Environmental Technology

Separation technology solutions from GEA Westfalia Separator for the treatment of water and waste water in municipal and industrial applications
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Increase Performance and Reduce Costs – Using Mechanical Separation Technology

GEA Westfalia Separator is the world's leading company for mechanical separation technology. The comprehensive expertise in the Business Line Environmental Technology enables us to offer our customers process solutions which set a worldwide standard in terms of economy, efficiency and sustainable environmental protection in drinking water recovery as well as in the treatment of water and waste water.

Whether recovering drinking water or treating municipal or industrial waste water – plant operators always focus on how these jobs can be managed efficiently and with minimum impact on the environment for the least possible cost.

The Business Line Environmental Technology at GEA Westfalia Separator Group responds to these challenges with high-performance separators and decanters, convincing machines in both economic and ecological terms.

Resource-saving treatment systems demand made-to-measure solutions

With the experience gleaned from over 3500 systems installed and the proven power of this technology leader to innovate in mechanical separation technology, we plan and manufacture customized solutions for our customers in the sectors below.

Drinking water recovery/waste water treatment
• Dewatering of sewage sludge
• Thickening of sewage sludge
• Treatment of municipal and industrial waste water
• Treatment of process water
• Recovery of valuable materials from production streams and sewage sludge
• Treatment of drinking water

Focus – cost efficiency

Treatment systems from GEA Westfalia Separator Group are designed to achieve maximum separation performances for minimum footprint and energy requirement. Performance capability is optimized by serv&care. Customized service agreements secure a high level of availability of plants and improve process reliability, so binding budgets can be drawn up and unplanned shutdowns avoided. This supports our customers' efforts to achieve absolute cost control.

Depending on requirements, the treatment systems are available in the form of either stationary or mobile units.
Decanters and separators

They Go Through Thick and Thin for You

High-performance decanters from GEA Westfalia Separator reliably handle the continuous solid-liquid separation in a wide range of applications and ensure optimal processes and process results. Separators from GEA Westfalia Separator are the first choice when it comes to treating liquids or liquid mixtures with a low solid content.

If the solids content in the suspension to be processed is particularly high, then decanter centrifuges from GEA Westfalia Separator Group are used. They work with a horizontal scroll and ensure a high clarification performance and maximum dewatering, but also for the separation of liquids with simultaneous removal of solids. The main requirements in this respect include a high bowl speed, a powerful drive for the scroll and a scroll speed which automatically adapts to the solids loading in the feed.

Designed and constructed for high clarification efficiency and maximum solid concentration, the different decanter models are not only products of our own experience but also incorporate the constantly changing results from the field. The result: high-performance decanters that not just meet all the demands made on them, but also surpass them in many respects, achieving maximum benefit for the user.

Clarifying decanter with GEA Westfalia Separator varipond®

Clarifying decanters from GEA Westfalia Separator Group are used for the clarification of liquids. A special feature of these decanters is the patented control and regulation system varipond®. This innovative system makes it possible to set the concentration of the concentrated solids to a constant value automatically and to maintain it exactly.

All decanter versions from GEA Westfalia Separator Group are robust centrifuges and consequently the long-term, quality response to many issues in the treatment of industrial waste waters. A self-cleaning separator can be installed downstream for polishing the liquid phases.

Separators from GEA Westfalia Separator Group likewise feature maximum quality, efficiency and quality. They can be recommended for all processes in which liquid mixtures with a low solid content have to be processed.

Decanters, also called solid-wall scroll centrifuges, operate with a horizontal axis of rotation and are used in waste water treatment for thickening sewage sludge and dewatering. They function on the principle of tube centrifuges but are equipped with a scroll rotating at a slightly different speed than the bowl, enabling them to continuously discharge the separated solids out of the centrifuge bowl. This makes possible a high separation efficiency in a small space.
The following characteristics apply to all GEA Westfalia Separator Group decanters and separators:

- Maximum productivity
- High-quality materials
- Small footprint
- High degree of operating reliability, availability and low wear
- Less manpower required
- Simple to operate
- Low operating costs
- Wide variety of potential applications
- Ease of maintenance

2-phase decanter specifically for the requirements of dewatering of industrial and municipal waste water sludges
Dewatering of sewage sludge

Optimum Dewatering Cuts Costs for Sludge Disposal

Water pollution control policy is posing growing challenges that have to be met by secondary waste water purification. In future, a further increase in the sewage sludge volume worldwide must therefore be expected.

The municipalities and industry are obligated to dispose of the growing volumes of sewage sludge inexpensively and in an environmentally sound way. The sewage sludge in future has to be disposed of state-of-the-art in compliance with the legislation governing the obligation to recycle. Optimum, economical dewatering of the sewage sludges is a central step for all utilization options.

Concentration on the essentials
The method of disposal and the associated demands on the degree of dewatering determine the economy of the dewatering system. Every increase in solids concentration makes sense with respect to the incineration and saving of landfill and transportation costs.

