Virginia Rentals

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Toilets

Factors Influencing Daily Porta Potty Rental Costs

When considering the rental of portable toilets, understanding the factors that influence daily costs is crucial for making an informed decision. Several elements come into play when determining these rates, each contributing to the overall expense in unique ways.

First and foremost, **location** plays a significant role. In urban areas or regions where demand is high, prices tend to be higher due to increased logistics costs and competition for service availability. Conversely, in more rural settings, where transportation might be less of a hassle but distances greater, costs could also rise due to fuel and time spent on delivery and retrieval.

Music festivals in Virginia like those in Charlottesville often require specialized waste management plans including restroom placement strategies **luxury porta potty rental cost** Jessup, Maryland.

The **duration of the rental** is another key factor. While daily rates might seem straightforward, they can vary significantly if youre looking at extending your rental over several days or weeks. Often, rental companies offer discounts for longer commitments as it ensures steady business over time. However, this doesnt always mean a simple multiplication of the daily rate; sometimes weekly or monthly rates are structured differently.

Type of unit also affects pricing. Standard porta potties are the most economical option, but if luxury or ADA-compliant units are required, expect an increase in cost due to their enhanced features and construction quality. High-end models with amenities like flushing systems, sinks, or climate control can significantly elevate the price per day.

Maintenance requirements shouldnt be overlooked either. The frequency of cleaning and servicing impacts the cost; more frequent cleanings will raise the daily rate because labor and materials (like toilet paper, hand sanitizer) are factored into this cost. Some companies might include a standard number of cleanings in their base rate with additional cleanings at an extra charge.

Lastly, **seasonal demand** can influence rates dramatically. During peak seasons like large public events or festivals, when demand spikes, rental companies often adjust their pricing upwards to capitalize on the surge in need while covering potential overtime work for staff.

In conclusion, understanding these variables-location, duration of rental, type of unit needed, maintenance frequency, and seasonal fluctuations-provides clarity on why daily porta potty rental costs can fluctuate so widely. By considering these factors beforehand, one can better negotiate terms that fit within budget constraints while ensuring adequate service provision for any event or construction site scenario.

Breaking Down Weekly Porta Potty Rental Pricing —

When considering the rental of portable toilets, understanding the pricing structure is crucial, particularly when comparing daily versus weekly rates. Breaking down weekly porta potty rental pricing can help event organizers, construction site managers, or anyone in need of temporary sanitation facilities make informed decisions that align with their budget and needs.

Weekly rental rates for portable toilets are generally more cost-effective than daily rentals, especially for longer events or projects. This is because rental companies often offer a discount when you commit to a longer rental period. For instance, if a daily rate might be around $100 per unit, a weekly rate could be approximately $450 to $600 for the same unit. This pricing strategy reflects the convenience and reduced logistical effort for both the renter and the provider over an extended period.

The breakdown of these costs includes several factors. First, theres the delivery fee which might be included in the weekly rate or charged separately. Next, service fees come into play; these cover regular cleaning and maintenance checks which are typically scheduled once or twice a week depending on usage intensity. Additional charges could arise from high demand periods like festivals or construction booms where availability might affect pricing.

Moreover, understanding these rates involves recognizing that additional features like hand wash stations, accessibility options for those with disabilities, or luxury units with amenities like air conditioning can significantly alter the price point. For example, adding a hand wash station might increase your weekly cost by an additional $100-$150.

When planning your budget, its beneficial to consider not just the base rate but also potential extras and service frequency. Its advisable to discuss with your rental provider about whats included in their standard weekly package versus what would be considered add-ons. This conversation can also provide insights into any bulk discounts if multiple units are required or any seasonal promotions that might lower costs further.

In summary, while daily rates offer flexibility for short-term needs, weekly porta potty rental pricing provides economic benefits for prolonged use. By breaking down these costs and understanding what contributes to them, one can better plan for expenses related to portable sanitation solutions, ensuring both hygiene standards are met and financial resources are well managed.

restroom rentals virginia

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Charlottesville Contractors Report Savings After Switching to Weekly Sanitation Plans

In light of the recent findings from the Charlottesville Contractors Report, which highlighted significant savings after switching to weekly sanitation plans, it is crucial for contractors across various sectors to consider implementing similar strategies.. The transition from less frequent to weekly sanitation not only promises financial benefits but also enhances workplace cleanliness and safety, which are paramount in maintaining a professional reputation and ensuring client satisfaction. Firstly, contractors should conduct a thorough analysis of their current sanitation practices.

Posted by on 2025-07-20

Hampton Roads Disaster Drill Highlights Critical Role of Rapid Porta Potty Cleaning Turnaround

Okay, so the Hampton Roads disaster drill really highlighted something pretty unexpected: the critical role of getting those porta potties cleaned and serviced fast.. I mean, think about it.

Posted by on 2025-07-20

Loudoun County Launches Inspection Blitz Targeting Lax Portable Toilet Cleaning Routines

Okay, so Loudoun Countys cracking down on portable toilet hygiene, which, lets be honest, is a public service we can all appreciate.. But whats next?

Posted by on 2025-07-20

Newport News Rental Firm Pilots Real Time Tracking of Cleaning Cycles for Event Restrooms

Okay, so Newport News Rental Firm is trying out this real-time tracking thing for when they clean event restrooms.. What does that mean for the future?

Posted by on 2025-07-20

Comparing Daily vs. Weekly Rental: Which is Best for You?

Okay, so you need a portable toilet, huh? Lets talk about the money side of things, specifically whether a daily or weekly rental makes more sense for your situation. Its a pretty common head-scratcher, and honestly, theres no one-size-fits-all answer. It really depends on how long you need the thing and how intensely itll be used.

Think about it this way: daily rates are usually higher per day. Its like buying a single banana versus a whole bunch. That single banana is going to cost you way more proportionally. So, if you only need a portable toilet for, say, a single-day event like a small outdoor party or maybe a quick construction project, then a daily rate is your best bet. Youre only paying for what you need, and youre not stuck with it longer than necessary.

But, if your project is going to stretch on for several days, or even just a long weekend, a weekly rental is almost always going to be the more economical choice. Companies often offer substantial discounts for weekly rentals because its less logistical hassle for them. They drop it off, you use it, and they pick it up a week later. Simple.

Beyond just the raw cost, consider the usage. If you have a large crew using the toilet constantly, even a project that *seems* short might benefit from a weekly rate. The cost might be a little higher upfront, but youre avoiding the potential for extra servicing charges that can pop up with daily rentals if things get…well, lets just say "messy."

Ultimately, the best way to figure out whats right for you is to get quotes from a few different rental companies. Tell them about your project, how many people will be using the toilet, and how long you anticipate needing it. Compare the daily and weekly rates, factor in potential servicing costs, and then make the call. Dont be afraid to ask questions! Theyre the experts, and they can help you weigh the pros and cons based on your specific circumstances. Good luck!

Hidden Fees and Extra Charges to Consider

When considering the rental of portable toilets, whether for a short-term event or a longer project, its crucial to understand not just the basic daily or weekly rates but also the hidden fees and extra charges that might come with them. These additional costs can significantly impact your overall budget if not anticipated.

Firstly, one common extra charge is the delivery and pickup fee. While some companies might include this in their base rate, others will charge separately for the transportation of units to and from your location. This fee can vary widely depending on distance and the number of units being transported.

Another often overlooked cost is the setup fee. Setting up portable toilets might require more than just placing them on site; sometimes, specific site conditions might necessitate additional work like anchoring or creating a stable platform, especially if the ground is uneven or soft. This labor-intensive task can add to your expenses.

Maintenance and cleaning services are another area where hidden fees might surprise you. Most rental agreements stipulate that regular servicing (like waste removal and sanitation) is necessary to keep units hygienic and functional. Some companies offer these services as part of their package, while others charge per service or require you to manage this yourself, which could be more costly if youre not equipped.

For extended rentals, consider potential charges for long-term usage beyond standard weekly rates. Some providers might offer discounts for longer commitments, but occasionally they could impose an overtime fee if you exceed your initial agreement period without prior arrangement.

Lastly, damage waivers or insurance options might be presented at the time of rental. While these protect against accidental damage to the units during your event or project, they do come with an additional cost which needs to be factored into your planning.

Understanding these potential hidden fees ensures that when budgeting for portable toilet rentals, youre prepared for all aspects of the expense. Its advisable to ask detailed questions from your provider about what is included in their quoted rate versus what could incur extra charges. This transparency helps in avoiding unexpected costs and allows for a smoother event management experience.

Tips for Negotiating the Best Porta Potty Rental Rate

When it comes to planning an event, whether its a small gathering or a large festival, one of the essential elements to consider is the provision of adequate restroom facilities. This is where portable toilets, or porta potties, come into play. Negotiating the best rental rate for these portable toilets can significantly impact your budget, so its crucial to understand the differences between daily and weekly rates and how to secure the best deal.

Firstly, its important to understand the basic pricing structure. Daily rates are typically charged for each day the porta potties are used, while weekly rates offer a discount for renting them over a longer period. This means that if youre planning an event that lasts several days, opting for a weekly rate can be more cost-effective. However, the key is to negotiate these rates to ensure youre getting the best possible price.

To start, research multiple rental companies to get a sense of the average rates. This will give you a benchmark to work with during negotiations. When you contact a rental company, be clear about the duration of your event and inquire about both daily and weekly rates. Most companies will be willing to offer a discount if you commit to a longer rental period.

Another tip is to ask about any additional services that might be included in the rental fee. Some companies offer cleaning services, which can be a significant added value. Knowing whats included can help you compare rates more accurately and decide if the extra cost is worth it.

Timing your negotiation can also make a difference. If youre booking well in advance, you might find that rental companies are more flexible with their pricing. Conversely, if youre booking last minute, be prepared to pay a premium. However, even in urgent situations, its worth asking if theres any room for negotiation.

Lastly, consider the reputation and reliability of the rental company. A company with a good track record might be willing to offer a better rate due to their confidence in their service. Dont hesitate to ask for references or read reviews to ensure youre dealing with a reputable provider.

In conclusion, negotiating the best porta potty rental rate involves understanding the difference between daily and weekly rates, doing thorough research, asking about additional services, timing your booking wisely, and considering the reliability of the rental company. By following these tips, you can secure a rental rate that fits your budget while ensuring your event runs smoothly.

Impact of Location and Season on Rental Prices

The impact of location and season on rental prices for portable toilets is a significant factor when understanding daily and weekly rates. Location plays a crucial role as rental costs can vary widely depending on whether the event or construction site is in an urban, suburban, or rural area. In bustling city centers where logistics are more complex due to traffic, parking restrictions, and higher demand, prices tend to be higher. Conversely, in more remote or less populated areas, where competition might be lower and transportation simpler, the rates could be more affordable.

Seasonal fluctuations also greatly influence rental prices. During peak seasons like summer, when outdoor events such as festivals, weddings, and large public gatherings are common, the demand for portable toilets skyrockets. This surge in demand often leads to increased rental rates as companies capitalize on the heightened need for their services. For instance, a company might charge a premium during festival season in July compared to a quieter month like February.

Moreover, weather conditions associated with different seasons can affect pricing indirectly. Harsh winters might reduce outdoor activities in colder regions, lowering demand and potentially reducing rates. However, if an event does occur during such times, the cost might increase due to the additional challenges of setting up and maintaining facilities in adverse weather.

Understanding these dynamics helps both renters and service providers plan more effectively. Renters can budget appropriately by anticipating higher costs during peak times or in high-demand locations. Providers can adjust their pricing strategies to balance supply with demand while ensuring profitability throughout varying conditions. Thus, being aware of how location and season affect rental prices provides valuable insight into managing expectations and financial planning for portable toilet rentals on both a daily and weekly basis.

