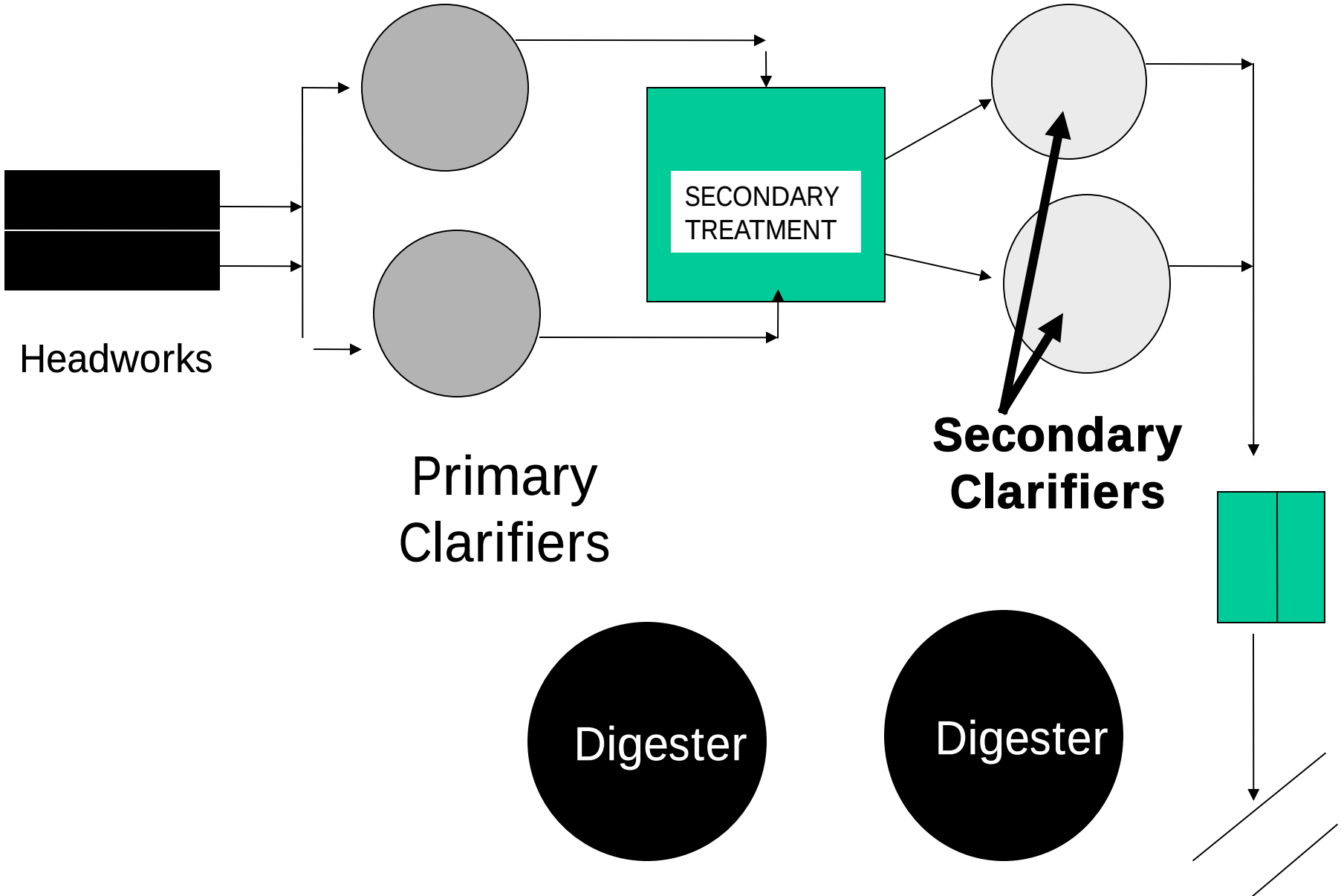
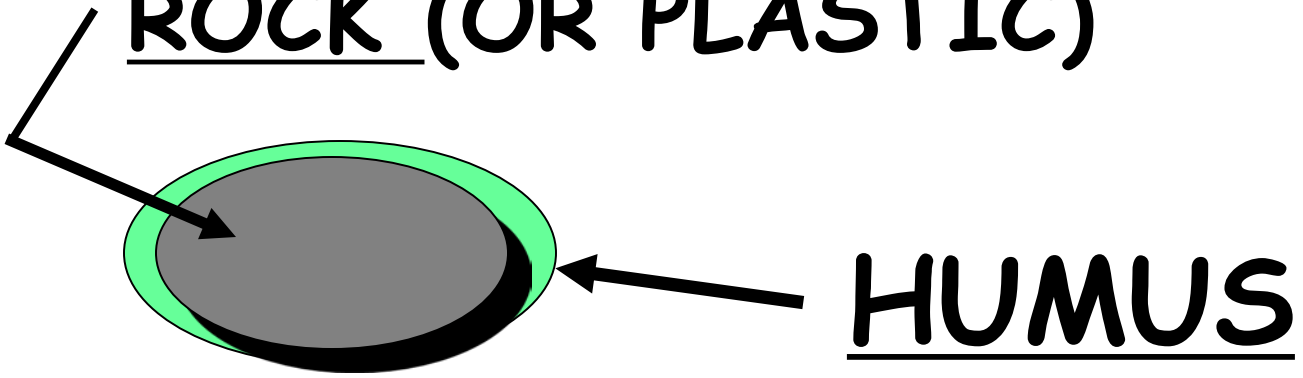
SECONDARY CLARIFIERS



