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Introduction

- **Definition:**

  - A vessel, as part of a surface water drainage system, into which potentially contaminated waste water will flow and where light liquids are separated from the waste water by means of gravity and/or coalescence, and retained.

- **Separator (Interceptor):**

  - Formerly referred to as interceptors, separators were traditionally constructed from brick or concrete.
  - Their use was primarily in petrol station forecourts.
  - The first ‘plastic’ separator was developed by Conder in 1972 and introduced to the market in 1974.
  - The characteristics, sizing and use of separators was initially driven by the NRA (National Rivers Authority). Their approach was to mirror the ASTM for multi chambered separators.
  - The first ‘bypass’ separator was developed in the late 1970’s, again by Conder.
Separators

- **Types:**

  - **Full Retention**
    - A full retention separator receives and treats the total flow from the contributing area.
    - Formerly multi-chambered, these separators are now invariably single chamber units.
    - They can be provided with or without additional volume to capture sediment.

  - **Bypass**
    - A bypass separator receives the total flow from the contributing area but treats only a portion, usually 10%.
    - Bypass separators have two chambers.
    - They can be provided with or without additional volume to capture sediment.

- **Classes:**

  - When conforming to the requirements of BS EN 858-1 and PPG3 full retention and bypass separators can be either class 1 or class 2.
Full Retention Separators

- **Construction:**
  - Usually constructed from glass reinforced polyester, these separators are horizontal, cylindrical chambers.
  - These would normally be supplied with a single turret having a suitable diameter to allow for emptying as well as man access.
  - The inlet would be trapped or dipped below the static liquid level to reduce turbulence.
  - The outlet would be dipped to near the bottom of the chamber allowing cleaner water to be discharged.
  - The turret is fitted with a fresh air vent.

- **Operation:**
  - The waste water from the contributing area passes through the inlet pipe into the separator chamber. Hydrocarbons with a density of less than, circa, 0.85 readily separate from the water and rise to the surface. Hydrocarbons with higher densities take progressively longer to separate and travel the length of the chamber within the main body of water. The ability of the oil droplets to rise is determined by the size of the droplet, the temperature of the water, the rate of flow and the length of time it is retained.
Bypass Separators

**Construction:**
- Usually constructed from glass reinforced polyester, these separators are horizontal, cylindrical chambers.
- These would normally be supplied with at least two turrets having suitable diameters to allow for emptying as well as man access on larger units.
- The inlet would be trapped or dipped below the static liquid level to reduce turbulence.
- The outlet would be an open, high level, pipe to accept both treated and bypassed flows.
- There would be an internal ‘skim’ pipe in the first chamber through which the initial flow would pass to the second chamber to be treated.
- A weir plate would be constructed at a higher level than the the ‘skim’ pipe allowing the ‘bypass’ flows to transfer directly to the outlet.
- The turrets are fitted with a fresh air vents.

**Operation:**
- The waste water from the contributing area passes through the inlet pipe into the first chamber of the separator. Under the primary, low flow, conditions, the separated, and rising oil droplets will ‘weir’ into the ‘skim’ pipe. This flow is transmitted to, and retained in the second chamber. Flows from this chamber are displaced to the outlet in a similar manner to full retention separators. Flows greater than those that pass through the ‘skim’ pipe increase the level of water in the first chamber. When the level reaches the weir plate the water passes directly to the outlet without being ‘treated’
Classes

- **Introduction:**
  - Classes for separators were introduced during the creation of the European Standard (BS EN 858-1) using the protocols in DIN 1999. The class is declared when the separator nominal size is determined, under test conditions.

- **Class 1 and Class 2:**
  - There are two classes, class 1 and class 2. Class 1 separators produce a maximum, averaged, permissible content of residual oil of 5 mg/l, *under test conditions*. For a class 2 separator this figure is 100 mg/l. The test is a convention that does not emulate operational conditions, therefore, this type of separator cannot be applied as a solution where a consent level has to be achieved. It can only be declared that a class 1 separator will produce a cleaner effluent than a class 2 separator. Class 1 is usually achieved by incorporating a coalescing filter before the final discharge.

- **Application:**
  - Class 1 separators are usually applied to surface water systems (see PPG3) and class 2 separators to foul water systems.
Selection of Nominal Size

Introduction:
- The nominal size of a separator is determined under test conditions. There is a list of preferred nominal sizes between 1.5 and 150 as described in BS EN 858-1. The nominal size of a full retention separator will normally have a prefix **NS** and for a bypass separator a prefix of **NSB**.

Selection:
- The environment Agency has produced a Pollution Prevention Guideline referenced PPG3. This specifically applies to the design and use of separators in surface water drainage systems, although a similar rationale could be applied to protect foul water drainage systems.
- The nominal size (NS) of a full retention separator that is required for a contributing area (A) is determined as follows:

  \[
  NS = 0.018 \ A(m^2)
  \]

  and for a bypass separator:

  \[
  NSB = 0.0018 \ A(m^2)
  \]

  In addition, capacity for silt storage (C) must be provided, either as an integral part of the separator or as a separate upstream unit, as follows:

  \[
  C(\text{litre}) = NS \times 100
  \]
Automatic Closure Devices

**Operation:**
- Both BS EN 858-1 and PPG3 advocate the use of automatic closure devices when used with full retention separators. **Automatic closure devices shall not be used with bypass separators.**
- These devices are usually in the form of a float and plate and rely on the difference in density between water and hydrocarbons.
- Closure devices should be set to operate when the separated light liquid storage capacity reaches a volume equal to ten times the nominal size of the separator (in litres).
Automatic Alarm Systems

**Operation:**

- Both BS EN 858-1 and PPG3 advocate the use of automatic alarm systems when used with both full retention and bypass separators.
- Automatic alarm systems can operate from mains power, by solar power with battery backup or by radio control.
- In each case the probe (switch) that sits within the separator at a level that coincides with the maximum oil storage volume sends information to a control unit to indicate the state of the separator.
Maintenance

Requirements:

- Detailed inspection and maintenance requirements can be found in both BS EN 858-2 and PPG3.
- In brief, each separator should be inspected at least every six months to determine to levels of oil and sediment. A log of these inspections should be kept. If emptying is necessary this should be carried out by a responsible contractor using the required EA certificates (notifiable waste).
- A structural survey should be carried out every five years.