

Scottish Wastewater Treatment



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Introduction to Wastewater

- What is wastewater?
 - Wastewater is liquid waste from humans and their general activities; mainly residential and industrial.

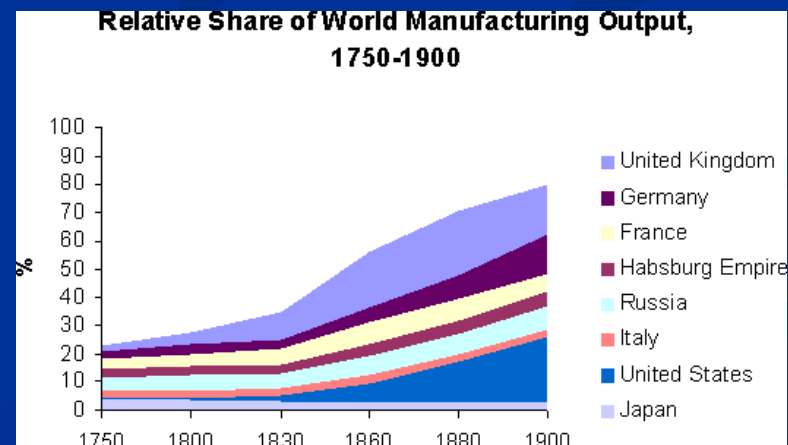


- Wastewater is vegetable, chemical, mineral or animal matter in solution or suspension.



Introduction to Wastewater

- Why do we need to treat waste water?
 - In Scotland, and Glasgow especially during the industrial revolution (18th and 19th century) tenement buildings were built to house the huge influx of workers from all over Scotland and Ireland.



Introduction to Wastewater

■ Why do we need to treat waste water?



- The tenement buildings (usually 4 stories high, red sandstone) became dangerously overcrowded, which lead to the spread of disease.



- This disease was mainly due to the cramped conditions and the lack of toilets, which forced people to throw their excrement out the window! They shouted Gardyloo!
- This severe problem lead to the development of sewage drains and improved toilet facilities.
- But the sewage drains flowed straight into the major river running through the city of Glasgow: The River Clyde.

Introduction to Wastewater

- The river Clyde quickly became one of the most polluted rivers in the world.
- People were getting sick from the fumes and they had to work around the river in the ship building industries around the Clyde, the smell became almost unbearable.
- This is when the waste water treatment plants in Scotland were developed.

- The River Clyde:



Water Standards In Great Britain

- Standards have a variety of aims:
 - The protection of wildlife and nature
 - Controlling risks to the quality of water extracted and supplied to our homes, or that used for irrigation in farming.
 - They ensure that our enjoyment of things such as boating, fishing and white water rafting are maintained.

