

# BIOLOGICAL TREATMENT SYSTEM FOR VEHICLE SERVICE STATIONS



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# Wastewater / Effluent Sources

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**Body washing**



**Under carriage cleaning**



# Main Pollutants

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- ❑ Mud
- ❑ Oil & Grease
- ❑ Soap / Detergent
- ❑ Kerosine

## Major Pollution Parameters

- pH
- Oil & Grease
- BOD - Biochemical Oxygen Demand
- COD - Chemical Oxygen Demand
- TSS

# QUALITY -TYPICAL FIGURES

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|     |   |   |
|-----|---|---|
| pH  | - | 6.0 - 8.5   |
| COD | - | 300 - 700 mg/l  |
| BOD | - | 250 - 500 mg/l  |
| O&G | - | Very high & varies depending on the house keeping practices |

# Wastewater Disposal Standards

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Tolerance Limits for Discharge of industrial effluents in to :

- Inland Surface Waters
- on land for Irrigation Purposes
- in to Marine Coastal Areas

| Parameter               | Tolerance Limit |
|-------------------------|-----------------|
| TSS -mg/l               | 50              |
| pH                      | 6'0 - 8'5       |
| BOD <sub>5</sub> - mg/l | 30              |
| O & G –mg/l             | 10'0            |
| COD – mg/l              | 250             |

# COMPARISON OF CHEMICAL & BIOLOGICAL SYSTEM

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## ● CHEMICAL SYSTEM

- Need chemical addition
- Large quantity of chemical sludge generated
- Need well trained operator to do the treatment
- Treated water contains trace amounts of treatment chemicals

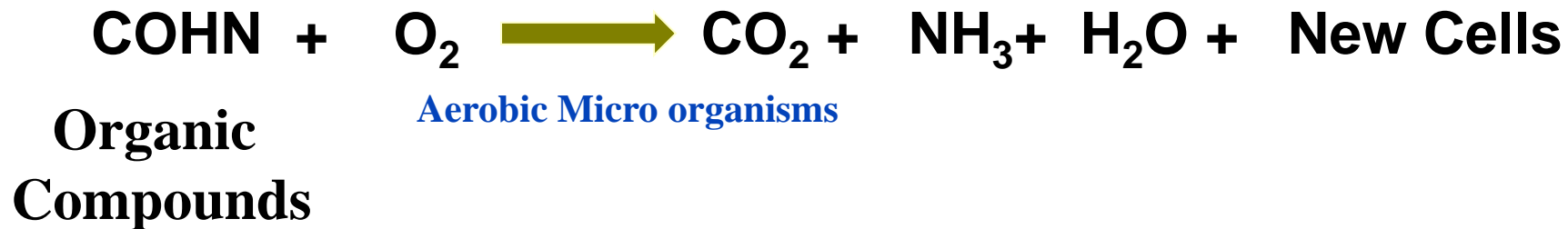
## ● BIOLOGICAL SYSTEM

- No chemical addition
- Small amount of biological sludge to be disposed
- No routine operation other than Aerator switch on & off AND opening & closing of valves
- No trace chemicals in treated water

# Biological Treatment

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Conversion of dissolved Organic Compounds in to simple compounds ( $\text{CO}_2$ ,  $\text{H}_2\text{O}$ ,  $\text{NH}_3$  etc.) by Aerobic micro-organisms in the presence of  $\text{O}_2$



# BIOLOGICAL TREATMENT MECHANISM

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## ● Oxidation

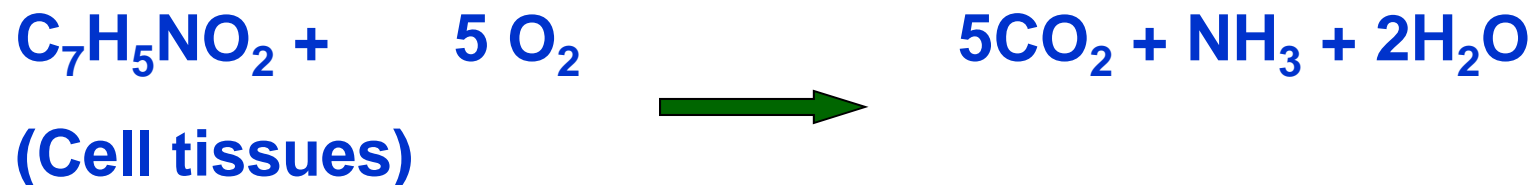


(Organic matter)      (Bacteria)