A TRICKLING FILTER CREATES SETTLEABLE SOLIDS FROM SUSPENDED AND DISSOLVED SOLIDS

TRICKLING FILTER

ROCK (OR PLASTIC)



HUMUS

HUMUS (SLOUGHING BIOMASS) GOES TO THE SECONDARY CLARIFIER

TRICKLING FILTER CLARIFIER

- HUMUS IS HIGH IN BOD AND MUST BE REMOVED

- EXPECT TO PUMP 30-40% MORE SLUDGE FROM A SECONDARY CLARIFIER (THAN A PRIMARY CLARIFIER)

TRICKLING FILTER CLARIFIER

- DESIGNED MUCH LIKE PRIMARY CLARIFIERS
- DETENTION TIME: 2-3 hours
- WEIR OVERFLOW RATE: 5,000-15,000 GPD/FT
- SURFACE LOADING: 300-1200 gpd/ft^2

TRICKLING FILTER CLARIFIER SLUDGE

- LOOKS DIFFERENT THAN THE SLUDGE FROM THE PRIMARY CLARIFIER

- DARKER (but not gray or black)
- "FLUFFY" MATERIAL WITH LITTLE or NO ODOR
- MAY BE SENT BACK TO PRIMARY CLARIFIER or TO THE DIGESTER

ACTIVATED SLUDGE CLARIFIERS

NOTE: SOME ACTIVATED SLUDGE PLANTS DO NOT HAVE PRIMARY CLARIFIERS—ONLY SECONDARY

- DESIGNED TO HANDLE LARGE VOLUMES OF SLUDGE

- REQUIRE MORE OPERATOR ATTENTION (HIGHER CERTIFICATION LEVEL FOR ACTIVATED SLUDGE THAN a TRICKLING FILTER)

ACTIVATED SLUDGE CLARIFIERS ARE DESIGNED FOR…

- **DETENTION TIME: 2 – 3 hours**
- **SURFACE LOADING: 300-1200 gpd/ft²**
- **WEIR OVERFLOW RATE: 5,000 – 15,000 GPD/FT**
- **SOLIDS LOADING: 24-30 lbs/day/ft²**

SOLIDS LOADING RATE

- USEFUL FOR ACTIVATED SLUDGE SECONDARY CLARIFIERS

- INDICATES THE AMOUNT OF SOLIDS THAT CAN BE REMOVED DAILY FOR EACH SQ-FT OF SURFACE AREA

SOLIDS LOADING RATE

SLR=lbs of SOLIDS/day / ft^2

$$lbs/day = C \times Q \times 8.34$$

Where: C = Suspended Solids concentration in ppm; Q = flow in millions of gallons/day, and 8.34 is lbs/gallon