Different Types of Porta Potties and Their Associated Costs

When planning an outdoor event or managing a construction site, one of the critical logistics to consider is the provision of portable toilets, commonly known as porta potties. These facilities come in various types, each tailored to different needs and budgets, which directly influences their daily and weekly rental rates.

The most basic type of porta potty is the standard unit. Its designed for basic sanitation needs and is often seen at construction sites or small gatherings. The simplicity of these units translates into lower costs, with daily rates typically ranging from $70 to $100, while weekly rentals might go from $150 to $250 depending on the location and supplier.

For events where comfort and hygiene are slightly more prioritized, there are deluxe models. These offer features like a larger interior space, a mirror, additional ventilation, and sometimes even a hand sanitizer dispenser. The added amenities bump up the cost; you might expect to pay around $120-$160 per day or $250-$350 for a week.

Then theres the luxury option - the VIP or ADA-compliant restrooms. These are fully equipped with running water for handwashing, flushing toilets, climate control in some cases, and are designed to be accessible for people with disabilities. Such high-end units command higher prices due to their enhanced features and larger size. Daily rates can start from $180 upwards, with weekly costs potentially exceeding $450.

Finally, for large-scale events like festivals or major construction projects where multiple units are necessary, companies often offer trailer-mounted restrooms. These trailers can include several stalls along with sinks in one unit. The convenience of having multiple facilities in one setup justifies the higher expense; daily rates can be anywhere from $300-$600, while weekly could range significantly based on size but often start at over $800.

Understanding these rates helps in budgeting effectively for any project or event requiring portable sanitation solutions. Its important to consider not just the initial rental cost but also service fees for cleaning which might be additional or included depending on the rental agreement. Moreover, negotiating longer-term rentals can sometimes reduce per-day costs if youre planning an extended event or project duration.

Choosing the right type of porta potty involves balancing your budget with the level of comfort and accessibility required by your attendees or workers. By doing so, you ensure that everyone has access to sanitary facilities without stretching your financial resources too thin.

About Sewage treatment

This article is about the treatment of municipal wastewater. For the treatment of any type of wastewater, see Wastewater treatment.
Aerial photo of Kuryanovo a

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Constructed wetlands fo

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Waste stabilization pond

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UASB for domestic wastew

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Sewage treatment plants (STPs) come in many different sizes and process configurations. Clockwise from top left: Aerial photo of Kuryanovo activated sludge STP in Moscow, Russia; Constructed wetlands STP near Gdansk, Poland; Waste stabilization ponds STP in the South of France; Upflow anaerobic sludge blanket STP in Bucaramanga, Colombia.

Sewage treatment	
Synonym	Wastewater treatment plant (WWTP), water reclamation plant
Position in sanitation chain	Treatment
Application level	City, neighborhood[1]
Management level	Public
Inputs	Sewage, could also be just blackwater (waste), greywater[1]
Outputs	Effluent, sewage sludge, possibly biogas (for some types)[1]
Types	List of wastewater treatment technologies
Environmental concerns	Water pollution, Environmental health, Public health, sewage sludge disposal issues

Sewage treatment is a type of wastewater treatment which aims to remove contaminants from sewage to produce an effluent that is suitable to discharge to the surrounding environment or an intended reuse application, thereby preventing water pollution from raw sewage discharges.[2] Sewage contains wastewater from households and businesses and possibly pre-treated industrial wastewater. There are a large number of sewage treatment processes to choose from. These can range from decentralized systems (including on-site treatment systems) to large centralized systems involving a network of pipes and pump stations (called sewerage) which convey the sewage to a treatment plant. For cities that have a combined sewer, the sewers will also carry urban runoff (stormwater) to the sewage treatment plant. Sewage treatment often involves two main stages, called primary and secondary treatment, while advanced treatment also incorporates a tertiary treatment stage with polishing processes and nutrient removal. Secondary treatment can reduce organic matter (measured as biological oxygen demand) from sewage,â€Š using aerobic or anaerobic biological processes. A so-called quaternary treatment step (sometimes referred to as advanced treatment) can also be added for the removal of organic micropollutants, such as pharmaceuticals. This has been implemented in full-scale for example in Sweden.[3]

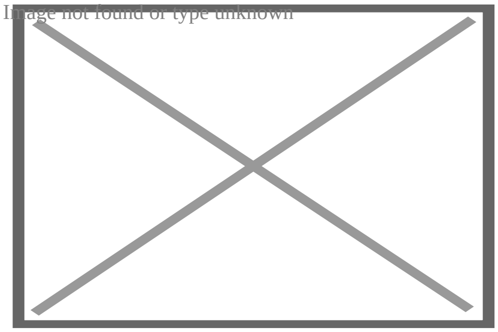
A large number of sewage treatment technologies have been developed, mostly using biological treatment processes. Design engineers and decision makers need to take into account technical and economical criteria of each alternative when choosing a suitable technology.[4]:â€Š215â€Š Often, the main criteria for selection are desired effluent quality, expected construction and operating costs, availability of land, energy requirements and sustainability aspects. In developing countries and in rural areas with low population densities, sewage is often treated by various on-site sanitation systems and not conveyed in sewers. These systems include septic tanks connected to drain fields, on-site sewage systems (OSS), vermifilter systems and many more. On the other hand, advanced and relatively expensive sewage treatment plants may include tertiary treatment with disinfection and possibly even a fourth treatment stage to remove micropollutants.[3]

At the global level, an estimated 52% of sewage is treated.[5] However, sewage treatment rates are highly unequal for different countries around the world. For example, while high-income countries treat approximately 74% of their sewage, developing countries treat an average of just 4.2%.[5]

The treatment of sewage is part of the field of sanitation. Sanitation also includes the management of human waste and solid waste as well as stormwater (drainage) management.[6] The term *sewage treatment plant* is often used interchangeably with the term *wastewater treatment plant*.[4][*page needed*][7]

Terminology

[edit]



Activated sludge sewage treatment plant in Massachusetts, US

The term *sewage treatment plant* (STP) (or *sewage treatment works*) is nowadays often replaced with the term *wastewater treatment plant* (WWTP).[7][8] Strictly speaking, the latter is a broader term that can also refer to industrial wastewater treatment.

The terms *water recycling center* or *water reclamation plants* are also in use as synonyms.

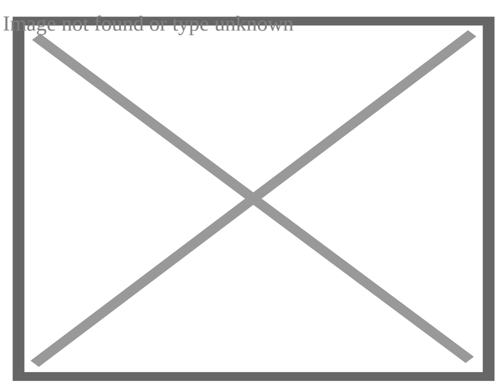
Purposes and overview

[edit]

The overall aim of treating sewage is to produce an effluent that can be discharged to the environment while causing as little water pollution as possible, or to produce an effluent that can be reused in a useful manner.[9] This is achieved by removing contaminants from the sewage. It is a form of waste management.

With regards to biological treatment of sewage, the treatment objectives can include various degrees of the following: to transform or remove organic matter, nutrients (nitrogen and phosphorus), pathogenic organisms, and specific trace organic constituents (micropollutants).[7]:â€Š548â€Š

Some types of sewage treatment produce sewage sludge which can be treated before safe disposal or reuse. Under certain circumstances, the treated sewage sludge might be termed *biosolids* and can be used as a fertilizer.



The process that raw sewage goes through before being released back into surface water

Sewage characteristics

[edit]
This section is an excerpt from Sewage § Concentrations and loads.[edit]

Typical values for physical–chemical characteristics of raw sewage in developing countries have been published as follows: 180 g/person/d for total solids (or 1100 mg/L when expressed as a concentration), 50 g/person/d for BOD (300 mg/L), 100 g/person/d for COD (600 mg/L), 8 g/person/d for total nitrogen (45 mg/L), 4.5 g/person/d for ammonia-N (25 mg/L) and 1.0 g/person/d for total phosphorus (7 mg/L).[10]:â€Š57â€Š The typical ranges for these values are: 120–220 g/person/d for total solids (or 700–1350 mg/L when expressed as a concentration), 40–60 g/person/d for BOD (250–400 mg/L), 80–120 g/person/d for COD (450–800 mg/L), 6–10 g/person/d for total nitrogen (35–60 mg/L), 3.5–6 g/person/d for ammonia-N (20–35 mg/L) and 0.7–2.5 g/person/d for total phosphorus (4–15 mg/L).[10]:â€Š57â€Š

For high income countries, the "per person organic matter load" has been found to be approximately 60 gram of BOD per person per day.[11] This is called the population equivalent (PE) and is also used as a comparison parameter to express the strength of industrial wastewater compared to sewage.

Collection

[edit]

This section is an excerpt from Sewerage.[edit]

Sewerage (or sewage system) is the infrastructure that conveys sewage or surface runoff (stormwater, meltwater, rainwater) using sewers. It encompasses components such as receiving drains, manholes, pumping stations, storm overflows, and screening chambers of the combined sewer or sanitary sewer. Sewerage ends at the entry to a sewage treatment plant or at the point of discharge into the environment. It is the system of pipes, chambers, manholes or inspection chamber, etc. that conveys the sewage or storm water.
In many cities, sewage (municipal wastewater or municipal sewage) is carried together with stormwater, in a combined sewer system, to a sewage treatment plant. In some urban areas, sewage is carried separately in sanitary sewers and runoff from streets is carried in storm drains. Access to these systems, for maintenance purposes, is typically through a manhole. During high precipitation periods a sewer system may experience a combined sewer overflow event or a sanitary sewer overflow event, which forces untreated sewage to flow directly to receiving waters. This can pose a serious threat to

public health and the surrounding environment.

Types of treatment processes

[edit]

Sewage can be treated close to where the sewage is created, which may be called a *decentralized system* or even an *on-site system* (on-site sewage facility, septic tanks, etc.). Alternatively, sewage can be collected and transported by a network of pipes and pump stations to a municipal treatment plant. This is called a *centralized system* (see also sewerage and pipes and infrastructure).

A large number of sewage treatment technologies have been developed, mostly using biological treatment processes (see list of wastewater treatment technologies). Very broadly, they can be grouped into high tech (high cost) versus low tech (low cost) options, although some technologies might fall into either category. Other grouping classifications are *intensive* or *mechanized* systems (more compact, and frequently employing high tech options) versus *extensive* or *natural* or *nature-based* systems (usually using natural treatment processes and occupying larger areas) systems. This classification may be sometimes oversimplified, because a treatment plant may involve a combination of processes, and the interpretation of the concepts of high tech and low tech, intensive and extensive, mechanized and natural processes may vary from place to place.