Less is more
Optimum dewatering of the sewage sludge is necessary before drying, incineration or landfilling to enable it to be utilized or disposed of in conformity with the requirements. The decanters from GEA Westfalia Separator Group meet these demands not least because of their high g force (separation efficiency) and optimum torque regulation.

A high degree of dewatering guarantees a significantly lower sludge volume and therefore significant cost savings for:
- Transport
- Landfill
- Energy consumption during drying or incineration
Sludge dewatering

1. Process waste water
2. Decanter
3. Buffer tank with agitator
4. Polymer
5. Sludge
6. Screw conveyor
7. Product pump
8. Drain for centrate
9. Container
10. Polymer metering pump
11. Polymer station
Rapid adaptation to environmental conditions made possible by varipond®
Thickening of sewage sludge

It Adds Up: 90 Percent Less Surplus Activated Sludge

Decanters from GEA Westfalia Separator achieve efficient thickening of sewage sludge, the central element being the patented varipond® system.

Legal regulations relating to the elimination of phosphorus and nitrogen and changes to the process technology of waste water purification have made mechanical thickening of sewage sludge unavoidable. In normal situations, efficient thickening using GEA Westfalia Separator Group decanters can reduce the volume of sewage sludge by up to 90 percent. An important contribution to this statistic is made by varipond®. Even where concentrations in the feed fluctuate, it ensures consistent dry substance values in the discharge.

GEA Westfalia Separator varipond® will not leave you out in the rain

Waste water treatment plant operators are familiar with situations like this: a sudden cloudburst and the drainage system can hardly contain the huge quantities of water. Pumps and dewatering systems have to operate under high pressure to get the torrent under control – a torrent which contains large quantities of solids such as entrained sand and other residues. This is where a fast-reacting system like varipond® is called for.

The name stands for “variable pond depth” when the machine is running. Until now, when feed conditions fluctuated decanters had to be turned off and modified in order to achieve a consistent concentration. Nowadays, varipond® makes it simple and reliable to adjust the ideal setting during operation. The centrifuge adapts completely automatically to changed feed conditions.

The dry substance (DS) content of the sludge is measured online. This achieves accuracies of ±0.3 percent DS under operating conditions, allowing supervision-free operation even at night and at weekends. The constant concentration allows the optimum design of the digestion tower of the waste water treatment plant and enables it to be operated more economically. The sludge is digested better. The increased quality enables a higher gas yield to be obtained.

All the benefits at a glance:
• 30 percent less sludge
• Fully-automatic feed control
• Reduced transport and disposal costs
Mobile units and skid units

This Much Is Clear: This Technology Keeps You Mobile

The mechanical separation technology of GEA Westfalia Separator is designed for flexible process integration. If required, the systems are also available as mobile units for purchase or lease and can quickly be transported from one point of use to another.

As far as the integration of treatment systems in plants and processes is concerned, the Business Line Environmental Technology offers you a wide variety of solutions for every purpose. In addition, both stationary and mobile systems are available, so that whether you are a municipal facility or an industrial company, you have the maximum flexibility with regard to different application locations.

The mobile units are particularly advantageous wherever rapid help or flexible deployment is required—from municipal waste water plants to the management of peak load to an enormous variety of industrial fields to rapid support in the event of bottlenecks. These systems and all the necessary units and connections can be transported from place to place quickly and easily in truck trailers, towed trailers or in specially-equipped containers.

Modular solutions for individual requirements

Modular compact units/skid units are available for treating waste water—these are flexible and individually adaptable. The “plug-and-play” design of the mobile unit means it can be connected up immediately once it is in situ and, in addition to a decanter or separator, it already includes all the necessary components such as polymer station, switch cabinet, feed pump, solids conveyor and water supply, including flushing device. All the components are installed on a stainless steel frame which can be brought to any location and used there without great effort.
Decanter skid unit for mobile treatment of sludge

Mobile container unit from GEA Westfalia Separator Group
Municipal waste water

Sewage Sludge Problems Can only Be Solved with Maximum Concentration

All over the world, municipalities are having to deal with an ever-increasing volume of sewage sludge. Economical and environmentally-friendly disposal depends on the degree of solids concentration.

International policy on protection of seas and lakes has committed in particular to cleaning waste water to a greater degree. A necessary consequence of this strategy is a worldwide rise in the volume of sewage sludge. As a result, municipalities face the task of disposing of these rapidly growing quantities in an environmentally friendly and yet cheap way. The solution is to dewater the sewage sludge as far as possible, because the higher the concentration of solids in the sewage sludge, the more economical subsequent processes will be. With regard to incineration and the saving of transport and landfill costs in particular, any increase in solids concentration is something which makes as much sense economically as ecologically.

The superior technology for sewage plants
The Business Line Environmental Technology supports waste water treatment plants with high-performance decanters for thickening and dewatering sewage sludge. These scroll centrifuges can also be equipped with peripherals, pumps, conveying devices, polymer stations and control units. A comparative test has shown that the technology from GEA Westfalia Separator Group is leading edge in terms of dry substance, separation efficiency and low polymer consumption.