TYPICAL RANGE=12 -30 #/day/ft^2

ACTIVATED SLUDGE CLARIFIER DESIGN:

DETENTION TIME: 2-3 HOURS

SURFACE LOADING: 300-1200 gpd/ft^2

WEIR OVERFLOW RATE: 5000 - 15000 gpd/ft^2

SOLIDS LOADING: 12 - 30 $lbs/day/ft^2$

SLUDGE REMOVAL IN ACTIVATED SLUDGE SECONDARY CLARIFIERS

DIFFERS FROM PRIMARY CLARIFIER OPERATION BECAUSE SLUDGE WITHDRAWAL IS CONTINUOUS

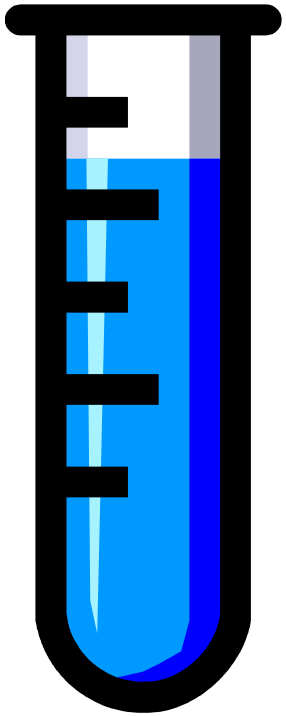
SUCTION-LIFT CLARIFIER

SLUDGE VOLUME INDEX (SVI)

- A GOOD OPERATING TEST FOR SLUDGE CONSISTENCY

- RELATES THE SETTLEABLE SOLIDS TO THE SUSPENDED SOLIDS

SLUDGE VOLUME INDEX TEST



- 1 Liter of mixed liquor, settled for 30 minutes
- ON SAME BATCH, RUN SUSPENDED SOLIDS