Low tech, extensive or nature-based processes

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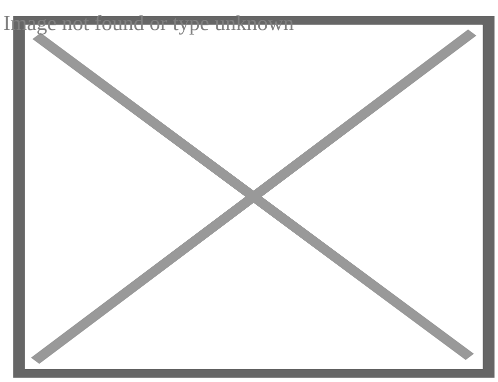
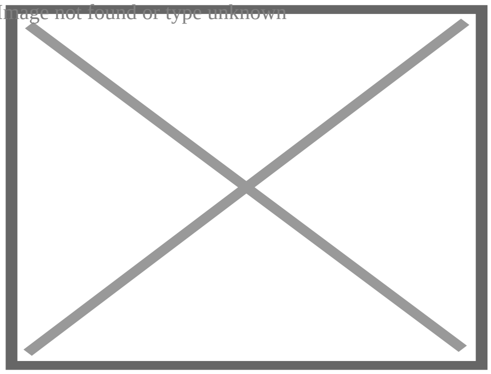
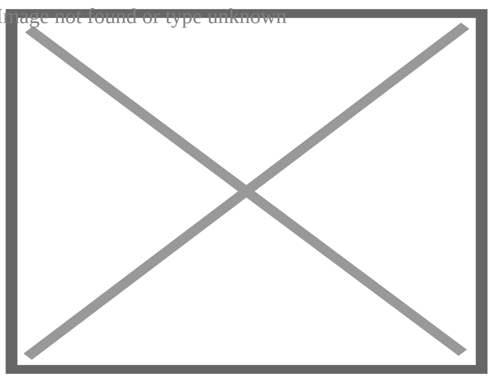


Constructed wetland (vertical flow) at Center for Research and Training in Sanitation, Belo Horizonte, Brazil



Trickling filter sewage treatment plant at Onça Treatment Plant, Belo Horizonte, Brazil

Examples for more low-tech, often less expensive sewage treatment systems are shown below. They often use little or no energy. Some of these systems do not provide a high level of treatment, or only treat part of the sewage (for example only the toilet wastewater), or they only provide pre-treatment, like septic tanks. On the other hand, some systems are capable of providing a good performance, satisfactory for several applications. Many of these systems are based on natural treatment processes, requiring large areas, while others are more compact. In most cases, they are used in rural areas or in small to medium-sized communities.



Rural Kansas lagoon on private property

For example, waste stabilization ponds are a low cost treatment option with practically no energy requirements but they require a lot of land.[[4]]:â€Š236â€Š Due to their technical simplicity, most of the savings (compared with high tech systems) are in terms of operation and maintenance costs.[[4]]:â€Š220–243â€Š

- Anaerobic digester types and anaerobic digestion, for example:
  - Upflow anaerobic sludge blanket reactor
  - Septic tank
  - Imhoff tank
- Constructed wetland (see also biofilters)
- Decentralized wastewater system
- Nature-based solutions

- On-site sewage facility
- Sand filter
- Vermifilter
- Waste stabilization pond with sub-types:[4]:â€Š189â€Š
  - e.g. Facultative ponds, high rate ponds, maturation ponds

Examples for systems that can provide full or partial treatment for toilet wastewater only:

- Composting toilet (see also dry toilets in general)
- Urine-diverting dry toilet
- Vermifilter toilet

High tech, intensive or mechanized processes

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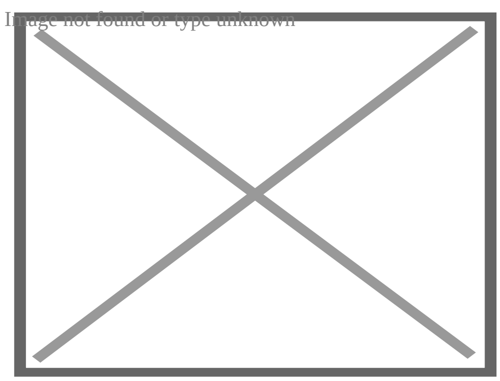


Aeration tank of activated sludge sewage treatment plant (fine-bubble diffusers) near Adelaide, Australia

Examples for more high-tech, intensive or mechanized, often relatively expensive sewage treatment systems are listed below. Some of them are energy intensive as well. Many of them provide a very high level of treatment. For example, broadly speaking, the activated sludge process achieves a high effluent quality but is relatively expensive and energy intensive.[4]:â€Š239â€Š

- Activated sludge systems
- Aerobic treatment system
- Enhanced biological phosphorus removal
- Expanded granular sludge bed digestion
- Filtration
- Membrane bioreactor
- Moving bed biofilm reactor
- Rotating biological contactor
- Trickling filter
- Ultraviolet disinfection

Disposal or treatment options

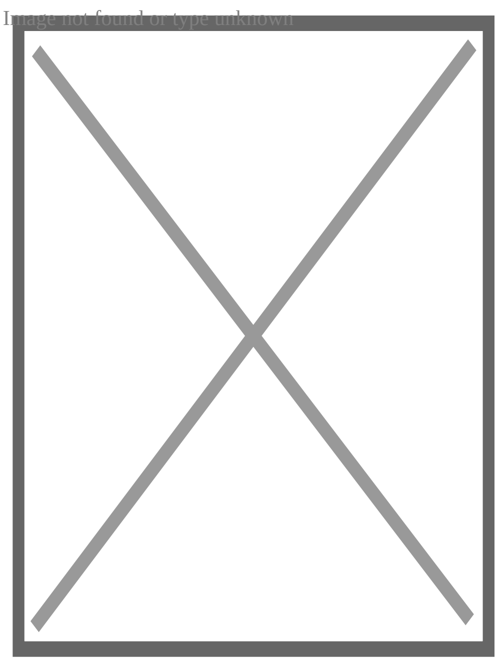
[edit]

There are other process options which may be classified as disposal options, although they can also be understood as basic treatment options. These include: Application of sludge, irrigation, soak pit, leach field, fish pond, floating plant pond, water disposal/groundwater recharge, surface disposal and storage.[12]:â€Š138â€Š

The application of sewage to land is both: a type of treatment and a type of final disposal.[4]:â€Š189â€Š It leads to groundwater recharge and/or to evapotranspiration. Land application include slow-rate systems, rapid infiltration, subsurface infiltration, overland flow. It is done by flooding, furrows, sprinkler and dripping. It is a treatment/disposal system that requires a large amount of land per person.

Design aspects

[edit]



Upflow anaerobic sludge blanket (UASB) reactor in Brazil (picture from a small-sized treatment plant), Center for Research and Training in Sanitation, Belo Horizonte, Brazil

Population equivalent

[edit]

The *per person organic matter load* is a parameter used in the design of sewage treatment plants. This concept is known as population equivalent (PE). The base value used for PE can vary from one country to another. Commonly used definitions used worldwide are: 1 PE equates to 60 gram of BOD per person per day, and it also equals 200 liters of sewage per day.[13] This concept is also used as a comparison parameter to express the strength of industrial wastewater compared to sewage.

Process selection

[edit]

When choosing a suitable sewage treatment process, decision makers need to take into account technical and economical criteria.[4]:â€Š215â€Š Therefore, each analysis is site-specific. A life cycle assessment (LCA) can be used, and criteria or weightings are attributed to the various aspects. This makes the final decision subjective to some extent.[4]:â€Š216â€Š A range of publications exist to help with technology selection.[4]:â€Š221â€Š[12][14][15]

In industrialized countries, the most important parameters in process selection are typically efficiency, reliability, and space requirements. In developing countries, they might be different and the focus might be more on construction and operating costs as well as process simplicity.[4]:â€Š218â€Š

Choosing the most suitable treatment process is complicated and requires expert inputs, often in the form of feasibility studies. This is because the main important factors to be considered when evaluating and selecting sewage treatment processes are numerous. They include: process applicability, applicable flow, acceptable flow variation, influent characteristics, inhibiting or refractory compounds, climatic aspects, process kinetics and reactor hydraulics, performance, treatment residuals, sludge processing, environmental constraints, requirements for chemical products, energy and other resources; requirements for personnel, operating and maintenance; ancillary processes, reliability, complexity, compatibility, area availability.[4]:â€Š219â€Š

With regards to environmental impacts of sewage treatment plants the following aspects are included in the selection process: Odors, vector attraction, sludge transportation, sanitary risks, air contamination, soil and subsoil contamination, surface water pollution or groundwater contamination, devaluation of nearby areas, inconvenience to the nearby population.[4]:â€Š220â€Š

Odor control

[edit]

Odors emitted by sewage treatment are typically an indication of an anaerobic or *septic* condition.[16] Early stages of processing will tend to produce foul-smelling gases, with hydrogen sulfide being most common in generating complaints. Large process plants in urban areas will often treat the odors with carbon reactors, a contact media with bio-slimes, small doses of chlorine, or circulating fluids to biologically capture and metabolize the noxious gases.[17] Other methods of odor control exist, including addition of iron salts, hydrogen peroxide, calcium nitrate, etc. to manage hydrogen sulfide levels.[18]

Energy requirements

[edit]

The energy requirements vary with type of treatment process as well as sewage strength. For example, constructed wetlands and stabilization ponds have low energy requirements.[19] In comparison, the activated sludge process has a high energy consumption because it includes an aeration step. Some sewage treatment plants produce biogas from their sewage sludge treatment process by using a process called anaerobic digestion. This process can produce enough energy to meet most of the energy needs of the sewage treatment plant itself.[7]:â€Š1505â€Š

For activated sludge treatment plants in the United States, around 30 percent of the annual operating costs is usually required for energy.[7]:â€Š1703â€Š Most of this electricity is used for aeration, pumping systems and equipment for the dewatering and drying of sewage sludge. Advanced sewage treatment plants, e.g. for nutrient removal, require more energy than plants that only achieve primary or secondary treatment.[7]:â€Š1704â€Š

Small rural plants using trickling filters may operate with no net energy requirements, the whole process being driven by gravitational flow, including tipping bucket flow distribution and the desludging of settlement tanks to drying beds. This is usually only practical in hilly terrain and in areas where the treatment plant is relatively remote from housing because of the difficulty in managing odors.[20][21]

Co-treatment of industrial effluent

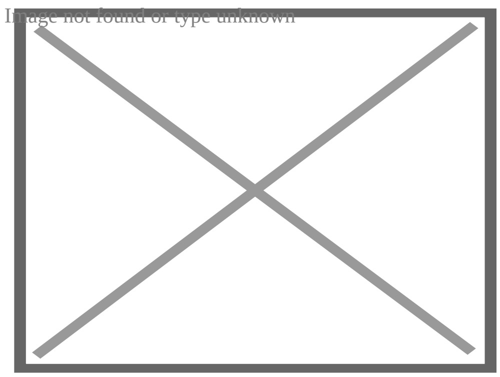
[edit]

In highly regulated developed countries, industrial wastewater usually receives at least pretreatment if not full treatment at the factories themselves to reduce the pollutant load, before discharge to the sewer. The pretreatment has the following two main aims: Firstly, to prevent toxic or inhibitory compounds entering the biological stage of the sewage treatment plant and reduce its efficiency. And secondly to avoid toxic compounds from accumulating in the produced sewage sludge which would reduce its beneficial reuse options. Some industrial wastewater may contain pollutants which cannot be removed by sewage treatment plants. Also, variable flow of industrial waste associated with production cycles may upset the population dynamics of biological treatment units.[*citation needed*]

Design aspects of secondary treatment processes

[edit]

Main article: Secondary treatment § Design considerations



A poorly maintained anaerobic treatment pond in Kariba, Zimbabwe (sludge needs to be removed)

Non-sewered areas

[edit]

Urban residents in many parts of the world rely on on-site sanitation systems without sewers, such as septic tanks and pit latrines, and fecal sludge management in these cities is an enormous challenge.[22]

For sewage treatment the use of septic tanks and other on-site sewage facilities (OSSF) is widespread in some rural areas, for example serving up to 20 percent of the homes in the U.S.[23]

Available process steps

[edit]

Sewage treatment often involves two main stages, called primary and secondary treatment, while advanced treatment also incorporates a tertiary treatment stage with polishing processes.[13] Different types of sewage treatment may utilize some or all of the process steps listed below.