## ● Synthesis



## ● Respiration

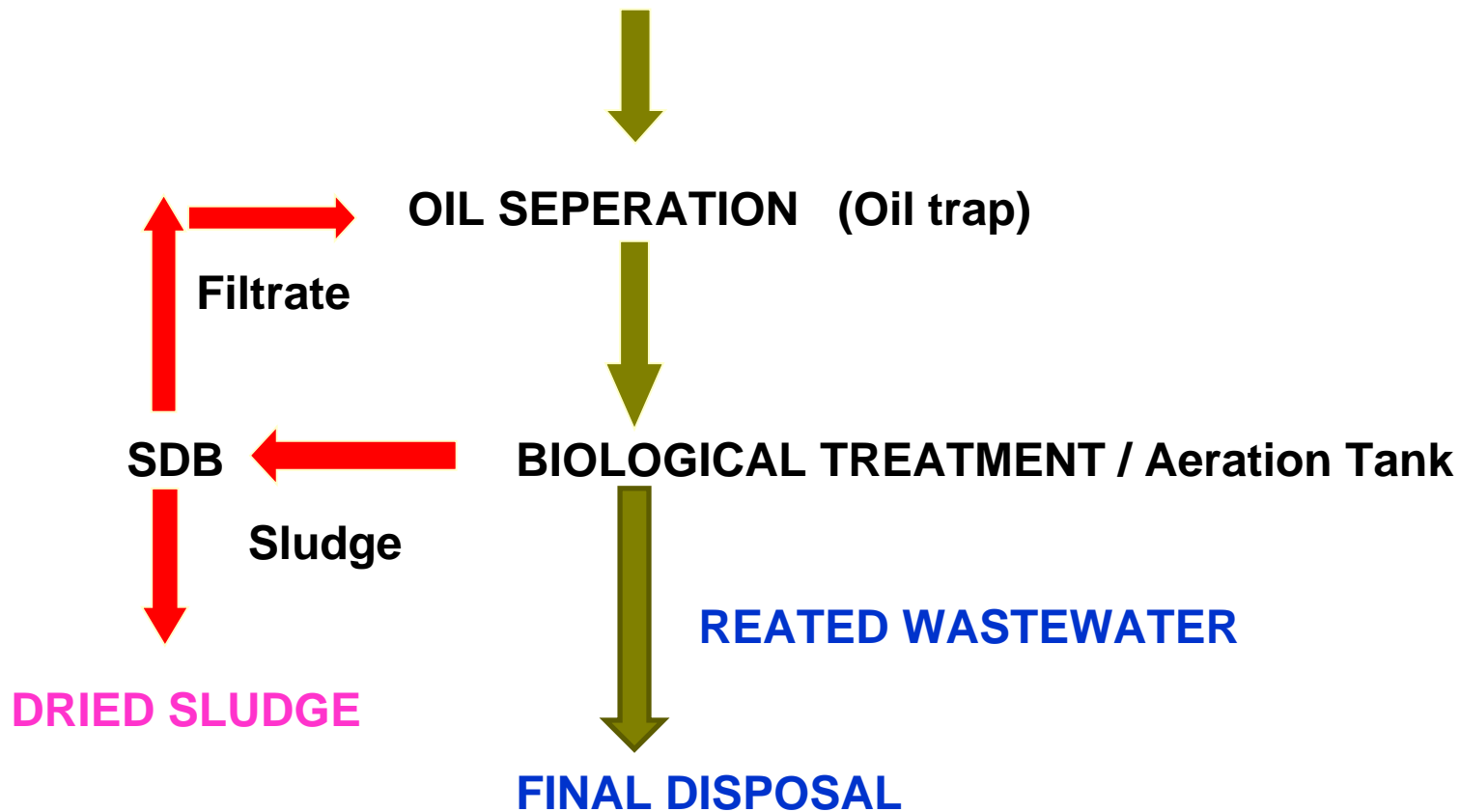