All the benefits at a glance:
• High throughputs with maximum separation efficiency
• Permanently low disposal costs
• Minimal polymer requirement
Processing of drinking water

Taken for Granted and yet Extremely Valuable: Clean Drinking Water.

Simply turn on the tap and water starts to flow – this is what people in industrialized countries expect. However, every sixth inhabitant on this planet today does not have access to clean drinking water.

This figure will be one in four in a few decades. Some researchers are forecasting that wars will be fought over drinking water. Average per capita water consumption is currently estimated at 660 m³ per year. Of this figure, only between one and three percent are actually used for drinking. The effective processing of surface and ground water will become more and more important in future as population growth continues and as the environment becomes increasingly contaminated. In the EU countries, drinking water today is obtained from surface water (64 percent) and ground water (36 percent).

Treatment of surface water

1. Chemical treatment
2. Untreated water
3. Sedimentation
4. Chlorine added to filtered water
5. Filtration
6. Decanter
7. Dewatering
8. Dewatered sludge
Recovering drinking water from surface water
Various chemical processes are used for cleaning the surface water, and decanters are subsequently used to dewater the sludge obtained.

The main impurities, caused by nature and also by humans, are as follows:
• Humus and composted vegetable constituents
• Minerals
• Organic impurities
• Chemical substances
• Bacteria and viruses

The quantity of mineral impurities in the raw water and the type of chemicals used for chemical precipitation are very important for dewatering the residual sludge.

High bowl speed and scroll torque
Clarifying decanters, designed by GEA Westfalia Separator Group specifically for high clarifying performance and maximum solids dewatering, are used for dewatering sludge in drinking water processing installations. This performance is achieved by the high bowl speed and a high scroll torque combined with a facility for regulating the differential speed that operates as a function of the solids load. Together with a closed installation, the closed design prevents aerosols from escaping and thus protects people and the environment.
Water treatment for the brewing industry

**Barley, Hops, Yeast, Water – Enjoyment for Man and Nature**

Innovative technology that’s ecological and economic – process-integrated environmental protection provided by decanters and separators in the international brewing industry.

Beer. The fact that beer consists only of barley, hops, yeast and pure water should not disguise the fact that beer brewing is one of the most complicated biochemical processes. A good brewer is essential for making a beer full of character. To take full advantage of his art, and also to continue to consider environmental protection, GEA Westfalia Separator Group provides the brewer with powerful centrifugal separating technology systems.

For many reasons, centrifugal separation technology has become established in breweries as a forward-looking solution for waste water processing. The technology has many advantages: decanters and separators operate continuously, are extremely efficient for clarification and separation, and require minimum energy and personnel. Processing installations for the entire waste water system can operate in extremely restricted spaces and require the minimum of upfront costs.

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**Waste water processing in breweries**
Waste water is not always waste water
Brewery waste waters mainly consist of two streams: residual substances and cleaning agents. Residual substances, such as yeast, fermentable sugar or kieselguhr can be recycled as valuable substances into the production process once solid and liquid components have been separated. This reduces costs and boosts the yield.

Cleaning the cleaning agents
Cleaning agents in waste water come from the cleaning of fermentation and storage tanks as well as vat and bottle rinsing. Separators and decanters have proved to be extremely efficient for removing these residues and cleaning agents thereby making a specific contribution to environmental protection and to reducing disposal costs.

Meaningful right until the end
It also makes sense to use a decanter after the anaerobic or aerobic treatment of the production waste water in the works waste water treatment plant. Compared with sedimentation under gravity, the decanter exerts a force on the solid particles that is four thousand times higher, resulting in much faster separation. The sludge removed by the scroll is dewatered and compacted; the smaller volume of solids makes disposal easier and less expensive.
Waste water treatment in dairies

Production waste water

- Strainer
- Pre-treatment
- Flotation
- Anaerobic reactor
- Activation/SBR
- Sedimentation

- Clarified liquid
- Flotation sludge
- Surplus activated sludge

- Water/concentrate

- Decanter
- Dewatered sludge
- Solids disposal

Waste water treatment in dairies
Water treatment for dairy operations

**Environmental Protection in Dairies Is not a Simple Matter**

Lowering waste water costs by reducing the volume of waste water and waste water freight – a major factor for determining the competitiveness of dairies.

The average volume of waste water in dairies is currently 1.3 l/kg milk. This results in considerable waste water disposal costs. The centrifugal separating technology from GEA Westfalia Separator Group paves the way for major potential savings by minimizing the use of fresh water and reducing the volume of residual sludge.