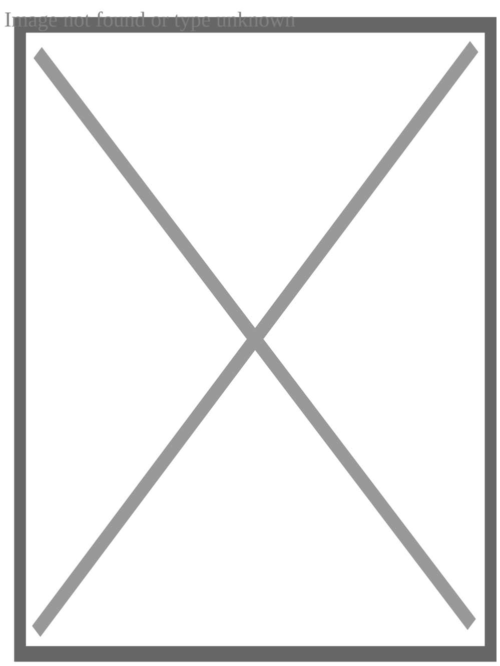
Preliminary treatment

[edit]

Preliminary treatment (sometimes called pretreatment) removes coarse materials that can be easily collected from the raw sewage before they damage or clog the pumps and sewage lines of primary treatment clarifiers.

Screening

[edit]

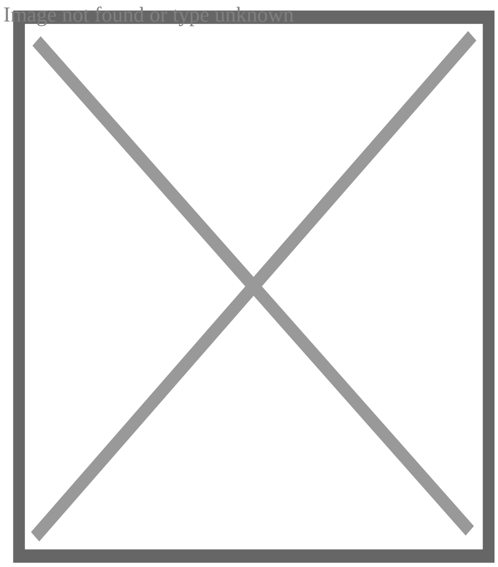


Preliminary treatment arrangement at small and medium-sized sewage treatment plants: Manually-cleaned screens and grit chamber (Jales Treatment Plant, São Paulo, Brazil)

The influent in sewage water passes through a bar screen to remove all large objects like cans, rags, sticks, plastic packets, etc. carried in the sewage stream.[24] This is most commonly done with an automated mechanically raked bar screen in modern plants serving large populations, while in smaller or less modern plants, a manually cleaned screen may be used. The raking action of a mechanical bar screen is typically paced according to the accumulation on the bar screens and/or flow rate. The solids are collected and later disposed in a landfill, or incinerated. Bar screens or mesh screens of varying sizes may be used to optimize solids removal. If gross solids are not removed, they become entrained in pipes and moving parts of the treatment plant, and can cause substantial damage and inefficiency in the process.[25]:â€Š9â€Š

Grit removal

[edit]



Preliminary treatment: Horizontal flow grit chambers at a sewage treatment plant in Juiz de Fora, Minas Gerais, Brazil

Grit consists of sand, gravel, rocks, and other heavy materials. Preliminary treatment may include a sand or grit removal channel or chamber, where the velocity of the incoming sewage is reduced to allow the settlement of grit. Grit removal is necessary to (1) reduce formation of deposits in primary sedimentation tanks, aeration tanks, anaerobic digesters, pipes, channels, etc. (2) reduce the frequency of tank cleaning caused by excessive accumulation of grit; and (3) protect moving mechanical equipment from abrasion and accompanying abnormal wear. The removal of grit is essential for equipment with closely machined metal surfaces such as comminutors, fine screens, centrifuges, heat exchangers, and high pressure diaphragm pumps.

Grit chambers come in three types: horizontal grit chambers, aerated grit chambers, and vortex grit chambers. Vortex grit chambers include mechanically induced vortex, hydraulically induced vortex, and multi-tray vortex separators. Given that traditionally, grit removal systems have been designed to remove clean inorganic particles that are greater than 0.210 millimetres (0.0083 in), most of the finer grit passes through the grit removal flows under normal conditions. During periods of high flow deposited grit is resuspended and the quantity of grit reaching the treatment plant increases substantially.[7]

Flow equalization

[edit]

Equalization basins can be used to achieve flow equalization. This is especially useful for combined sewer systems which produce peak dry-weather flows or peak wet-weather flows that are much higher than the average flows.[7]:â€Š334â€Š Such basins can improve the performance of the biological treatment processes and the secondary clarifiers.[7]:â€Š334â€Š

Disadvantages include the basins' capital cost and space requirements. Basins can also provide a place to temporarily hold, dilute and distribute batch discharges of toxic or high-strength wastewater which might otherwise inhibit biological secondary treatment (such was wastewater from portable toilets or fecal sludge that is brought to the sewage treatment plant in vacuum trucks). Flow equalization basins require variable discharge control, typically include provisions for bypass and cleaning, and may also include aerators and odor control.[26]

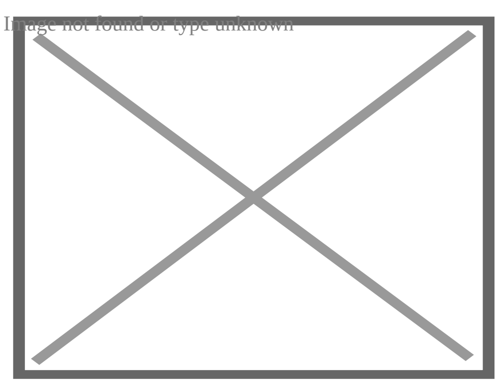
Fat and grease removal

[edit]

In some larger plants, fat and grease are removed by passing the sewage through a small tank where skimmers collect the fat floating on the surface. Air blowers in the base of the tank may also be used to help recover the fat as a froth. Many plants, however, use primary clarifiers with mechanical surface skimmers for fat and grease removal.

Primary treatment

[edit]



Rectangular primary settling tanks at a sewage treatment plant in Oregon, US

Primary treatment is the "removal of a portion of the suspended solids and organic matter from the sewage".[7]:â€Š11â€ŠIt consists of allowing sewage to pass slowly through a basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface and are skimmed off. These basins are called *primary sedimentation tanks* or *primary clarifiers* and typically have a hydraulic retention time (HRT) of 1.5 to 2.5 hours.[7]:â€Š398â€Š The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment. Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank where it is pumped to sludge treatment facilities.[25]:â€Š9–11â€Š

Sewage treatment plants that are connected to a combined sewer system sometimes have a bypass arrangement after the primary treatment unit. This means that during very heavy rainfall events, the secondary and tertiary treatment systems can be bypassed to protect them from hydraulic overloading, and the mixture of sewage and storm-water receives primary treatment only.[27]

Primary sedimentation tanks remove about 50–70% of the suspended solids, and 25–40% of the biological oxygen demand (BOD).[7]:â€Š396â€Š

Secondary treatment

[edit]
Main article: Secondary treatment

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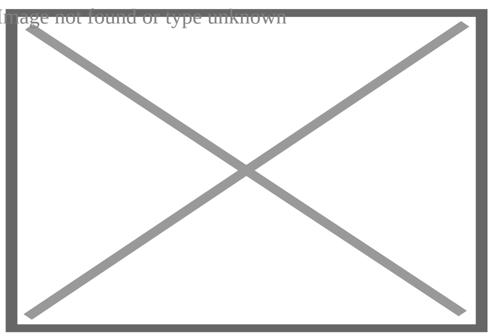


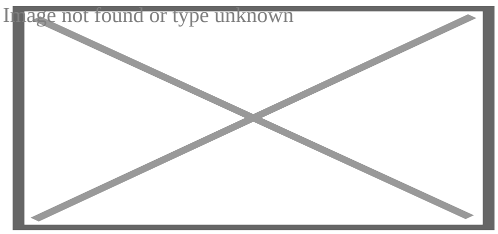
Simplified process flow diagram for a typical large-scale treatment plant using the activated sludge process

The main processes involved in secondary sewage treatment are designed to remove as much of the solid material as possible.[13] They use biological processes to digest and remove the remaining soluble material, especially the organic fraction. This can be done with either suspended-growth or biofilm processes. The microorganisms that feed on the organic matter present in the sewage grow and multiply, constituting the biological solids, or biomass. These grow and group together in the form of flocs or biofilms and, in some specific processes, as granules. The biological floc or biofilm and remaining fine solids form a sludge which can be settled and separated. After separation, a liquid remains that is almost free of solids, and with a greatly reduced concentration of pollutants.[13]

Secondary treatment can reduce organic matter (measured as biological oxygen demand) from sewage,â€Š using aerobic or anaerobic processes. The organisms involved in these processes are sensitive to the presence of toxic materials, although these are not expected to be present at high concentrations in typical municipal sewage.

Tertiary treatment

[edit]



Overall setup for a micro filtration system

Advanced sewage treatment generally involves three main stages, called primary, secondary and tertiary treatment but may also include intermediate stages and final polishing processes. The purpose of tertiary treatment (also called *advanced treatment*) is to provide a final treatment stage to further improve the effluent quality before it is discharged to the receiving water body or reused. More than one tertiary treatment process may be used at any treatment plant. If disinfection is practiced, it is always the final process. It is also called *effluent polishing*. Tertiary treatment may include biological nutrient removal (alternatively, this can be classified as secondary treatment), disinfection and partly removal of micropollutants, such as environmental persistent pharmaceutical pollutants.

Tertiary treatment is sometimes defined as anything more than primary and secondary treatment in order to allow discharge into a highly sensitive or fragile ecosystem such as estuaries, low-flow rivers or coral reefs.[28] Treated water is sometimes disinfected chemically or physically (for example, by lagoons and microfiltration) prior to discharge into a stream, river, bay, lagoon or wetland, or it can be used for the irrigation of a golf course, greenway or park. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purposes.

Sand filtration removes much of the residual suspended matter.[25]:â€Š22–23â€Š Filtration over activated carbon, also called *carbon adsorption,* removes residual toxins.[25]:â€Š19â€Š Micro filtration or synthetic membranes are used in membrane bioreactors and can also remove pathogens.[7]:â€Š854â€Š

Settlement and further biological improvement of treated sewage may be achieved through storage in large human-made ponds or lagoons. These lagoons are highly aerobic, and colonization by native macrophytes, especially reeds, is often encouraged.

Disinfection

[edit]

Disinfection of treated sewage aims to kill pathogens (disease-causing microorganisms) prior to disposal. It is increasingly effective after more elements of the foregoing treatment sequence have been completed.[29]:â€Š359â€Š The purpose of disinfection in the treatment of sewage is to substantially reduce the number of pathogens in the water to be discharged back into the environment or to be reused. The target level of reduction of biological contaminants like pathogens is often regulated by the presiding governmental authority. The effectiveness of disinfection depends on the quality of the water being treated (e.g. turbidity, pH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. Water with high turbidity will be treated less successfully, since solid matter can shield organisms, especially from ultraviolet light or if contact times are low. Generally, short contact times, low doses and high flows all militate against effective disinfection. Common methods of disinfection include ozone, chlorine, ultraviolet light, or sodium hypochlorite.[25]:â€Š16â€Š Monochloramine, which is used for drinking water, is not used in the treatment of sewage because of its persistence.