# Biological Treatment Process

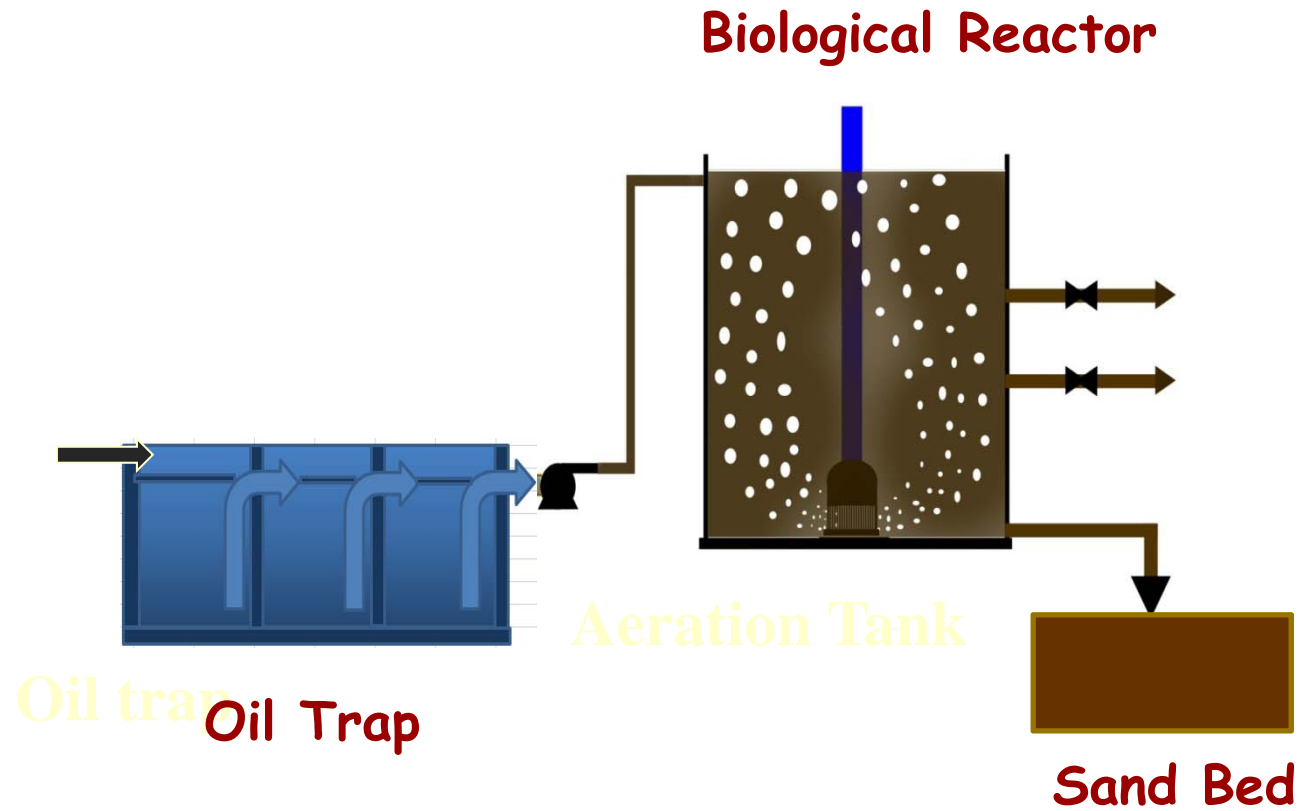
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