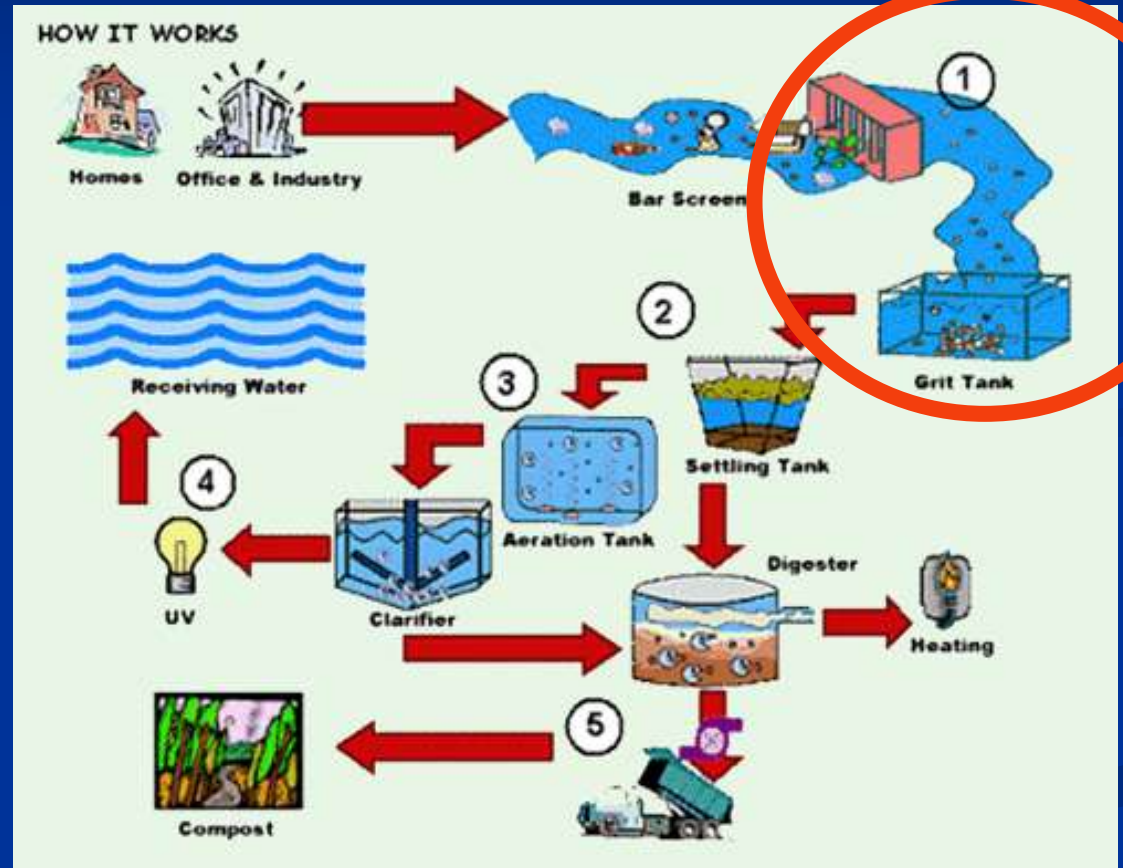


Water Standards In Great Britain

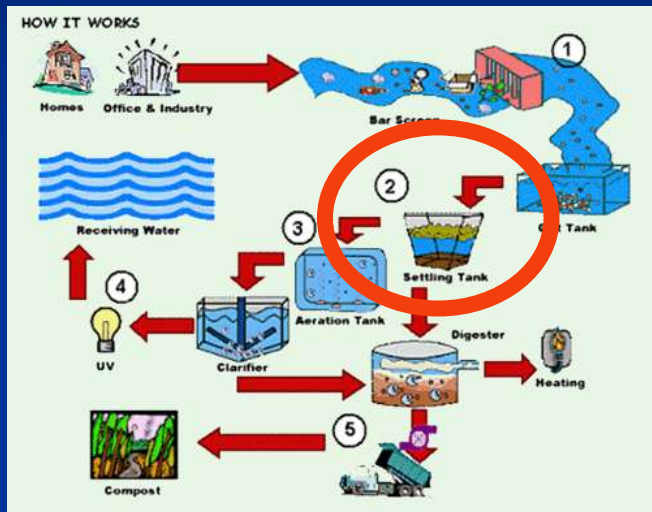
- The Urban Wastewater Treatment Directive:
 - Regulates the collection and treatment of wastewater from our homes and industries.
 - Protects the environment from the negative effects of urban waste and discharges from industrial sectors.
 - The UWWT act was implemented in 1994.
 - This act also banned the disposal of sludge into the sea in 1998.

How Do we Treat the Wastewater?

- The basics steps are outlined in the diagram:
- 1) **Preliminary treatment** – speed of water reduces, debris settles in grit tanks; mechanical bar screen collects other foreign matter.



How Do we Treat the Wastewater?