Hygiene is the most important factor in milk processing and the production of dairy products. This necessarily results in the use of considerable volumes of water for cleaning purposes. In addition, considerable quantities of waste water with volatile milk constituents, fats and proteins occur when milk is being processed, particularly during evaporation and spray drying. Two main streams of waste water are produced: process waste water which comes into contact with milk, and process waste water which does not directly come into contact with product. Decanters and separators from GEA Westfalia Separator Group are ideal for providing savings, enhanced efficiency and easy operation. **Milk is not the only consideration ...**

... it is also necessary to consider the way in which the downstream products are treated. The recycling of valuable substances into the production process and the reduction of waste substances that can no longer be recycled enhance productivity, lower operating costs and protect the environment. According to calculations by the Verband der deutschen Milchwirtschaft (Association of German Dairying), direct dischargers, i.e. companies with their own waste water processing facility, operate with costs that are up to two-thirds lower than users of municipal waste water treatment plants. After anaerobic or aerobic biological treatment of dairy waste waters, the decanter technology of GEA Westfalia Separator Group provides a tried-and-tested method for thickening residual sludge. Thickening and dewatering reduces disposal costs, enhances competitiveness and protects the environment.
Water treatment for fruit juice production

Start-Up Capital of Mother Nature

Centrifugal separation technology maintains the “intrinsic value” in the production of fruit juices.

The valuable constituents in fruit, namely vitamins, are intrinsic. This would appear to be obvious, although upon closer observation it is not quite so evident as the interior of the fruit starts in the peel, e.g. in the case of lemons or oranges, where the peel is processed into valuable by-products. When fruit is processed into fruit juice there are stringent quality and hygiene requirements as well as market-oriented considerations: higher levels of concentration reduce transportation costs.

Large volumes of fresh water are required for cleaning the fruit, pipework, storage tanks and bottles. Mechanical separation technology from GEA Westfalia Separator Group provides a range of benefits for processing waste water in fruit juice production and achieves excellent results as a result of its closed design and high dewatering capacity.

Decanters and separators keep the vitamins
Numerous substances are retained in the wash water during the cleaning of pipework and storage tanks. Many valuable organic substances (fruit residues with a high sugar content) have to be separated because fermentation would otherwise start very easily. Residues of chemical substances (insecticides) from cultivation and residues from the production process also have to be removed completely. This means that the wash water has to be processed thoroughly because it cannot be discharged into the sewerage system or into the environment in this state. Mechanical separation of the solids is an ideal and cost-effective method for treating wash water.

After straining and biological pre-clarification in activation tanks, decanters thicken the residual sludge and the volume of the sludge is reduced; the discharged solids are of a crumbly consistency and can be disposed of inexpensively. The process water can be recycled into the cleaning cycle or discharged into the sewerage system in an environmentally friendly manner. The volume of fresh water consumed is reduced, resources are used efficiently and energy costs are lowered. In this way, decanters and separators from GEA Westfalia Separator Group make a major and inexpensive contribution towards ensuring that everything is in its rightful place: the vitamins in the juice, and clean water in the cycle of nature.
Waste water treatment in fruit juice production

Production waste water

- Strainer
- Neutralization/pre-treatment
- Anaerobic treatment
- Sedimentation
- Activation
- Sedimentation

Clarified liquid

Sludge

Water/concentrate

Decanter

Dewatered sludge

Solids disposal
Waste water treatment in wine production

Production waste water

- Strainer
- Pre-treatment
- Sedimentation
- Activation
- Sedimentation
- Clarified liquid

Water/concentrate

- Decanter
  - Dewatered sludge
  - Solids disposal

Sludge

Water / concentrate

Solids disposal
The Truth in Wine Eventually Emerges Clearly

Decanters and separators are used both in wine production and in waste water treatment in wineries.

‘Wine is the poetry of the earth’, said Mario Soldati. The vintner who makes a good wine is therefore a poet, and the wine cellar is his study. However, the considerable amount of labour and effort involved in the process, from cultivating the grape in the vineyard and the processes of harvesting and pressing the grapes as well as allowing the wine to mature, are frequently forgotten. It is well known that decanters and separators have an important and useful role to play in the production and filtration of wine. However, the fact that they are also useful in waste water treatment in wineries is not always appreciated.

Large volumes of fresh water have to be used in the numerous stages of the wine-making process for the necessary cleaning of transport vehicles, storage tanks, wine casks, filter installations and bottles. The cellars themselves also have to be cleaned. This results in waste water with a high organic load consisting of vine leaves, stems, vermin, dirt and yeast. This mixture very quickly starts to ferment, which means that clarification is necessary. The use of centrifugal separation technology is very beneficial not only to maintain hygiene but also to reduce costs.

Decanters and separators reduce the strain on vintners and the environment

Mechanical separation of solids is an optimum and cost-effective method of cleaning wash water. After straining and biological pre-clarification in activation tanks, the thickened residual sludge is dewatered by decanters, and the volume of the sludge is reduced; the discharged solids are of a free flowing consistency and can be disposed of inexpensively. The process water can be recycled into the cleaning cycle or discharged into the sewerage system in an environmentally friendly manner: the volume of fresh water consumed is reduced, resources are used efficiently and energy costs are lowered. In this way, decanters and separators from GEA Westfalia Separator Group make a major and inexpensive contribution towards ensuring that the truth is retained in the wine and that which clearly emerges remains in the environment: clean water.
Water treatment in the production of vegetable products

Dirt is Avoided

Decanters minimize the consumption of fresh water in the production of vegetable products.