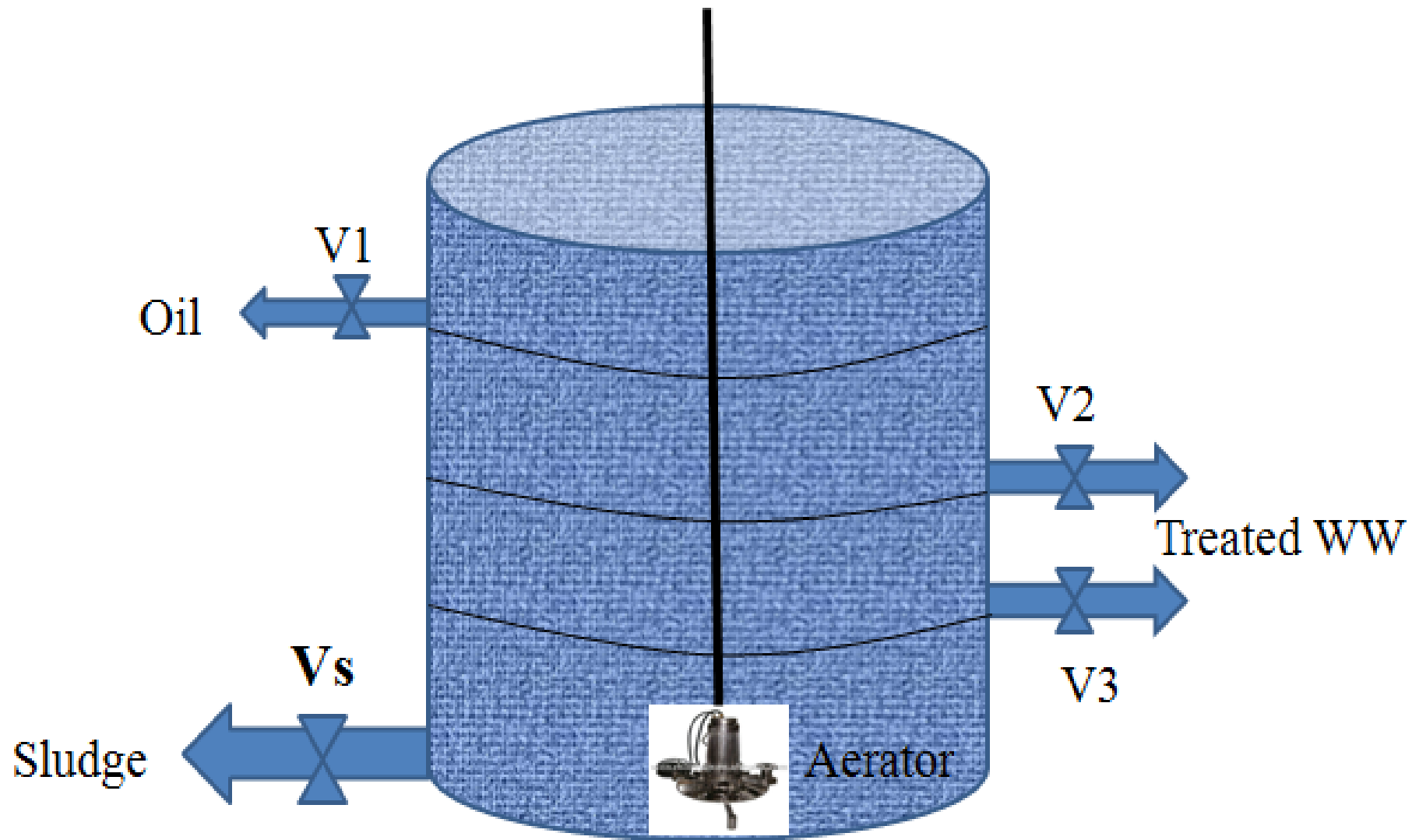
**WW from Vehicle servicing**