Chlorination remains the most common form of treated sewage disinfection in many countries due to its low cost and long-term history of effectiveness. One disadvantage is that chlorination of residual organic material can generate chlorinated-organic compounds that may be carcinogenic or harmful to the environment. Residual chlorine or chloramines may also be capable of chlorinating organic material in the natural aquatic environment. Further, because residual chlorine is toxic to aquatic species, the treated effluent must also be chemically dechlorinated, adding to the complexity and cost of treatment.

Ultraviolet (UV) light can be used instead of chlorine, iodine, or other chemicals. Because no chemicals are used, the treated water has no adverse effect on organisms that later consume it, as may be the case with other methods. UV radiation causes damage to the genetic structure of bacteria, viruses, and other pathogens, making them incapable of reproduction. The key disadvantages of UV disinfection are the need for frequent lamp maintenance and replacement and the need for a highly treated effluent to ensure that the target microorganisms are not shielded from the UV radiation (i.e., any solids present in the treated effluent may protect microorganisms from the UV light). In many countries, UV light is becoming the most common means of disinfection because of the concerns about the impacts of chlorine in chlorinating residual organics in the treated sewage and in chlorinating organics in the receiving water.

As with UV treatment, heat sterilization also does not add chemicals to the water being treated. However, unlike UV, heat can penetrate liquids that are not transparent. Heat disinfection can also penetrate solid materials within wastewater, sterilizing their contents. Thermal effluent decontamination systems provide low resource, low maintenance effluent decontamination once installed.

Ozone (O_3) is generated by passing oxygen (

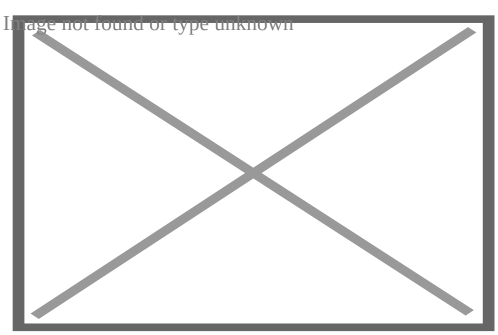
O_2) through a high voltage potential resulting in a third oxygen atom becoming attached and forming

O_3. Ozone is very unstable and reactive and oxidizes most organic material it comes in contact with, thereby destroying many pathogenic microorganisms. Ozone is considered to be safer than chlorine because, unlike chlorine which has to be stored on site (highly poisonous in the event of an accidental release), ozone is generated on-site as needed from the oxygen in the ambient air. Ozonation also produces fewer disinfection by-products than chlorination. A disadvantage of ozone disinfection is the high cost of the ozone generation equipment and the requirements for special operators. Ozone sewage treatment requires the use of an ozone generator, which decontaminates the water as ozone bubbles percolate through the tank.

Membranes can also be effective disinfectants, because they act as barriers, avoiding the passage of the microorganisms. As a result, the final effluent may be devoid of pathogenic organisms, depending on the type of membrane used. This principle is applied in membrane bioreactors.

Biological nutrient removal

[edit]



Nitrification process tank at an activated sludge plant in the United States

Sewage may contain high levels of the nutrients nitrogen and phosphorus. Typical values for nutrient loads per person and nutrient concentrations in raw sewage in developing countries have been published as follows: 8 g/person/d for total nitrogen (45 mg/L), 4.5 g/person/d for ammonia-N (25 mg/L) and 1.0 g/person/d for total phosphorus (7 mg/L).[4]:â€Š57â€Š The typical ranges for these values are: 6–10 g/person/d for total nitrogen (35–60 mg/L), 3.5–6 g/person/d for ammonia-N (20–35 mg/L) and 0.7–2.5 g/person/d for total phosphorus (4–15 mg/L).[4]:â€Š57â€Š

Excessive release to the environment can lead to nutrient pollution, which can manifest itself in eutrophication. This process can lead to algal blooms, a rapid growth, and later decay, in the population of algae. In addition to causing deoxygenation, some algal species produce toxins that contaminate drinking water supplies.

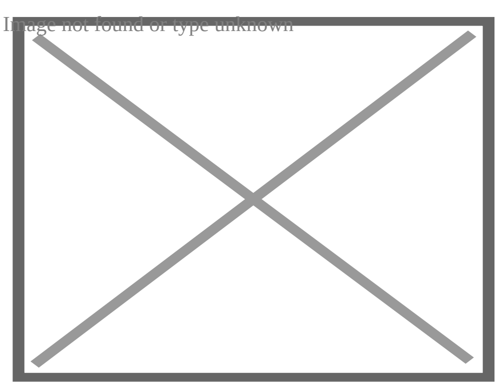
Ammonia nitrogen, in the form of free ammonia (NH_3) is toxic to fish. Ammonia nitrogen, when converted to nitrite and further to nitrate in a water body, in the process of nitrification, is associated with the consumption of dissolved oxygen. Nitrite and nitrate may also have public health significance if concentrations are high in drinking water, because of a disease called metahemoglobinemia.[4]:â€Š42â€Š

Phosphorus removal is important as phosphorus is a limiting nutrient for algae growth in many fresh water systems. Therefore, an excess of phosphorus can lead to eutrophication. It is also particularly important for water reuse systems where high phosphorus concentrations may lead to fouling of downstream equipment such as reverse osmosis.

A range of treatment processes are available to remove nitrogen and phosphorus. Biological nutrient removal (BNR) is regarded by some as a type of secondary treatment process,[7] and by others as a *tertiary* (or *advanced*) treatment process.

Nitrogen removal

[edit]



Constructed wetlands (vertical flow) for sewage treatment near Shanghai, China

Nitrogen is removed through the biological oxidation of nitrogen from ammonia to nitrate (nitrification), followed by denitrification, the reduction of nitrate to nitrogen gas. Nitrogen gas is released to the atmosphere and thus removed from the water.

Nitrification itself is a two-step aerobic process, each step facilitated by a different type of bacteria. The oxidation of ammonia (NH_4^+) to nitrite ($NO_2^?$) is most often facilitated by bacteria such as *Nitrosomonas* spp. (*nitroso* refers to the formation of a nitroso functional group). Nitrite oxidation to nitrate ($NO_3^?$), though traditionally believed to be facilitated by *Nitrobacter* spp. (nitro referring the formation of a nitro functional group), is now known to be facilitated in the environment predominantly by *Nitrospira* spp.

Denitrification requires anoxic conditions to encourage the appropriate biological communities to form. *Anoxic conditions* refers to a situation where oxygen is absent but nitrate is present. Denitrification is facilitated by a wide diversity of bacteria. The activated sludge process, sand filters, waste stabilization ponds, constructed wetlands and other processes can all be used to reduce nitrogen.[25]:â€Š17–18â€Š Since denitrification is the reduction of nitrate to dinitrogen (molecular nitrogen) gas, an electron donor is needed. This can be, depending on the wastewater, organic matter (from the sewage itself), sulfide, or an added donor like methanol. The sludge in the anoxic tanks (denitrification tanks) must be mixed well (mixture of recirculated mixed liquor, return activated sludge, and raw influent) e.g. by using submersible mixers in order to achieve the desired denitrification.

Over time, different treatment configurations for activated sludge processes have evolved to achieve high levels of nitrogen removal. An initial scheme was called the Ludzack–Ettinger Process. It could not achieve a high level of denitrification.[7]:â€Š616â€Š The Modified Ludzak–Ettinger Process (MLE) came later and was an improvement on the original concept. It recycles mixed liquor from the discharge end of the aeration tank to the head of the anoxic tank. This provides nitrate for the facultative bacteria.[7]:â€Š616â€Š

There are other process configurations, such as variations of the Bardenpho process.[30]:â€Š160â€Š They might differ in the placement of anoxic tanks, e.g. before and after the aeration tanks.

Phosphorus removal

[edit]

Studies of United States sewage in the late 1960s estimated mean per capita contributions of 500 grams (18 oz) in urine and feces, 1,000 grams (35 oz) in synthetic detergents, and lesser variable amounts used as corrosion and scale control chemicals in water supplies.[31] Source control via alternative detergent formulations has subsequently reduced the largest contribution, but naturally the phosphorus content of urine and feces remained unchanged.

Phosphorus can be removed biologically in a process called enhanced biological phosphorus removal. In this process, specific bacteria, called polyphosphate-accumulating organisms (PAOs), are selectively enriched and accumulate large quantities of phosphorus within their cells (up to 20 percent of their mass).[30] :â€Š148–155â€Š

Phosphorus removal can also be achieved by chemical precipitation, usually with salts of iron (e.g. ferric chloride) or aluminum (e.g. alum), or lime.[25]:â€Š18â€Š This may lead to a higher sludge production as hydroxides precipitate and the added chemicals can be expensive. Chemical phosphorus removal requires significantly smaller equipment footprint than biological removal, is easier to operate and is often more reliable than biological phosphorus removal. Another method for phosphorus removal is to use granular laterite or zeolite.[32][33]

Some systems use both biological phosphorus removal and chemical phosphorus removal. The chemical phosphorus removal in those systems may be used as a backup system, for use when the biological phosphorus removal is not removing enough phosphorus, or may be used continuously. In either case, using both biological and chemical phosphorus removal has the advantage of not increasing sludge production as much as chemical phosphorus removal on its own, with the disadvantage of the increased initial cost associated with installing two different systems.

Once removed, phosphorus, in the form of a phosphate-rich sewage sludge, may be sent to landfill or used as fertilizer in admixture with other digested sewage sludges. In the latter case, the treated sewage sludge is also sometimes referred to as biosolids. 22% of the world's phosphorus needs could be satisfied by recycling residential wastewater.[34][35]

Fourth treatment stage

[edit]
Further information: Environmental impact of pharmaceuticals and personal care products

Micropollutants such as pharmaceuticals, ingredients of household chemicals, chemicals used in small businesses or industries, environmental persistent pharmaceutical pollutants (EPPP) or pesticides may not be eliminated in the commonly used sewage treatment processes (primary, secondary and tertiary treatment) and therefore lead to water pollution.[36] Although concentrations of those substances and their decomposition products are quite low, there is still a chance of harming aquatic organisms. For pharmaceuticals, the following substances have been identified as toxicologically relevant: substances with endocrine disrupting effects, genotoxic substances and substances that enhance the development of bacterial resistances.[37]

They mainly belong to the group of EPPP.

Techniques for elimination of micropollutants via a fourth treatment stage during sewage treatment are implemented in Germany, Switzerland, Sweden[3] and the Netherlands and tests are ongoing in several other countries.[38] In Switzerland it has been enshrined in law since 2016.[39] Since 1 January 2025, there has been a recast of the Urban Waste Water Treatment Directive in the European Union. Due to the large number of amendments that have now been made, the directive was rewritten on November 27, 2024 as Directive (EU) 2024/3019, published in the EU Official Journal on December 12, and entered into force on January 1, 2025. The member states now have 31 months, i.e. until July 31, 2027, to adapt their national legislation to the new directive ("implementation of the directive").

The amendment stipulates that, in addition to stricter discharge values for nitrogen and phosphorus, persistent trace substances must at least be partially separated. The target, similar to Switzerland, is that 80% of 6 key substances out of 12 must be removed between discharge into the sewage treatment plant and discharge into the water body. At least 80% of the investments and operating costs for the fourth treatment stage will be passed on to the pharmaceutical and cosmetics industry according to the polluter pays principle in order to relieve the population financially and provide an incentive for the development of more environmentally friendly products. In addition, the municipal wastewater treatment sector is to be energy neutral by 2045 and the emission of microplastics and PFAS is to be monitored.