SVI, mL/gm = volume in mL of 1 gram (weight) of MLSS after 30 minutes

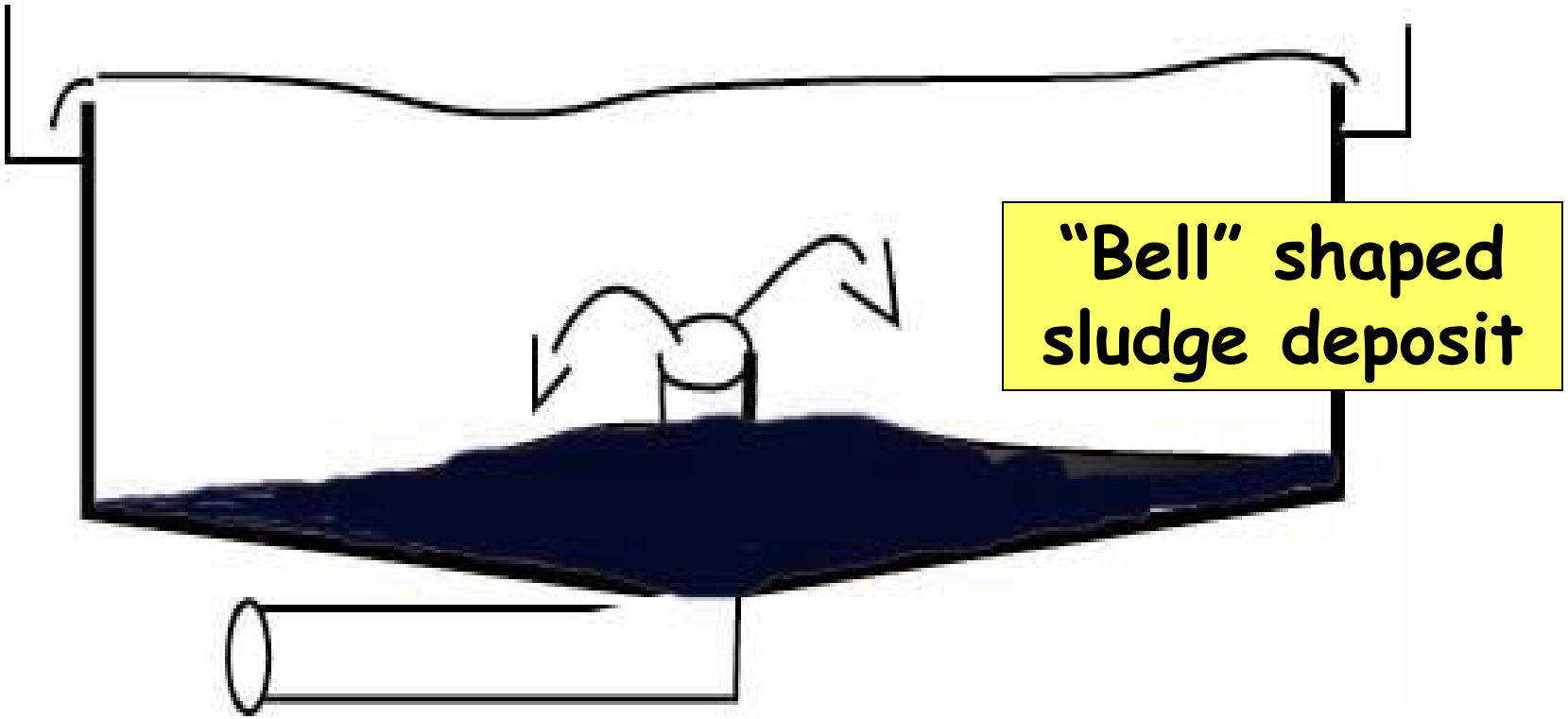
SVI EXAMPLE

FROM A SAMPLE OF MIXED LIQUOR YOU DETERMINE:

SETTLEABLE SOLIDS = 610 mL/L
SUSPENDED SOLIDS = 5580 mg/L

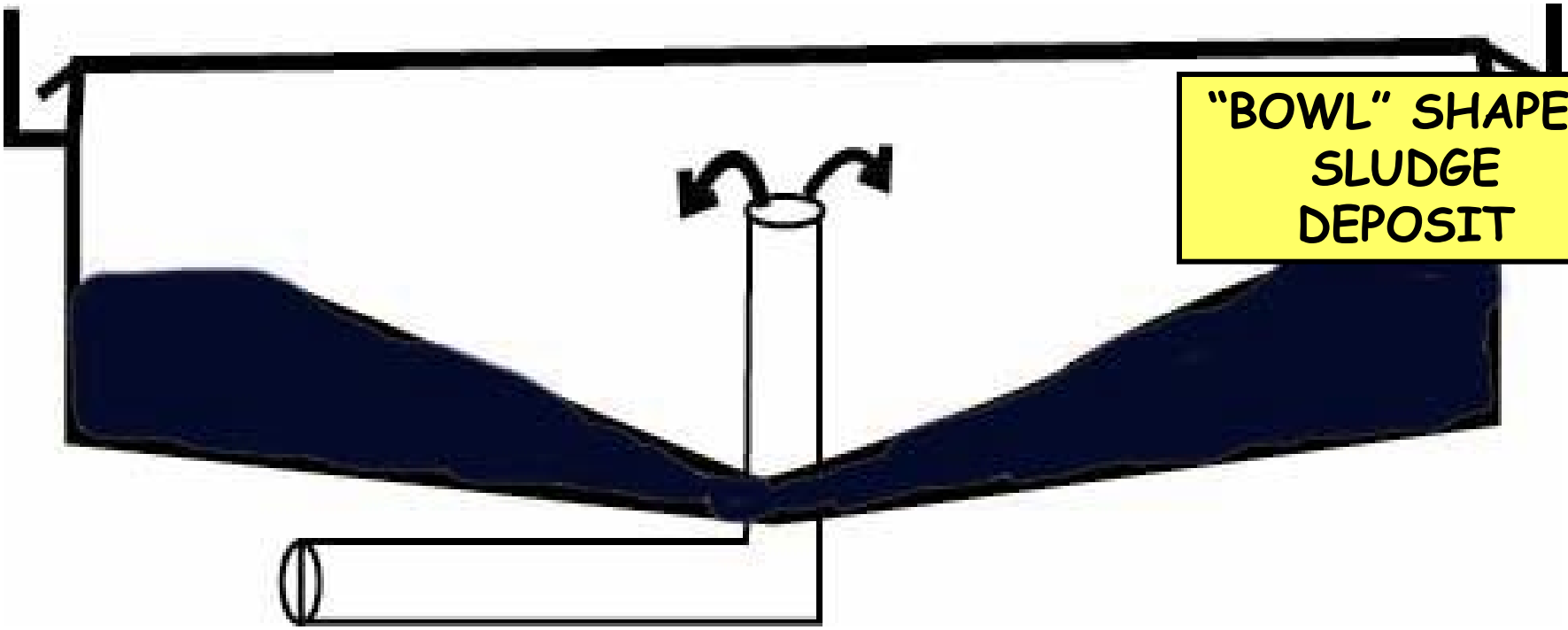
SVI = 610 ml/L / 5580 mg/L x 1000 mg/gm = 109 mL/gm