Extremely strict hygiene regulations are applied during the processing of vegetables into convenience products, either deep-frozen vegetables, preserves or ready-made meals. Large quantities of organic substances (vegetable waste) are also obtained when the vegetables are cleaned; this waste can rapidly start to rot. This makes it doubly necessary to devote a great deal of care to processing the wash water. Decanters and separators from GEA Westfalia Separator Group are ideal for these applications as a result of their closed design and their high dewatering capacity.

At the beginning there is an extensive full bath for the vegetables that have just been harvested and which are still contaminated with various foreign substances, such as humus, insects, worms and other components. The packaged products should contain only what is on the label. The high content of organic substances in the wash water means that extensive processing is essential because it cannot be discharged into the sewerage system or the environment in this condition. Mechanical separation of the solids is a simple and cost-effective method of cleaning the wash water. This reduces the costs of fresh water as well as storing and disposing of the residues.

Rake, strainer, settling tank and decanter

A rake is the first cleaning stage in which coarse solids such as vegetable leaves are separated and transported for further use, e.g. as animal feed. The wash water is pre-cleaned in this way and dirt and sand are removed in a sand trap; the water is further purified in a bowl strainer machine and discharged into a settling tank. The wash water that has been treated in this way is now pumped into the decanter. Any fine substances still contained in the wash water are now continuously separated and discharged with a high dry substance content. The separated solids can be processed into animal feed, and the water that has been clarified by the decanter is discharged into a retainer tank and then to the waste water treatment plant.
Wash water cleaning in vegetable processing

1. Wash water
2. Coarse solids
3. Sand
4. Sand trap
5. Bowl strainer machine
6. Rakes
7. Solids
8. Decanter
9. Clarified water
10. To waste water treatment
11. Container
Installation example of wet fermentation

1. Quenching water
2. Biofilter
3. Break down and dissolve
4. Exhaust air
5. Heat recovery
6. Paddle mixer
7. Conveyer belt for biowaste
8. Delivery of biowaste
9. Bunker
10. Light substances
11. Sand
12. Combined heating/power generating plant
13. Heating
14. Biogas
15. Sand trap
16. Gas flame (option)
17. Raw suspension
18. Gas tank
20. Partial recycling
21. Fermentation suspension
22. Quality compost
23. Dewatering/decanter
24. Centrate
25. To waste water treatment
“Nature is a company which has not gone bankrupt for four billion years”, said Frederik Véster during the 1970s, demanding that society ought to take nature as its example. Modern environmental protection is based on a process of product recycling instead of mere product disposal. Waste is unknown in nature – nature cannot afford waste in the long term.

**Anaerobic fermentation**

For the enthusiastic amateur gardener, the method of composting organic waste for recycling natural fertilizer into the nutrient cycle may be sufficient; however, a different method is necessary in the waste and disposal industry. The innovative method of anaerobic biowaste fermentation was established in the mid-1990s. This technology has demonstrated its worth as a method of recycling to save energy, protect the environment and conserve resources.

**Wet fermentation**

The size of the items of biowaste is reduced to a maximum of 60 mm by removing all foreign substances such as plastics, metal and textiles. Water is then added and the mixture is treated at 70°C for an hour. After sand has been removed and the fibres broken down further, this mixture of biowaste and water has a grain size of less than 10 mm and can be fermented under anaerobic conditions in a digesting tower. A significant side effect of the fermentation process is the production of biogas, which can be used to generate electricity after it has been dried and cleaned, and more than covers the fermentation system’s own energy requirement. With up to 540 kilowatt hours per 100 cubic metres of biowaste, this is an environmentally sound and forward-looking method of energy recovery, which will play a major role in future energy policy helping to save limited resources of fossil fuels and control the greenhouse effect.

**Decanters recover valuable compost**

Decanters from GEA Westfalia Separator Group are used to dewater the fermented biomass from the fermenter by separating solid particles and dewatering them to a free flowing dry consistency. The solids, which are discharged by the decanter under forces equivalent to 3000 to 4000 times gravity, are a valuable fertilizer rich in organic components. This fertilizer is suitable for use in gardening, agriculture and forestry. Strict quality controls guarantee that there are no hygiene-related problems. The centrate is recycled into the fermentation process or is sent for further processing. The process allows centrifugal separating technology from GEA Westfalia Separator Group to turn waste into valuable energy media and fertilizer.

**The advantages at a glance**

- High separating capacity and good centrate quality
- High DS value in the solids which can be composted
- Preliminary stage for further processing method
- Centrate recirculated to mashing
- Reduction of logistics and disposal costs
- Closed substance streams due to fertilizer production, recirculation and where appropriate direct discharge

Water treatment in biofermentation

**Waste is Unknown in Nature**

Decanters assist the recovery of energy from biogas and valuable fertilizer.
The laws of physics say: energy is never lost, it is merely converted. In nature, this fact is the basis of life and has developed over millions of years. The ancient Egyptians revered the scarab as a holy animal because it uses what is discarded by other animals to derive energy, thus closing the eternal cycle. Liquid manure from animal husbandry is a valuable natural fertiliser used in modern agriculture – if it is properly introduced into the nutrient cycle of nature.