The implementation of the framework guidelines is staggered until 2045, depending on the size of the sewage treatment plant and its population equivalents (PE). Sewage treatment plants with over 150,000 PE have priority and should be adapted immediately, as a significant proportion of the pollution comes from them. The adjustments are staggered at national level in:

- 20% of the plants by 31 December 2033,
- 60% of the plants by 31 December 2039,
- 100% of the plants by 31 December 2045.

Wastewater treatment plants with 10,000 to 150,000 PE that discharge into coastal waters or sensitive waters are staggered at national level in:

- 10% of the plants by 31 December 2033,
- 30% of the plants by 31 December 2036,
- 60% of the plants by 31 December 2039,
- 100% of the plants by 31 December 2045.

The latter concerns waters with a low dilution ratio, waters from which drinking water is obtained and those that are coastal waters, or those used as bathing waters or used for mussel farming. Member States will be given the option not to apply fourth treatment in these areas if a risk assessment shows that there is no potential risk from micropollutants to human health and/or the environment.[40][41]

Such process steps mainly consist of activated carbon filters that adsorb the micropollutants. The combination of advanced oxidation with ozone followed by granular activated carbon (GAC) has been suggested as a cost-effective treatment combination for pharmaceutical residues. For a full reduction of microplasts the combination of ultrafiltration followed by GAC has been suggested. Also the use of enzymes such as laccase secreted by fungi is under investigation.[42][43] Microbial biofuel cells are investigated for their property to treat organic matter in sewage.[44]

To reduce pharmaceuticals in water bodies, source control measures are also under investigation, such as innovations in drug development or more responsible handling of drugs.[37][45] In the US, the National Take Back Initiative is a voluntary program with the general public, encouraging people to return excess or expired drugs, and avoid flushing them to the sewage system.[46]

Sludge treatment and disposal

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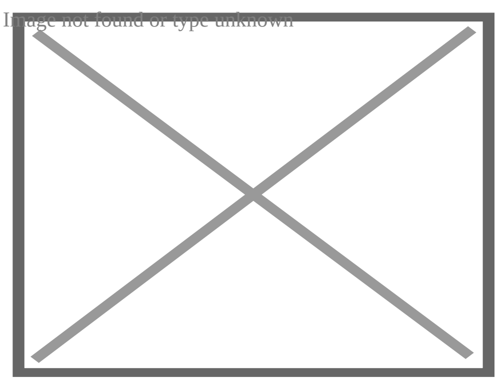
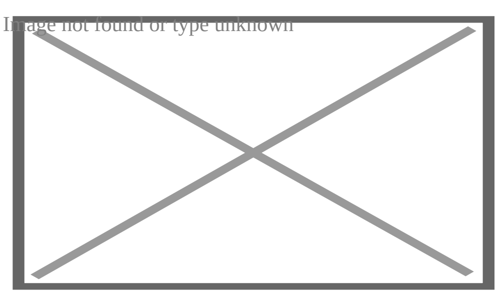


View of a belt filter press at the Blue Plains Advanced Wastewater Treatment Plant, Washington, D.C.



Mechanical dewatering of sewage sludge with a centrifuge at a large sewage treatment plant (Arrudas Treatment Plant, Belo Horizonte, Brazil)

This section is an excerpt from Sewage sludge treatment.[edit]

Sewage sludge treatment describes the processes used to manage and dispose of sewage sludge produced during sewage treatment. Sludge treatment is focused on reducing sludge weight and volume to reduce transportation and disposal costs, and on reducing potential health risks of disposal options. Water removal is the primary means of weight and volume reduction, while pathogen destruction is frequently accomplished through heating during thermophilic digestion, composting, or incineration. The choice of a sludge treatment method depends on the volume of sludge generated, and comparison of treatment costs required for available disposal options. Air-drying and composting may be attractive to rural communities, while limited land availability may make aerobic digestion and mechanical dewatering preferable for cities, and economies of scale may encourage energy recovery alternatives in metropolitan areas.

Sludge is mostly water with some amounts of solid material removed from liquid sewage. Primary sludge includes settleable solids removed during primary treatment in primary clarifiers. Secondary sludge is sludge separated in secondary clarifiers that are used in secondary treatment bioreactors or processes using inorganic oxidizing agents. In intensive sewage treatment processes, the sludge produced needs to be removed from the liquid line on a continuous basis because the volumes of the tanks in the liquid line have insufficient volume to store sludge.[47] This is done in order to keep the treatment processes compact and in balance (production of sludge approximately equal to the removal of sludge). The sludge removed from the liquid line goes to the sludge treatment line. Aerobic processes (such as the activated sludge process) tend to produce more sludge compared with anaerobic processes. On the other hand, in extensive (natural) treatment processes, such as ponds and constructed wetlands, the produced sludge remains accumulated in the treatment units (liquid line) and is only removed after several years of operation.[48]

Sludge treatment options depend on the amount of solids generated and other site-specific conditions. Composting is most often applied to small-scale plants with aerobic digestion for mid-sized operations, and anaerobic digestion for the larger-scale operations. The sludge is sometimes passed through a so-called pre-thickener which de-waters the sludge. Types of pre-thickeners include centrifugal sludge thickeners,[49] rotary drum sludge thickeners and belt filter presses.[50] Dewatered sludge may be incinerated or transported offsite for disposal in a landfill or use as an agricultural soil amendment.[51]

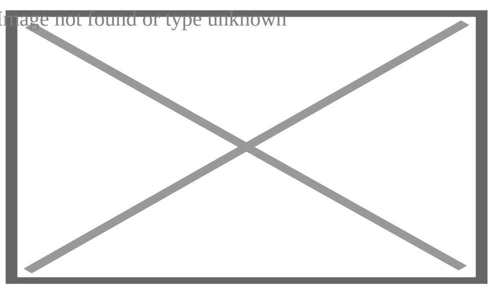
Environmental impacts

[edit]

Sewage treatment plants can have significant effects on the biotic status of receiving waters and can cause some water pollution, especially if the treatment process used is only basic. For example, for sewage treatment plants without nutrient removal, eutrophication of receiving water bodies can be a problem.

This section is an excerpt from Water pollution.[edit]

Water pollution (or aquatic pollution) is the contamination of water bodies, with a negative impact on their uses.[52]:â€Š6â€Š It is usually a result of human activities. Water bodies include lakes, rivers, oceans, aquifers, reservoirs and groundwater. Water pollution results when contaminants mix with these water bodies. Contaminants can come from one of four main sources. These are sewage discharges, industrial activities, agricultural activities, and urban runoff including stormwater.[53] Water pollution may affect either surface water or groundwater. This form of pollution can lead to many problems. One is the degradation of aquatic ecosystems. Another is spreading water-borne diseases when people use polluted water for drinking or irrigation.[54] Water pollution also reduces the ecosystem services such as drinking water provided by the water resource.



Treated effluent from sewage treatment plant in DÄ›Ä•ín, Czech Republic, is discharged to surface waters.

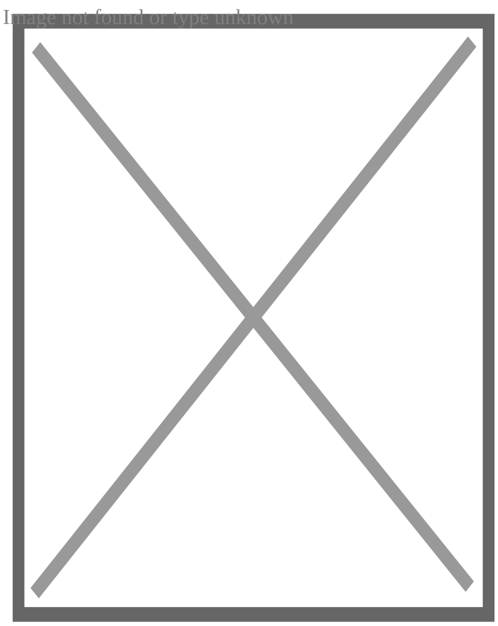
In 2024, The Royal Academy of Engineering released a study into the effects wastewater on public health in the United Kingdom.[55] The study gained media attention, with comments from the UKs leading health professionals, including Sir Chris Whitty. Outlining 15 recommendations for various UK bodies to dramatically reduce public health risks by increasing the water quality in its waterways, such as rivers and lakes.

After the release of the report, The Guardian newspaper interviewed Whitty, who stated that improving water quality and sewage treatment should be a high level of importance and a "public health priority". He compared it to eradicating cholera in the 19th century in the country following improvements to the sewage treatment network.[56] The study also identified that low water flows in rivers saw high concentration levels of sewage, as well as times of flooding or heavy rainfall. While heavy rainfall had always been associated with sewage overflows into streams and rivers, the British media went as far to warn parents of the dangers of paddling in shallow rivers during warm weather.[57]

Whitty's comments came after the study revealed that the UK was experiencing a growth in the number of people that were using coastal and inland waters recreationally. This could be connected to a growing interest in activities such as open water swimming or other water sports.[58] Despite this growth in recreation, poor water quality meant some were becoming unwell during events.[59] Most notably, the 2024 Paris Olympics had to delay numerous swimming-focused events like the triathlon due to high levels of sewage in the River Seine.[60]

Reuse

[edit]
Further information: Reuse of excreta

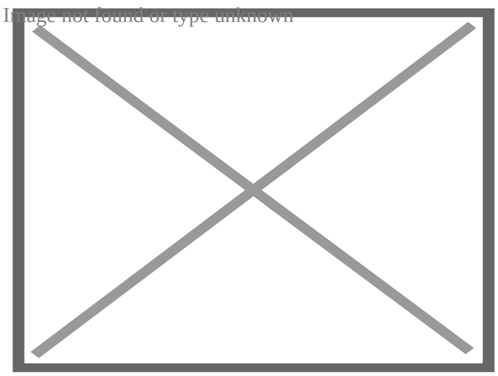


Sludge drying beds for sewage sludge treatment at a small treatment plant at the Center for Research and Training in Sanitation, Belo Horizonte, Brazil

Irrigation

[edit]
See also: Sewage farm

Increasingly, people use treated or even untreated sewage for irrigation to produce crops. Cities provide lucrative markets for fresh produce, so are attractive to farmers. Because agriculture has to compete for increasingly scarce water resources with industry and municipal users, there is often no alternative for farmers but to use water polluted with sewage directly to water their crops. There can be significant health hazards related to using water loaded with pathogens in this way. The World Health Organization developed guidelines for safe use of wastewater in 2006.[61] They advocate a 'multiple-barrier' approach to wastewater use, where farmers are encouraged to adopt various risk-reducing behaviors. These include ceasing irrigation a few days before harvesting to allow pathogens to die off in the sunlight, applying water carefully so it does not contaminate leaves likely to be eaten raw, cleaning vegetables with disinfectant or allowing fecal sludge used in farming to dry before being used as a human manure.[62]



Circular secondary sedimentation tank at activated sludge sewage treatment plant at Arrudas Treatment Plant, Belo Horizonte, Brazil

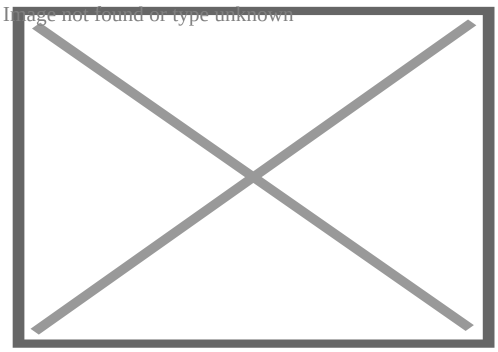
Reclaimed water

[edit]