SIGNIFICANCE OF SVI



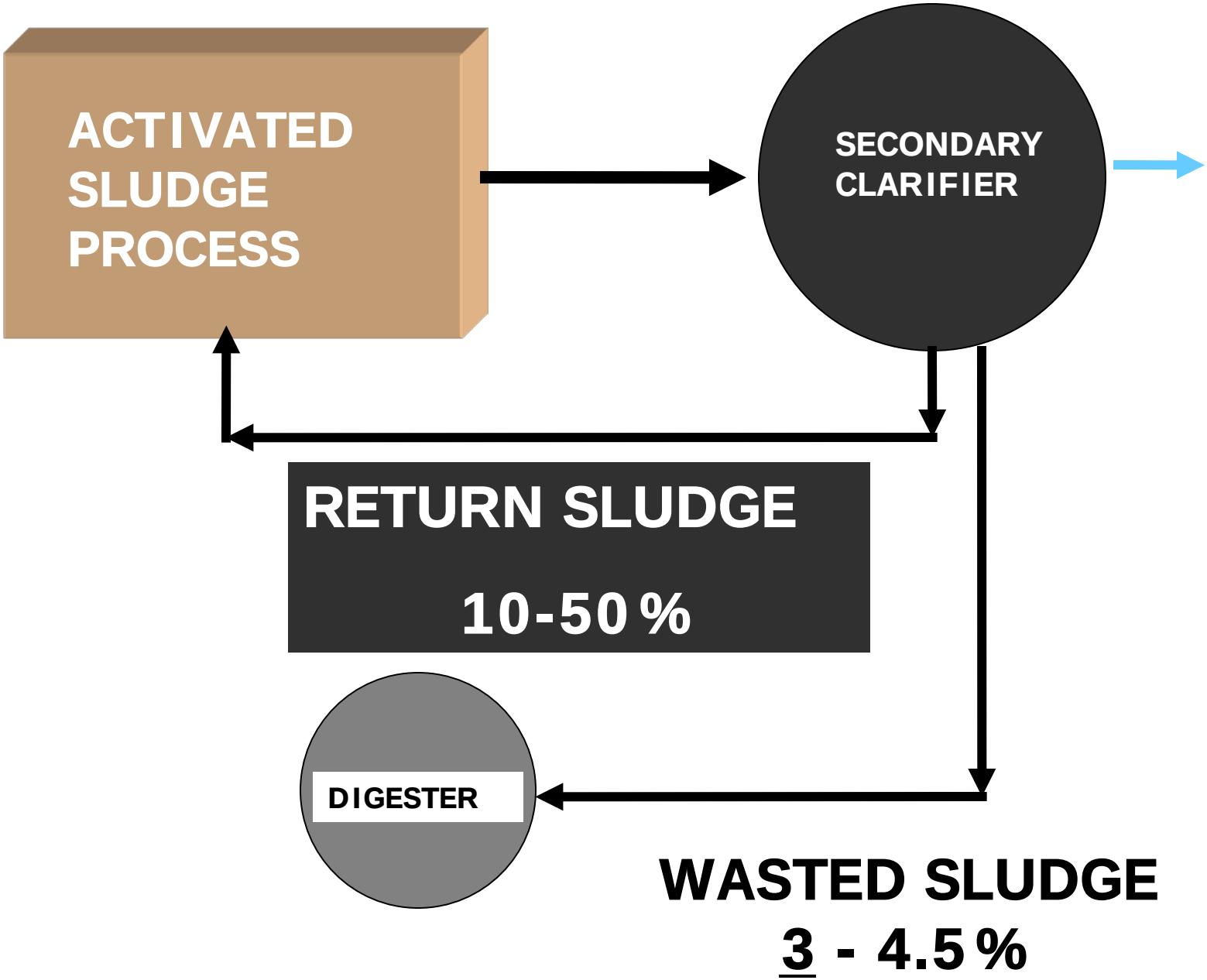
SVI ≤ 80 mL/gm

SIGNIFICANCE OF SVI



SVI ≥ 250 mL/gm

MORE EFFICIENT TO PUMP SLUDGE FROM CENTER OF CLARIFIER


ACTIVATED SLUDGE PROCESS
SECONDARY CLARIFIER
RETURN SLUDGE
10-50 %
DIGESTER
WASTED SLUDGE
3 - 4.5 %

