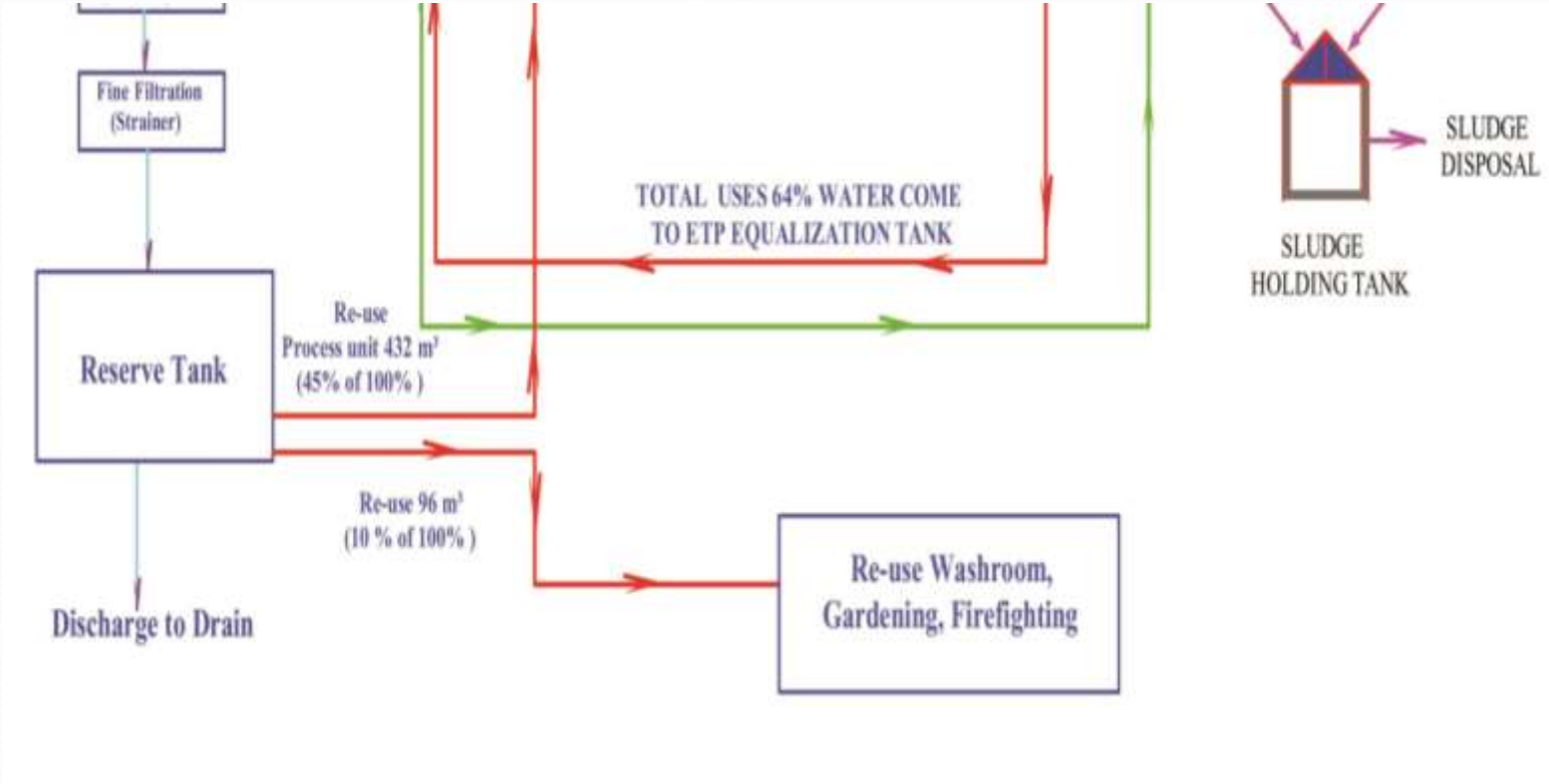