This section is an excerpt from Reclaimed water.[edit]
Water reclamation is the process of converting municipal wastewater or sewage and industrial wastewater into water that can be reused for a variety of purposes. It is also called wastewater reuse, water reuse or water recycling. There are many types of reuse. It is possible to reuse water in this way in cities or for irrigation in agriculture. Other types of reuse are environmental reuse, industrial reuse, and reuse for drinking water, whether planned or not. Reuse may include irrigation of gardens and agricultural fields or replenishing surface water and groundwater. This latter is also known as groundwater recharge. Reused water also serve various needs in residences such as toilet flushing, businesses, and industry. It is possible to treat wastewater to reach drinking water standards. Injecting reclaimed water into the water supply distribution system is known as direct potable reuse. Drinking reclaimed water is not typical.[63] Reusing treated municipal wastewater for irrigation is a long-established practice. This is especially so in arid countries. Reusing wastewater as part of sustainable water management allows water to remain an alternative water source for human activities. This can reduce scarcity. It also eases pressures on groundwater and other natural water bodies.[64]

Global situation

[edit]



Share of domestic wastewater that is safely treated (in 2018)[65]

Before the 20th century in Europe, sewers usually discharged into a body of water such as a river, lake, or ocean. There was no treatment, so the breakdown of the human waste was left to the ecosystem. This could lead to satisfactory results if the assimilative capacity of the ecosystem is sufficient which is nowadays not often the case due to increasing population density.[4]:â€Š78â€Š

Today, the situation in urban areas of industrialized countries is usually that sewers route their contents to a sewage treatment plant rather than directly to a body of water. In many developing countries, however, the bulk of municipal and industrial wastewater is discharged to rivers and the ocean without any treatment or after preliminary treatment or primary treatment only. Doing so can lead to water pollution. Few reliable figures exist on the share of the wastewater collected in sewers that is being treated worldwide. A global estimate by UNDP and UN-Habitat in 2010 was that 90% of all wastewater generated is released into the environment untreated.[66] A more recent study in 2021 estimated that globally, about 52% of sewage is treated.[5] However, sewage treatment rates are highly unequal for different countries around the world. For example, while high-income countries treat approximately 74% of their sewage, developing countries treat an average of just 4.2%.[5] As of 2022, without sufficient treatment, more than 80% of all wastewater generated globally is released into the environment. High-income nations treat, on average, 70% of the wastewater they produce, according to UN Water.[34][67][68] Only 8% of wastewater produced in low-income nations receives any sort of treatment.[34][69][70]

The Joint Monitoring Programme (JMP) for Water Supply and Sanitation by WHO and UNICEF report in 2021 that 82% of people with sewer connections are connected to sewage treatment plants providing at least secondary treatment.[71]:â€Š55â€Š However, this value varies widely between regions. For example, in Europe, North America, Northern Africa and Western Asia, a total of 31 countries had universal (>99%) wastewater treatment. However, in Albania, Bermuda, North Macedonia and Serbia "less than 50% of sewered wastewater received secondary or better treatment" and in Algeria, Lebanon and Libya the value was less than 20% of sewered wastewater that was being treated. The report also found that "globally, 594 million people have sewer connections that don't receive sufficient treatment. Many more are connected to wastewater treatment plants that do not provide effective treatment or comply with effluent requirements.".[71]:â€Š55â€Š

Global targets

[edit]

Sustainable Development Goal 6 has a Target 6.3 which is formulated as follows: "By 2030, improve water quality by reducing pollution, eliminating,dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally."[65] The corresponding Indicator 6.3.1 is the "proportion of wastewater safely treated". It is anticipated that wastewater production would rise by 24% by 2030 and by 51% by 2050.[34][72][73]

Data in 2020 showed that there is still too much uncollected household wastewater: Only 66% of all household wastewater flows were collected at treatment facilities in 2020 (this is determined from data from 128 countries).[8]:â€Š17â€Š Based on data from 42 countries in 2015, the report stated that "32 per cent of all wastewater flows generated from point sources received at least some treatment".[8]:â€Š17â€Š For sewage that has indeed been collected at centralized sewage treatment plants, about 79% went on to be safely treated in 2020.[8]:â€Š18â€Š

History

[edit]
Further information: History of water supply and sanitation § Sewage treatment

The history of sewage treatment had the following developments: It began with land application (sewage farms) in the 1840s in England, followed by chemical treatment and sedimentation of sewage in tanks, then biological treatment in the late 19th century, which led to the development of the activated sludge process starting in 1912.[74][75]

This section is an excerpt from History of water supply and sanitation § Biological treatment.[edit]

It was not until the late 19th century that it became possible to treat the sewage by biologically decomposing the organic components through the use of microorganisms and removing the pollutants. Land treatment was also steadily becoming less feasible, as cities grew and the volume of sewage produced could no longer be absorbed by the farmland on the outskirts.

Edward Frankland conducted experiments at the sewage farm in Croydon, England during the 1870s and was able to demonstrate that filtration of sewage through porous gravel produced a nitrified effluent (the ammonia was converted into nitrate) and that the filter remained unclogged over long periods of time.[76] This established the then revolutionary possibility of biological treatment of sewage using a contact bed to oxidize the waste. This concept was taken up by the chief chemist for the London Metropolitan Board of Works, William Dibdin, in 1887:

> ...in all probability the true way of purifying sewage...will be first to separate the sludge, and then turn into neutral effluent... retain it for a sufficient period, during which time it should be fully aerated, and finally discharge it into the stream in a purified condition. This is indeed what is aimed at and imperfectly accomplished on a sewage farm.[77]

From 1885 to 1891, filters working on Dibdin's principle were constructed throughout the UK and the idea was also taken up in the US at the Lawrence Experiment Station in Massachusetts, where Frankland's work was confirmed.[78] In 1890, the LES developed a 'trickling filter' that gave a much more reliable performance.[79]

Regulations

[edit]

In most countries, sewage collection and treatment are subject to local and national regulations and standards.

By country

[edit]

Overview

[edit]

- v
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Wastewater treatment by country

- Benin
- China
- Costa Rica
- Egypt
- Ireland
- Jordan
- Morocco
- Pakistan
- Palestine
- Peru
- Portugal
- South Africa
- Uganda
- Yemen

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Water supply and sanitation by country

- Afghanistan
- Algeria
- Angola
- Argentina
- Australia
- Azerbaijan
- Bangladesh
- Belgium
- Belize
- Benin
- Bhutan
- Bolivia
- Bosnia and Herzegovina
- Brazil
- Burkina Faso
- Cambodia
- Canada
- Chile
- China
- Colombia
- Costa Rica
- Cuba
- Democratic Republic of the Congo
- Denmark
- Dominican Republic
- Ecuador
- Egypt
- El Salvador
- Ethiopia
- France
- Georgia
- Germany
- Ghana
- Greece
- Grenada
- Guatemala
- Guyana
- Haiti
- Honduras
- India
- Indonesia
- Iran
- Iraq
- Ireland
- Israel
- Italy
- Jamaica
- Japan
- Jordan

Europe

[edit]

In the European Union, 0.8% of total energy consumption goes to wastewater treatment facilities.[34][80] The European Union needs to make extra investments of €90 billion in the water and waste sector to meet its 2030 climate and energy goals.[34][81][82]

In October 2021, British Members of Parliament voted to continue allowing untreated sewage from combined sewer overflows to be released into waterways.[83][84]

This section is an excerpt from Urban Waste Water Treatment Directive § Description.[edit]

The Urban Waste Water Treatment Directive (full title "Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment") is a European Union directive regarding urban wastewater collection, wastewater treatment and its discharge, as well as the treatment and discharge of "waste water from certain industrial sectors". It was adopted on 21 May 1991.[85] It aims "to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors" by mandating waste water collection and treatment in urban agglomerations with a population equivalent of over 2000, and more advanced treatment in places with a population equivalent above 10,000 in sensitive areas.[86]

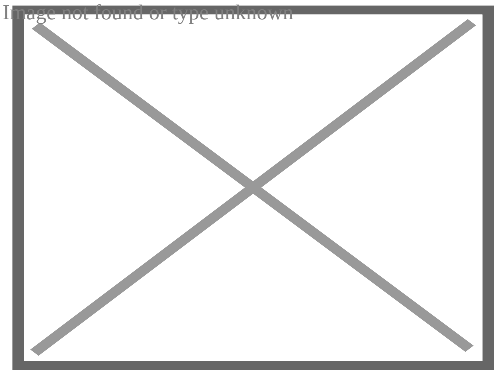
Asia

[edit]

India

[edit]

This section is an excerpt from Water supply and sanitation in India § Wastewater treatment.[edit]



Picture of a wastewater stream

In India, wastewater treatment regulations come under three central institutions, the ministries of forest, climate change housing, urban affairs and water.[87] The various water and sanitation policies such as the "National Environment Policy 2006" and "National Sanitation Policy 2008" also lay down wastewater treatment regulations. State governments and local municipalities hold responsibility for the disposal of sewage and construction and maintenance of "sewerage infrastructure". Their efforts are supported by schemes offered by the Government of India, such as the National River Conservation Plan, Jawaharlal Nehru National Urban Renewal Mission, National Lake Conservation Plan. Through the Ministry of Environment and Forest, India's government also has set up incentives that encourage industries to establish "common facilities" to undertake the treatment of wastewater.[88]

The 'Delhi Jal Board' (DJB) is currently operating on the construction of the largest sewage treatment plant in India. It will be operational by the end of 2022 with an estimated capacity of 564 MLD. It is supposed to solve the existing situation wherein untreated sewage water is being discharged directly into the river 'Yamuna'.

Japan

[edit]

This section is an excerpt from Water supply and sanitation in Japan § Wastewater treatment and sanitation.[edit]
Currently, Japan's methods of wastewater treatment include rural community sewers, wastewater facilities, and on-site treatment systems such as the Johkasou system to treat domestic wastewater.[89] Larger wastewater facilities and sewer systems are generally used to treat wastewater in more urban areas with a larger population. Rural sewage systems are used to treat wastewater at smaller domestic wastewater treatment plants for a smaller population. Johkasou systems are on-site wastewater treatment systems tanks. They are used to treat the wastewater of a single household or to treat the wastewater of a small number of buildings in a more decentralized manner than a

sewer system.[90]

Africa

[edit]

Libya

[edit]

This section is an excerpt from Environmental issues in Libya § Wastewater treatment.[edit]

In Libya, municipal wastewater treatment is managed by the general company for water and wastewater in Libya, which falls within the competence of the Housing and Utilities Government Ministry. There are approximately 200 sewage treatment plants across the nation, but few plants are functioning. In fact, the 36 larger plants are in the major cities; however, only nine of them are operational, and the rest of them are under repair.[91]

The largest operating wastewater treatment plants are situated in Sirte, Tripoli, and Misurata, with a design capacity of 21,000, 110,000, and 24,000 m3/day, respectively. Moreover, a majority of the remaining wastewater facilities are small and medium-sized plants with a design capacity of approximately 370 to 6700 m3/day. Therefore, 145,800 m3/day or 11 percent of the wastewater is actually treated, and the remaining others are released into the ocean and artificial lagoons although they are untreated. In fact, nonoperational wastewater treatment plants in Tripoli lead to a spill of over 1,275, 000 cubic meters of unprocessed water into the ocean every day.[91]

Americas

[edit]

United States

[edit]

This section is an excerpt from Water supply and sanitation in the United States § Wastewater treatment.[edit]
The United States Environmental Protection Agency (EPA) and state environmental agencies set wastewater standards under the Clean Water Act.[92] Point sources must obtain surface water discharge permits through the National Pollutant Discharge Elimination System (NPDES). Point sources include industrial facilities, municipal governments (sewage treatment plants and storm sewer systems), other government facilities such as military bases, and some agricultural facilities, such as animal feedlots.[93] EPA sets basic national wastewater standards: The "Secondary Treatment