Inexpert spreading of liquid manure is frequently one of the main reasons for very high concentrations of nitrates and phosphates in groundwater or surface water. There is a conflict between intense animal husbandry and a shortage of areas for disposing of liquid manure. GEA Westfalia Separator Group has developed a cost-effective processing concept for this problem. The aim is to process the liquid manure and the related surpluses of nutrients in the operations and to ensure that the products obtained are used properly. The continuous separation of solids and the high dewatering capacity of decanters make them an efficient and cost-effective solution for agriculture.

**Phosphates:** minus 90 percent nitrogen: minus 35 percent
Natural fertilizer can be spread in a manner that is not detrimental to the soil, only after phosphate and nitrogen concentrations have been reduced. Mechanical separation technology using decanters from GEA Westfalia Separator Group is responsible for the traditional task of solid-liquid separation. The decanter separates between 70 and 90 percent of phosphate compounds and between 30 and 35 percent of nitrogen compounds.

**Making proper use of recovered nutrients**
A liquid manure processing installation separates the solid particles and dewateres them to a free flowing consistency. The solids discharged by the decanter are suitable for processing into fertilizer, but must be first treated hygienically. This is achieved by drying or composting.

**Mobile from farm to farm**
To achieve optimum capacity utilization, GEA Westfalia Separator Group has developed a mobile system which can easily and quickly be transported from farm to farm on a trailer or container. All necessary components such as pumps, conveyor technology and its own power supply provided by a diesel generator mean that the decanter, with a capacity of up to 50 m³/h, is completely self-contained.
Mechanical separation does not require any chemical additives, e.g. flocculants
Separating technology from GEA Westfalia Separator Group solves the problems of agriculture in two ways: the extremely strict requirements of the EU with regard to groundwater and nature protection are more than satisfied; and disposal, storage and transportation costs are minimized. By manufacturing valuable natural fertilizers from waste substances it is now possible to generate what previously was simply allowed to seep away: namely cash.
Waste water treatment in tanneries

- Tanning waste water
  - Neutralization
    - Polymer solution
      - Biological sludge
        - Biological treatment
          - Clarified liquid
            - Decanter
              - Dewatered sludge
                - Solids disposal
              - Clarified water
                - To waste water treatment plant
      - Biological sludge
Water treatment in tanneries

Say no to High Consumption

With a high dewatering capacity and low consumption of rinsing water, decanters from GEA Westfalia Separator create optimum conditions for processing waste water from tanneries.

Tanneries belong to industrial sectors with the highest levels of water consumption. To make leather from one tonne of raw material, experience has shown that up to 60 m$^3$ of water are required. The volume of waste water, which contains high levels of alkaline and organic substances, is, of course, correspondingly high. If the waste water is not appropriately pre-treated, it cannot be directly discharged or processed in municipal waste water treatment plants. Throughout the world, decanters from GEA Westfalia Separator Group, which ensure optimum pre-treatment for subsequent biological treatment, are used for appropriate processing within tanneries.

Leather production is one of the oldest trades. Modern industrial-scale production still requires extremely high volumes of process water. The water is not only needed for transportation in the production process but also for various tasks such as unhairing or soaking the hides. The waste water problem is correspondingly acute – in European producer countries like Italy and Spain but also in China, India, Korea, Brazil and the USA, to name just the most important producers. As a result of the specific production methods, the waste water has high alkaline levels (pH value 10), is contaminated with chemicals such as sulphite and chrome, and has a high level of organic substances. This means that waste water from tanneries cannot usually be discharged directly into public sewerage systems. To solve the problem, biochemical processing of the waste water is a standard operation in modern installations. Decanters from GEA Westfalia Separator Group also play a significant role.

When the waste water from the tanning process has been collected, and after a polymer has been added, the decanters operate in a continuous procedure to remove all organic substances, e.g. hair, from the thickened sludge. The separated solids can be composted and are also used in gardening or forestry applications. The liquid phase is then subjected to biological treatment. The resultant sludge is recycled into the dewatering process; the waste water can be sent safely to conventional municipal waste water treatment plants. The advantages of decanters provide optimum dewatering capacity and use very little rinsing water. The closed system prevents aerosols from escaping; such aerosols would otherwise pose a problem for humans and the environment.
Water treatment in paint shops

**Paints Inject Colour into Life – and into Waste Water**

Decanters and separators recover the paint and allow the environment to blossom.

Paint is applied in many areas of industry, for a wide range of reasons: not just for better visual appearance; protection against corrosion and improved surface qualities are also very important. However, what can be done with the waste water?

Waste water does not usually occur during the manufacture of paint as the systems are closed to water. However, waste water may occur in peripheral processes, for instance in the cleaning of packaging materials and mixing tanks. Such wash water contains residues of dispersed acrylate and vinyl resins, dissolved cellulose derivatives, together with residues of pigments and filling agents, solvents, traces of acids or lyes from pH value adjustment as well as residues of preserving agents. Such waste waters have to be processed and decanters from GEA Westfalia Separator Group are very effective and efficient for these applications.