IN THE CLARIFER, THE OPERATOR MUST MONITOR…

- SLUDGE BLANKET
- EFFLUENT SUSPENDED SOLIDS
- RETURN SLUDGE FLOWS

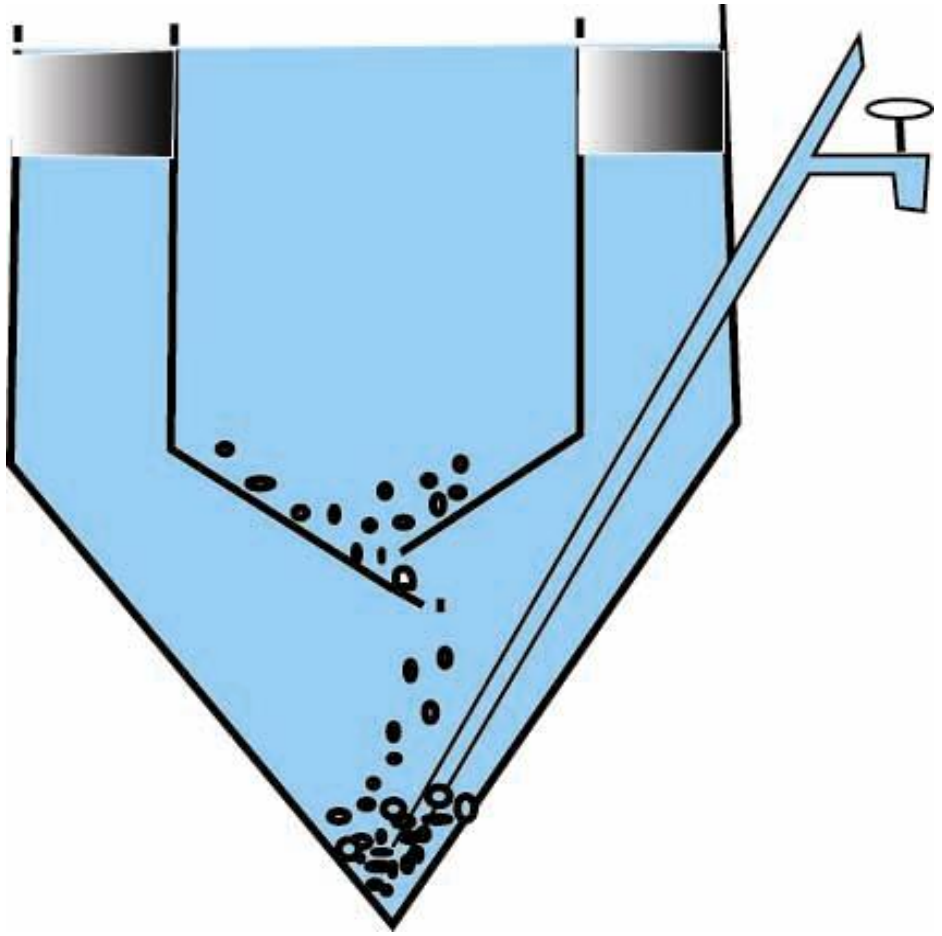
OPERATOR MUST MONITOR THE CLARIFIER EFFLUENT FOR…

- TURBIDITY
- DISSOLVED OXYGEN (O_2)
- pH, BOD, AMMONIA NITROGEN (NH_3)