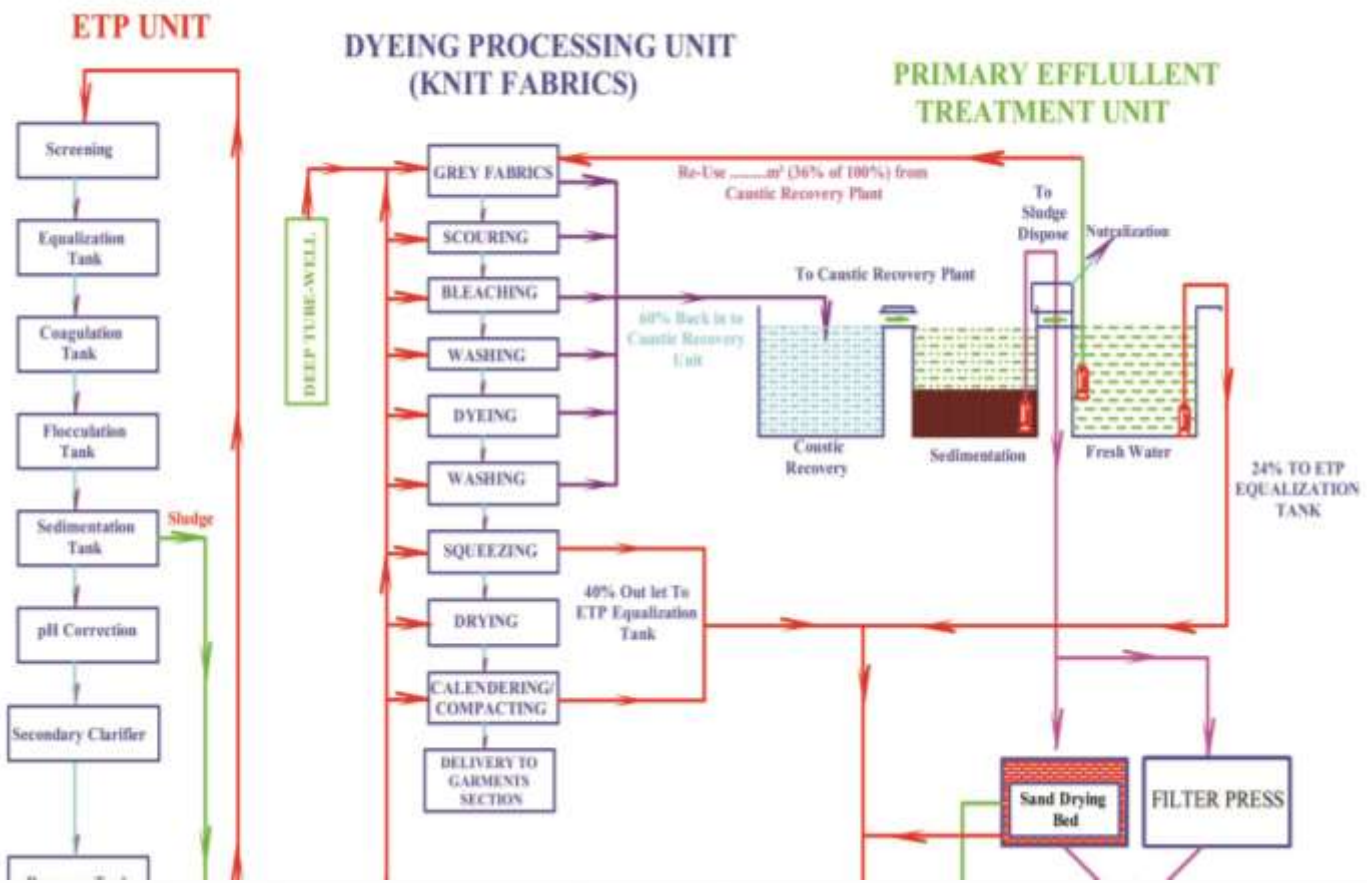