**The use of decanters in painting installations**

Waste waters in paint shops are mainly contaminated with solvents, undissolved paint constituents and a high percentage of paint particles that can be coagulated. The use of decanters can considerably reduce disposal costs for the paint sludges with a water content of 80 to 95 percent. The sludge obtained is stored in a storage facility and then pumped into the decanter. The solids discharge is disposed of or recycled; the clarified phase is recycled back into the process reducing the costs of waste water disposal and the use of fresh water.

**Decanters for water-based paints**

Today, environmentally friendly, water-based paints are used specifically in the aviation and automotive industries, and in many other areas of industry. Decanters from GEA Westfalia Separator Group separate paint residues from the water and ensure that it can be reused. The high-speed operation creates a large clarification area to ensure high throughput capacities and better separation with a high dry substance content.

Nature adorns itself with the most beautiful colors. Decanters and separators from GEA Westfalia Separator Group fulfil a fundamental objective in this respect. They draw a clear distinction between the colors of nature and paints manufactured industrially by man: color belongs in life; paint does not belong in the environment.
Waste water treatment in the paint-processing industry

1 Operating water
2 Clarified phase
3 Decanter
4 Degummed paint sludge
5 Buffer tank
6 Solids
7 Circuit water
8 Solids discharge
Waste water treatment in the paper industry

1. Pre-clarifying tank
2. High-load biology (1st stage)
3. Sedimentation
4. Post-clarification
5. Activation installation (2nd stage)
6. Primary sludge
7. Secondary sludge
8. Flotation sludge (various ink, paste sludge)
9. Capable of being dewatered individually and also together
10. Clarified phase
11. Landfill
12. Drying
13. Incineration
Paper is Patient – the Environment Is Not

Efficient waste water processing helps the paper industry to reduce costs and protect the environment.

The paper-making process is one of the most water-intensive industrial production processes. This is because, without the physical properties of water, it would not be possible for a consistent structure to be achieved when the constituents of paper are processed in a sludge. A high level of water consumption is inevitable in the processing of natural raw materials (wood, cellulose, vegetable fibres) and also in the process of recycling waste paper. This creates a high level of waste water for processing. The residues in the waste water are a problem particularly in the case of de-inking; the process of recycling printed waste paper. This demonstrates the tremendous advantages of using decanters and separators, both in terms of competitive advantages by way of reducing costs in the paper industry and also for environmental protection by minimizing toxic substances.

Illustration by comparison
The above diagram demonstrates the impact of using centrifugal separation technology for processing waste water in the paper production process. Whereas valuable components are lost in processes without decanters, mechanical separation means that most of the constituents can be recovered and can be recycled into the production process. The old principle of “time is money” means there is a two-fold benefit – for the environment and for the paper industry.

- Closed system, no aerosol emissions
- Maximum dewatering
- Corrosion protection for all components which come into contact with product due to the use of stainless steel
- High throughput capacity
- Continuous and cost-effective operation
- Simple and flexible operation
- Low space requirement
- Low addition of fresh water
Water treatment in the pharmaceutical industry

No Risks or Side-Effects

So that waste water processing does not cause headaches.

The average life expectancy of man has almost doubled during the past 100 years. This has been owing to knowledge of hygienic conditions, changes in nutrition and living conditions and progress made in medical research. Today, many illnesses, which decades ago appeared to be untreatable, can now be treated by medical products. With its research and development activities, the pharmaceutical industry has made a major contribution to this development and the volume of medical products that is available today is almost unimaginable.

Great quantities of chemicals and biological primary substances are required for making medical products. This means that the production waste water also contains a wide range of substances that cannot be easily separated from the sewage sludges. Moreover, conventional clarification and sedimentation tanks, which cover a large area and require relatively long purification times, make it very difficult to comply with statutory limit values in the waste water.

Clarification tank and separator

It is necessary to use separators to remove solids from production waste water to a level that meets the specified limit values. A major advantage of separators compared with conventional membrane filtration installations, which have been tested by the pharmaceutical industry for comparison purposes, is that there is no “clogging” phenomena so stable process reliability is guaranteed. From the balancing tanks, the waste water is sent to aeration tanks for biological treatment, then sent via pre-clarifiers to a compensation tank which is used as a buffer tank. The separator is then responsible for polishing the waste water. This process clarifies the waste water sufficiently for it to be discharged directly into lakes and rivers.
Production waste water

Neutralization/pre-treatment

Sludge

Sedimentation

Activation

Sedimentation

Clarified liquid

Rake defatting

Water

Concentrate

Anaerobic treatment

Sludge

Separator

Dewatered sludge

Solids disposal

Waste water processing in the pharmaceutical industry
Waste water treatment in coal-fired power stations

1. Metal Cl
2. Flocculant
3. Acid
4. Milk of lime
5. Acid water
6. Cooling water
7. Precipitation
8. Cooling
9. Buffer tank
10. Solids
11. Neutralization
12. Waste water
Water treatment in flue gas desulphurization and sewage sludge dewatering

Decanters for the Middle Empire: Environmental Protection in Coal-Fired Power Stations in China

China’s economy is expanding at breath-taking speed. To ensure that environmental protection is also taken into consideration, decanters from GEA Westfalia Separator are used for scrubbing flue gas and dewatering sewage sludge.