Regulation" applies to municipal sewage treatment plants,[94] and the "Effluent guidelines" which are regulations for categories of industrial facilities.[95]

See also

[edit]

- icon Image not found or type unknown Environment portal
- Decentralized wastewater system
- List of largest wastewater treatment plants
- List of water supply and sanitation by country
- Organisms involved in water purification
- Sanitary engineering
- Waste disposal

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External links

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- Water Environment Federation – Professional association focusing on municipal wastewater treatment

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Wastewater

Sources and types	○ Acid mine drainage ○ Ballast water ○ Bathroom ○ Blackwater (coal) ○ Blackwater (waste) ○ Boiler blowdown ○ Brine ○ Combined sewer ○ Cooling tower ○ Cooling water ○ Fecal sludge ○ Greywater ○ Infiltration/Inflow ○ Industrial wastewater ○ Ion exchange ○ Leachate ○ Manure ○ Papermaking ○ Produced water ○ Return flow ○ Reverse osmosis ○ Sanitary sewer ○ Septage ○ Sewage ○ Sewage sludge ○ Toilet ○ Urban runoff
Quality indicators	○ Adsorbable organic halides ○ Biochemical oxygen demand ○ Chemical oxygen demand ○ Coliform index ○ Oxygen saturation ○ Heavy metals ○ pH ○ Salinity ○ Temperature ○ Total dissolved solids ○ Total suspended solids ○ Turbidity ○ Wastewater surveillance

Treatment options

- Activated sludge
- Aerated lagoon
- Agricultural wastewater treatment
- API oil–water separator
- Carbon filtering
- Chlorination
- Clarifier
- Constructed wetland
- Decentralized wastewater system
- Extended aeration
- Facultative lagoon
- Fecal sludge management
- Filtration
- Imhoff tank
- Industrial wastewater treatment
- Ion exchange
- Membrane bioreactor
- Reverse osmosis
- Rotating biological contactor
- Secondary treatment
- Sedimentation
- Septic tank
- Settling basin
- Sewage sludge treatment
- Sewage treatment
- Sewer mining
- Stabilization pond
- Trickling filter
- Ultraviolet germicidal irradiation
- UASB
- Vermifilter
- Wastewater treatment plant

Disposal options

- Combined sewer
- Evaporation pond
- Groundwater recharge
- Infiltration basin
- Injection well
- Irrigation
- Marine dumping
- Marine outfall
- Reclaimed water
- Sanitary sewer
- Septic drain field
- Sewage farm
- Storm drain
- Surface runoff
- Vacuum sewer

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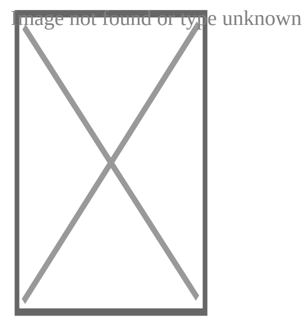
Environmental technology

General

- Appropriate technology
- Clean technology
- Climate smart agriculture
- Environmental design
- Environmental impact assessment
- Eco-innovation
- Ecotechnology
- Electric vehicle
- Energy recycling
- Environmental design
- Environmental impact assessment
- Environmental impact design
- Green building
- Green vehicle
- Environmentally healthy community design
- Public interest design
- Sustainability
- Sustainability science
- Sustainable (agriculture
- architecture
- design
- development
- food systems
- industries
- procurement
- refurbishment
- technology
- transport)



Pollution

- Air pollution (control
- dispersion modeling)
- Industrial ecology
- Solid waste treatment
- Waste management
- Water (agricultural wastewater treatment
- industrial wastewater treatment
- sewage treatment
- waste-water treatment technologies
- water purification)

Sustainable energy

- Efficient energy use
- Electrification
- Energy development
- Energy recovery
- Fuel (alternative fuel
- biofuel
- carbon-neutral fuel
- hydrogen technologies)
- List of energy storage projects
- Renewable energy
    - commercialization
    - transition
- Sustainable lighting
- Transportation (electric vehicle
- hybrid vehicle)
- Building (green
- insulation
- natural
- sustainable architecture
- New Urbanism
- New Classical)

Conservation

- Conservation biology
- Ecoforestry
- Efficient energy use
- Energy conservation
- Energy recovery
- Energy recycling
- Environmental movement
- Environmental remediation
- Glass in green buildings
- Green computing
- Heat recovery ventilation
- High-performance buildings
- Land rehabilitation
- Nature conservation
- Permaculture
- Recycling
- Water heat recycling

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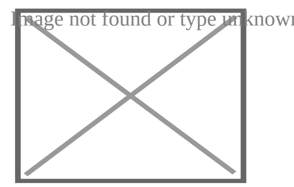
Biosolids, waste, and waste management

Major types

- Agricultural wastewater
- Biodegradable waste
- Biomedical waste
- Brown waste
- Chemical waste
- Construction waste
- Demolition waste
- Electronic waste
    - by country
- Food waste
- Green waste
- Hazardous waste
- Heat waste
- Industrial waste
- Industrial wastewater
- Litter
- Marine debris
- Mining waste
- Municipal solid waste
- Open defecation
- Packaging waste
- Post-consumer waste
- Radioactive waste
- Scrap metal
- Sewage
- Sharps waste
- Surface runoff
- Toxic waste



Processes	◦ Anaerobic digestion
	◦ Balefill
	◦ Biodegradation
	◦ Composting
	◦ Durable good
	◦ Ecological design
	◦ Garden waste dumping
	◦ Illegal dumping
	◦ Incineration
	◦ Landfill
	◦ Landfill mining
	◦ Mechanical biological treatment
	◦ Mechanical sorting
	◦ Photodegradation
	◦ Reclaimed lumber
	◦ Recycling
	    ◦ appliance recycling
	    ◦ battery recycling
	    ◦ bottle recycling
	    ◦ fluorescent lamp recycling
	    ◦ land recycling
	    ◦ plastic recycling
	    ◦ textile recycling
	    ◦ timber recycling
	    ◦ tire recycling
	    ◦ water heat recycling
	    ◦ water recycling shower
	◦ Repurposing
	◦ Resource recovery
	◦ Reusable packaging
	◦ Right to repair
	◦ Sewage treatment
	◦ Urban mining
	◦ Waste collection
	◦ Waste sorting
	◦ Waste trade
	◦ Waste treatment
	◦ Waste-to-energy

Countries	○ Afghanistan ○ Albania ○ Armenia ○ Australia ○ Belgium ○ Bangladesh ○ Brazil ○ Bosnia and Herzegovina ○ Egypt ○ Georgia ○ Hong Kong ○ India ○ Israel ○ Japan ○ Kazakhstan ○ New Zealand ○ Russia ○ South Korea ○ Sri Lanka ○ Switzerland ○ Syria ○ Tanzania ○ Taiwan ○ Thailand ○ Turkey ○ United Kingdom ○ United States

Agreements	○ Bamako Convention
	○ Basel Convention
	○ EU directives
	    ○ batteries
	        ○ Recycling
	    ○ framework
	    ○ incineration
	    ○ landfills
	    ○ RoHS
	    ○ vehicles
	    ○ waste water
	    ○ WEEE
	○ London Convention
	○ Oslo Convention
	○ OSPAR Convention

Occupations

- Sanitation worker
- Street sweeper
- Waste collector
- Waste picker

Other topics

- Blue Ribbon Commission on America's Nuclear Future
- China's waste import ban
- Cleaner production
- Downcycling
- Eco-industrial park
- Extended producer responsibility
- High-level radioactive waste management
- History of waste management
- Landfill fire
- Sewage regulation and administration
- Supervised injection site
- Toxic colonialism
- Upcycling
- Waste hierarchy
- Waste legislation
- Waste minimisation
- Zero waste

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National

- Germany
- United States
- Japan
- Latvia
- Israel

Other

- Yale LUX

About Environmentally friendly

Atmosphere friendly processes, or environmental-friendly procedures (also referred to as eco-friendly, nature-friendly, and environment-friendly), are sustainability and advertising terms referring to items and services, regulations, standards and policies that claim minimized, marginal, or no damage upon communities or the environment. Firms make use of these ambiguous terms to promote items and services, occasionally with added, much more specific certifications, such as ecolabels. Their overuse can be described as greenwashing. To ensure the successful conference of Lasting Development Objectives (SDGs) firms are recommended to employ environmental pleasant processes in their production. Especially, Sustainable Development Objective 12 procedures 11 targets and 13 indicators "to guarantee sustainable intake and production patterns". The International Organization for Standardization has actually developed ISO 14020 and ISO 14024 to develop concepts and procedures for environmental tags and declarations that certifiers and eco-labellers should comply with. In particular, these standards connect to the avoidance of financial problems of interest, making use of sound scientific approaches and accepted test treatments, and visibility and transparency in the setting of criteria.
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About Toilet

A toilet is a piece of hygienic hardware that gathers human waste (urine and feces) and often toilet tissue, usually for disposal. Flush bathrooms make use of water, while dry or non-flush toilets do not. They can be made for a resting placement preferred in Europe and North America with a commode seat, with extra factors to consider for those with specials needs, or for a crouching posture more prominent in Asia, known as a squat commode. In metropolitan locations, flush bathrooms are normally linked to a sewer system; in isolated locations, to a septic system. The waste is referred to as blackwater and the combined effluent, including other resources, is sewer. Dry commodes are connected to a pit, detachable container, composting chamber, or various other storage space and therapy gadget, consisting of pee diversion with a urine-diverting commode. "Toilet" or "toilets" is additionally extensively utilized for areas having just one or even more commodes and hand-basins. Lavatory is an older word for bathroom. The innovation utilized for modern-day commodes varies. Commodes are typically made from ceramic (porcelain), concrete, plastic, or timber. Newer commode technologies include dual flushing, low flushing, bathroom seat warming, self-cleaning, women rest rooms and waterless rest rooms. Japan is understood for its toilet technology. Plane bathrooms are specifically created to operate in the air. The demand to preserve anal health post-defecation is widely acknowledged and bathroom tissue (typically held by a commode roll holder), which might likewise be made use of to clean the vulva after peeing, is extensively used (in addition to bidets). In private homes, depending on the area and style, the toilet might exist in the exact same bathroom as the sink, bathtub,

and shower. One more alternative is to have one room for body cleaning (likewise called "restroom") and a different one for the toilet and handwashing sink (commode space). Public toilets (restrooms) include several toilets (and generally single rest rooms or trough rest rooms) which are available for use by the public. Products like urinal blocks and commode blocks assistance keep the smell and tidiness of toilets. Bathroom seat covers are occasionally utilized. Mobile toilets (regularly chemical "porta johns") might be generated for large and short-term celebrations. Historically, cleanliness has actually been a problem from the earliest stages of human settlements. Nevertheless, numerous poor families in creating nations use extremely standard, and often unhygienic, commodes –-- and virtually one billion people have no accessibility to a toilet whatsoever; they need to honestly defecate and pee. These problems can bring about the spread of diseases transferred via the fecal-oral course, or the transmission of waterborne illness such as cholera and dysentery. For that reason, the United Nations Sustainable Growth Objective 6 wants to "achieve access to sufficient and equitable sanitation and health for all and end open defecation".
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Check our other pages :

- **Quality Control Checks after Portable Toilet Cleaning**
- **Deposit and Invoice Terms in Portable Restroom Agreements**
- **Sample Pricing Scenarios for Event Portable Toilets**

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