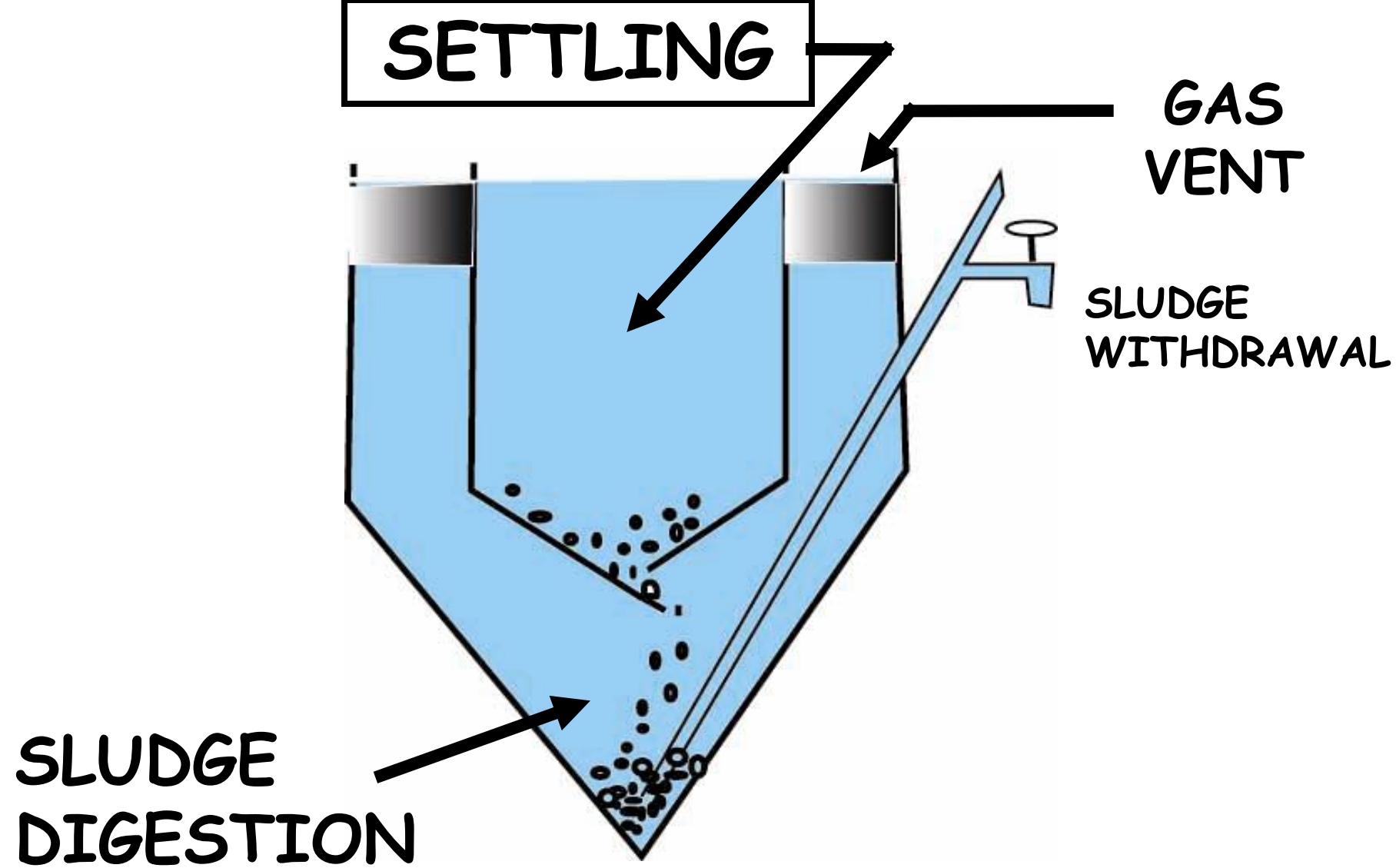
COMBINED SETTLING AND DIGESTION UNITS

- USUALLY CONSIDERED "PACKAGED TREATMENT PLANTS" BECAUSE THEY ARE FACTORY-BUILT AND SHIPPED TO THE SITE AS A PACKAGE