China is fast catching up with the western industrial standard. However, further economic growth will only be guaranteed if energy production is able to keep up with this development. Because the country has large reserves of coal, it intends to step up the process of expanding its coal-fired power stations which already supply approximately 70 percent of the country’s overall power requirements. However, this means that China is also facing an environmental problem. Decanters from GEA Westfalia Separator Group are playing a major role in providing a solution.

Flue gas, which contains sulphuric acid and is, therefore, toxic for the environment, is generated in coal-fired power stations. A few years ago, the Chinese state therefore started to equip existing as well as new coal-fired power stations with flue scrubbing installations. The milk of lime used for neutralizing the flue gas is dewatered by various sizes of decanter and is converted into a consistency that can be used directly by the gypsum construction industry for manufacturing plaster board. Current figures indicate how great the need is for decanters: China is one of the largest coal producers and consumers in the world. More than half of the coal is consumed in power generation. New power stations are being built, mainly in the major industrial centres such as Tianjin near Beijing, Shanghai, Guangzhou and increasingly in the “Golden triangle” of Shenzhen. The Taishan power station in the South of Shanghai alone is expected to produce 3 GW of power making it one of the largest coal-fired power stations in China. The decanter type UCC 450 has already been installed in this plant to dewater the flue gas washing liquid with a capacity of up to 20 m³/h. Power stations of this size are planned and operated in the same way as a small city. Accordingly, these “small cities” also require a corresponding waste water treatment plant. The waste water treatment facility makes ecological and economic sense and is therefore the second area of application for decanters in the Chinese coal-fired power station industry. Highly efficient models such as the “Crocodile” UCD 305 are used for maximum dewatering of the biological sludge. The advantages of decanter technology compared with the discontinuously operating chamber filter press are also becoming increasingly recognized in China.

Decanters from GEA Westfalia Separator Group perform well when compared with other decanters primarily because of their high throughput capacities both in absolute terms and also in relation to the solids.
Treatment and purification of radioactive wash water

Energy is Necessary – with Inbuilt Safety

Decanters and separators meet maximum safety requirements in the treatment of radioactive wash water.

Nuclear fission is not possible without radioactive material, so it’s natural that the process creates contaminated wash water. This water is not for cooling water in the reactor as a closed-circuit system is used in this application to ensure that high concentration radiation cannot escape. However, radioactive solid and liquid waste is obtained from processing and treatment in the secondary areas of nuclear power stations. Decanters and separators are used in such applications.

In-house laundries operate in all nuclear power stations. The work clothes of the service personnel such as overalls, gloves, overshoes, etc. have to be constantly cleaned. The washing machines operate non-stop particularly during the shut-down times when work is carried out in critical zones. A considerable amount of water results from this process that might contain radioactive substances which have to be separated.
First decanters, then separators – a reliable combination
The wash water is discharged into collecting tanks and then pumped to a decanter. Compared with the pre-coat filters that were used previously, the decanter can considerably reduce the volume of solids because the discharge concentrate from the decanter has a water content of only 10 to 35 percent. The solids that are not separated are homogenized by the centripetal pump in the decanter discharge, and the clarified wash water is sent to the separator for polishing. The polished wash water is collected in control tanks and checked extensively for radioactivity. When it is subsequently discharged into the sewerage system, the levels of radioactivity are far below the statutory limit levels.

The combination of decanters and separators from GEA Westfalia Separator Group guarantees optimum clarification and maximum protection of the environment in this sensitive application, and the volume of solids for storage under secure conditions is considerably reduced. It’s a safe, clean, cost-effective solution.

Processing of radioactive wash water

1. Operating water
2. Pre-treated wash water
3. Wash water
4. Clarified wash water
5. Chemicals
6. Decanter
7. Solids
8. Separator
9. Pump
10. Solids tank
11. Collection pump
12. Conditioning
13. Sewer
14. Solids disposal
15. Solids pump
16. Solids tank
17. Control tank
Safety first: this is precisely what the service concept serv&care stands for.

Shipowners not only benefit from traditional services such as inspection, maintenance, original spare parts and repair work provided by the original manufacturer; they also benefit from proactive solutions which avoid risk, e.g. online and offline monitoring with GEA Westfalia Separator wewatch®. These preventive services are the best pre-condition for a smooth operation.

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The proactive, risk-free services of serv&care optimize operating reliability and permanent availability of the drive systems.
In addition to traditional services such as maintenance or repair, serv&care also provides solutions which avoid risk and with which the installation availability can be proactively assured.

serv&care accordingly makes for maximum operating reliability, machine availability, process efficiency and budget security. And these benefits are provided throughout the entire life cycle of the entire installation.

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- Risk avoidance through service provided by the original manufacturer
- Proactive solutions
- Upgrading to boost performance
- Crew training
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