Fine Filtration
(Strainer)
Reserve Tank
Discharge to Drain
Re-use
Process unit 432 m³
(45% of 100%)
Re-use 96 m³
(10 % of 100%)
Re-use Washroom,
Gardening, Firefighting
TOTAL USES 64% WATER COME
TO ETP EQUALIZATION TANK
SLUDGE
HOLDING TANK
SLUDGE
DISPOSAL

Wastewater Re-cycling 3rd Phase.

- Total Waste water Generation in this factory 960 m^3/day
- 8% Water re-use = 76.8 m^3/day or 3.24 m^3/hr.

Continued

3rd Phase-8% of 100% Re-cycle Process



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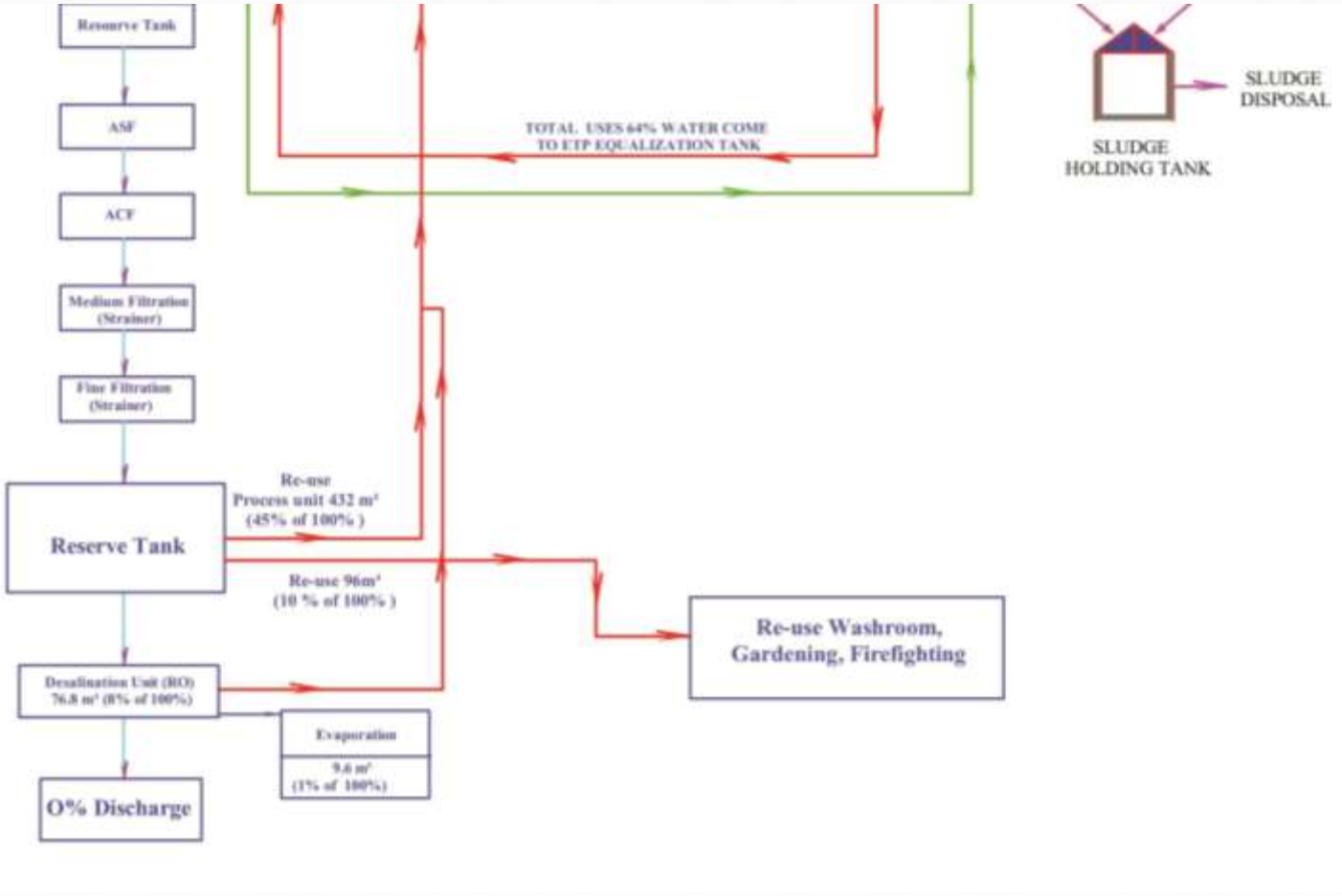
Resourve Tank
ASF
ACF
Medium Filtration (Strainer)
Fine Filtration (Strainer)
Reserve Tank
Re-use Process unit 432 m³ (45% of 100%)
Re-use 96m³ (10 % of 100%)
Re-use Washroom, Gardening, Firefighting
Desalination Unit (RO) 76.8 m³ (8% of 100%)
Evaporation
9.6 m³ (1% of 100%)
O% Discharge
TOTAL USES 64% WATER COME TO ETP EQUALIZATION TANK
SLUDGE DISPOSAL
SLUDGE HOLDING TANK

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Thank you all.