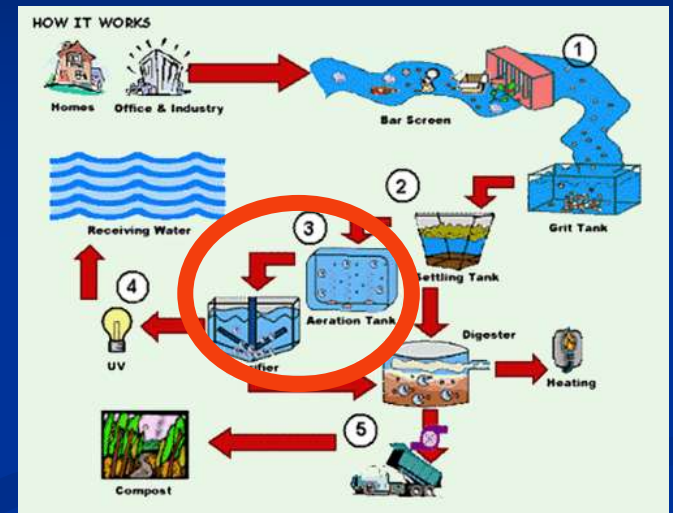
- **2) Primary treatment** – allows the physical separation of solids and grease from the wastewater; removes between 30-40% of Biological Oxygen Demand (BOD) and 50% of Total Suspended Solids (TSS).
 - wastewater flows into a settling tank
 - it sits for several hours
 - the mechanical arm rotates and collects floating fats, oils and grease (FOG) which is sent to landfill.
 - Settled material: primary sludge



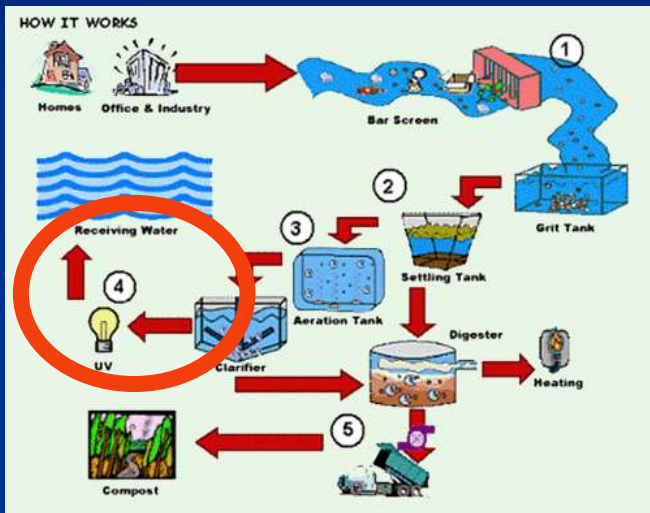
How Do we Treat the Wastewater?

■ 3) Secondary treatment

- Secondary treatment is a biological treatment.
- removes up to **90%** of BOD and TSS.
- effluent is pumped to the secondary treatment stage.
- Micro-organisms eat the organic matter.
- The micro-organisms create a solid organic material (sludge)
- Secondary sludge is also thickened and pumped to digesters for processing and solids processing (similar to the sludge from 1).



How Do we Treat the Wastewater?



■ 4) Final treatment

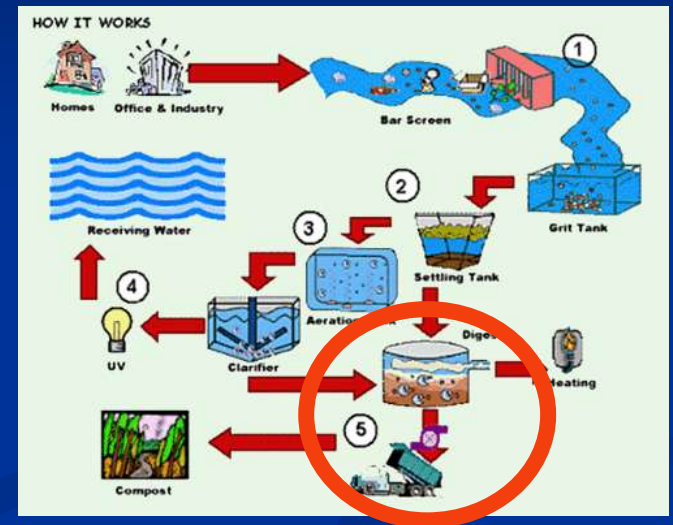
- The remaining wastewater is **disinfected** to kill harmful micro-organisms.
- Then released into receiving waters. many methods available to kill micro-organisms: **ultraviolet** and **sulphur** based chemical addition are the most common.
- At this stage, the final effluent, is discharged into the marine environment.