# Treatment System

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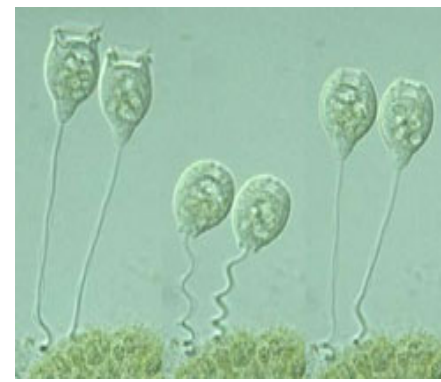


**Biological Reactor**  
SBR

# Aeration Tank function

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Micro Organisms that plays the major role of treatment

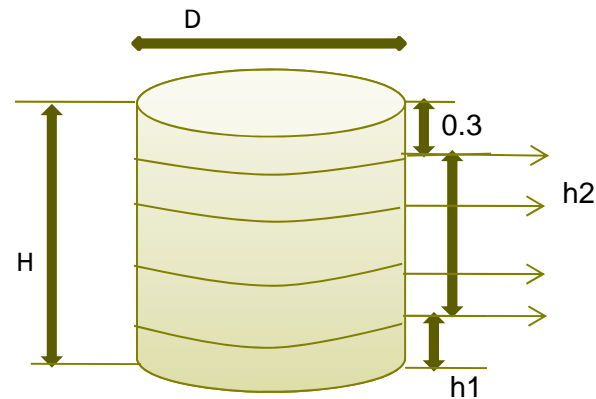


# Favorable conditions for microbial culture

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- Organic Compounds (Food)
- Oxygen & sufficient Mixing
- pH

# Biological Reactor sizing



| No. of vehicles serviced per day (N) | Daily discharge (Q-m <sup>3</sup> ) | Diameter (D) | H (m) | h1 (m) | h2 (m) | V (m <sup>3</sup> ) |
|--------------------------------------|-------------------------------------|--------------|-------|--------|--------|---------------------|
| 5                                    | 0.75                                | 1.5          | 1.2   | 0.4    | 0.5    | 2.25                |
| 7                                    | 1                                   | 1.5          | 1.7   | 0.6    | 0.8    | 3                   |
| 10                                   | 1.5                                 | 1.5          | 2.5   | 0.8    | 1.4    | 4.5                 |
| 15                                   | 2.25                                | 2            | 1.9   | 0.7    | 0.9    | 6                   |
| 20                                   | 3                                   | 2            | 2.4   | 0.95   | 1.15   | 7.5                 |

# EX: FINAL DISCHARGE QUALITY

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| Parameter    | Before Treatment | After Treatment | Tolerance Limit |
|--------------|------------------|-----------------|-----------------|
| pH           | 5.0-8.6          | 6'5 - 8'0       | 6'0 - 8'5       |
| O & G (mg/l) | > 10             | <10             | 10              |
| BOD (mg/l)   | 200-500          | <30             | 30              |
| COD (mg/l)   | 500-1000         | <250            | 250             |

# Operational Cost

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- **Capital investment - Plant construction**
- **Running cost of Aerator - Plant Operation**







Thank you

# Example : Plant Operation Cost

Case : average number of vehicles serviced per day = 5 (= 1m<sup>3</sup> of wastewater)

BOD = 350 mg/l

BOD load = 350 mg/l x 1x1000 l/d = 0.35kg BOD/d

O<sub>2</sub> requirement = 2.3 kg x 0.35 = 0.805 kg O<sub>2</sub> / d

1.5kW aerator ----- 1 kg O<sub>2</sub> /hr, = 0.805 hrs. (1 hr aeration is sufficient)

01 hour aeration during 20 hrs is not practical. Therefore , assuming 10 minutes aeration for every 1 hr (10 mts x 20 hrs = 3.3 hrs)

Total hrs per month = 3.3 x 31 = 102.3 hrs per month

Need 1.5kW x 102.3 hrs = 153.45 kW hrs per month

Cost = 24 /= /hr x 153.45 hrs. /m

= 3682.8/- per month

= 3682.8 /5 x25= 29.45/= per vehicle

= 30/- per vehicle



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**10 vehicles       15/= per vehicle**

**05 vehicles       30/= per vehicle**

**0.5kW aerator ----- 0.3 kg O<sub>2</sub> /hr, = 0.805 hrs. (4 hr aeration is sufficient)**

**10 vehicles       08/= per vehicle**

**05 vehicles       10/= per vehicle**