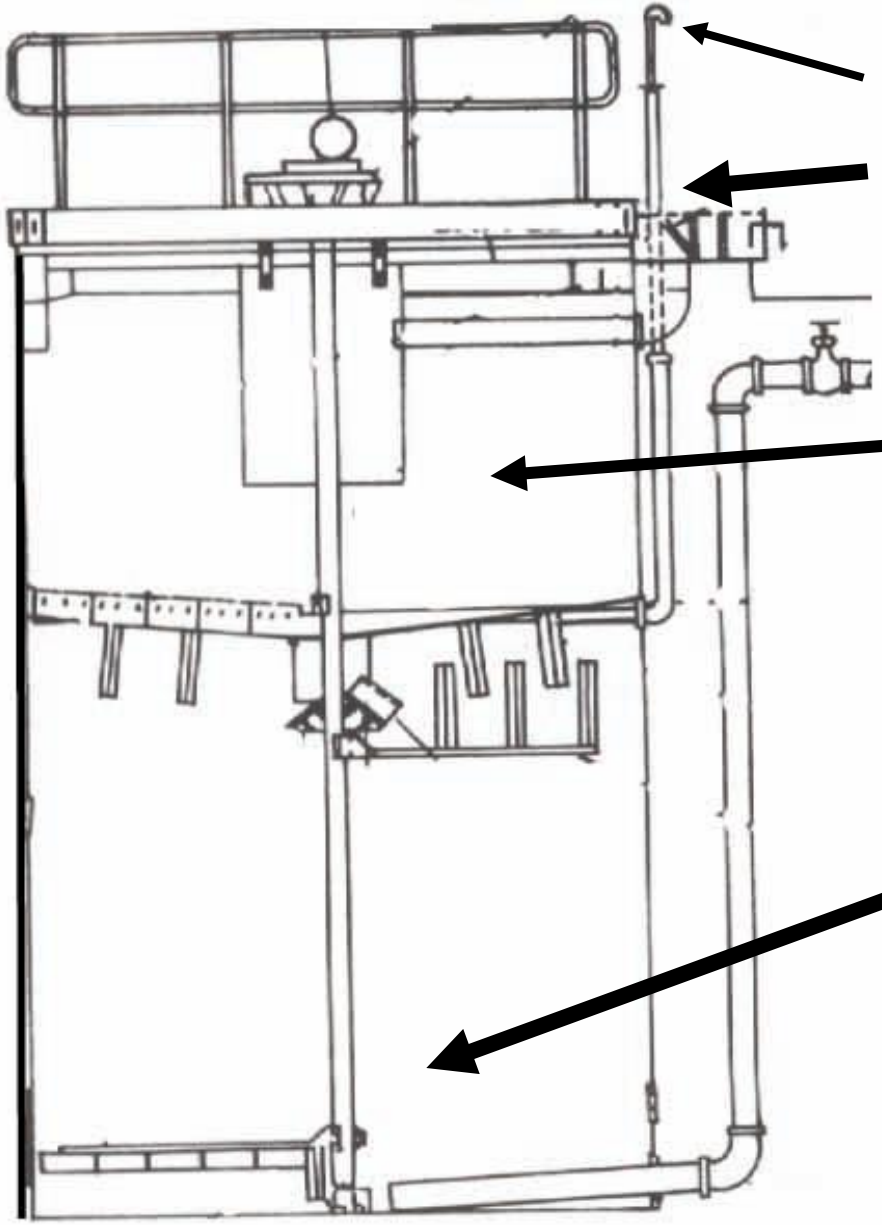
COMBINED SETTLING/DIGESTION



THESE UNITS ARE ALL COPIED FROM THE IMHOFF TANK



IMHOFF TANK



CLARIGESTER™