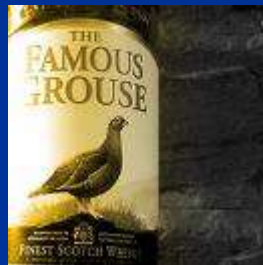
What Happens With the Waste?

■ 5) Solids processing

- Solids from the primary settling tank and from the clarifier are sent to digesters for processing.
- The afore mentioned micro-organisms produce methane and water.
- Digestion results in a 90% reduction of pathogens and the production of a wet soil-like material called "biosolids" that contain 95-97% water.
- To remove water:
mechanical equipment such as a belt filter press or centrifuge are used to squeeze water from the biosolids to reduce its volume.



Whiskey!!!



What is special about the Glen Ord Whiskey Distillery?

- In 2001 this Whiskey company became the first in the UK to use a revolutionary waste water treatment method!
- Biobed Modular Plant (MP) technology.
 - High rate granular treatment for wastewater with low COD loads.
 - The Glen Ord Distillery:



What is special about the Glen Ord Whiskey Distillery?

- The technology was developed by Biothane Systems International.
- Plant Capacity: 1000Kg COD/day
- Recieves maximum flow: 908m³/day
- Since installation the plant has consistently treating the distilleries effluent.
- Achieves BOD and COD reductions exceeding 90% and 80%!

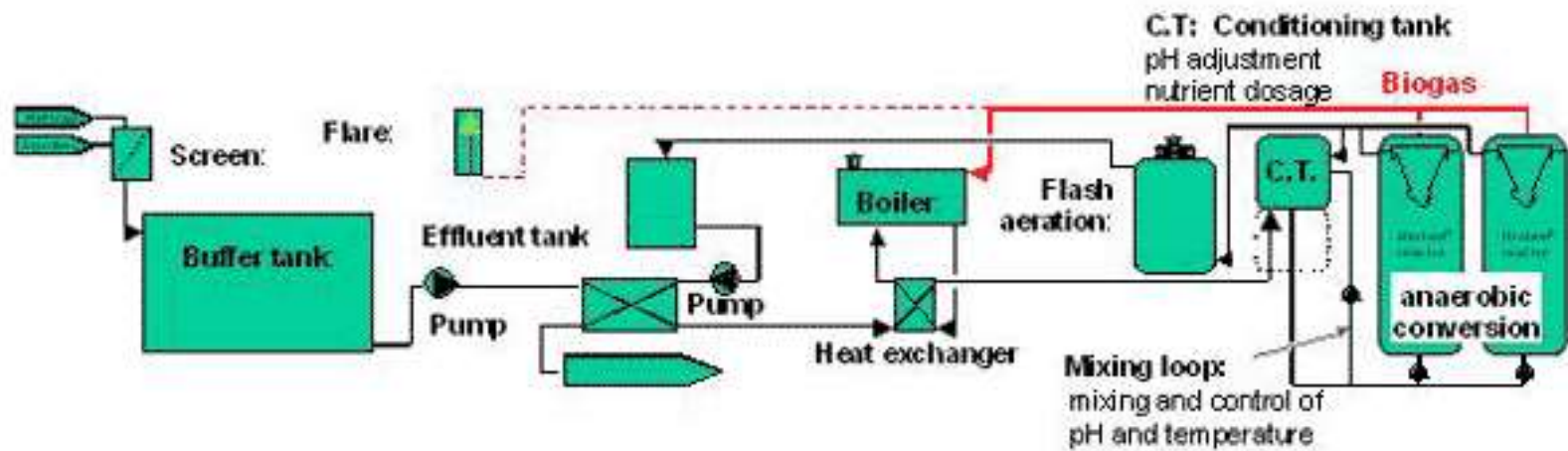


More About the MP Technology

- A fully pre-engineered design concept.
- Makes possible the extension of granular anaerobic technology to small COD loads- below 3000Kg/day.
- Innovative step: high turn-down ratio in comparison.
- Deals with fluctuating COD very well.
- Pre fabrication leads to short installation time
- Biothane won the IWEX award for their Biobed system in 2001.



Glen Ord Anaerobic Wastewater Treatment
Biothane Systems International Ltd.



Bibliography

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Thank you for your attention

