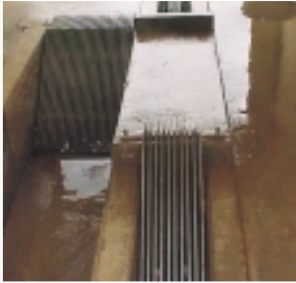


An Illustrated Guide to Basic Sewage Purification Operations



Department of Water Affairs and Forestry
First Edition, 2002

DEPARTMENT OF WATER AFFAIRS AND FORESTRY

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Southern Africa**

PREFACE

Water services include water supply as well as appropriate sanitation. Services refers to the provision of infrastructure as well as the sustainable operation and maintenance of the associated systems. The Department of Water Affairs and Forestry has an obligation to support municipalities with their constitutional role to provide water services to all citizens. One way in which the Department can assist is by developing the skills of municipal staff. In this regard, the Department has identified the need to train on-site staff for the proper operation and maintenance of sewage works - essential components of many sanitation systems - and therefore developed this guide.

The first edition of this guide is aimed at entry grade attendants who operate smaller waste water treatment facilities. Particular attention has been given to the needs of those who have limited literacy skills. Important concepts and correct operational procedures have been explained in simple terms and in a humorous manner by using cartoon illustrations. This guide emphasises the importance of the operator's job and providing services to communities.

This guide is part of a comprehensive support package to municipalities and fits into government's endeavour to systematically build capacity at local government level, providing well-structured and accredited training. It is intended as a reference for the personnel employed at a waste water treatment facility but can also be used by the facility manager for training purposes.

The participation of various persons in the development of this guide, their time and knowledge sharing - is much appreciated.

Let's all continue to work together to improve services to our communities.

Department of Water Affairs and Forestry

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INTRODUCTION

The purpose of this guide is to provide persons involved in conducting routine maintenance tasks and checks on sewage treatment works with a better understanding of basic sewage treatment operational activities.

The guide has been developed in an illustrated colour format to aid a wide spectrum of users in the understanding of the underlying fundamental concepts to basic sewage treatment works.

The guide is intended for use by:

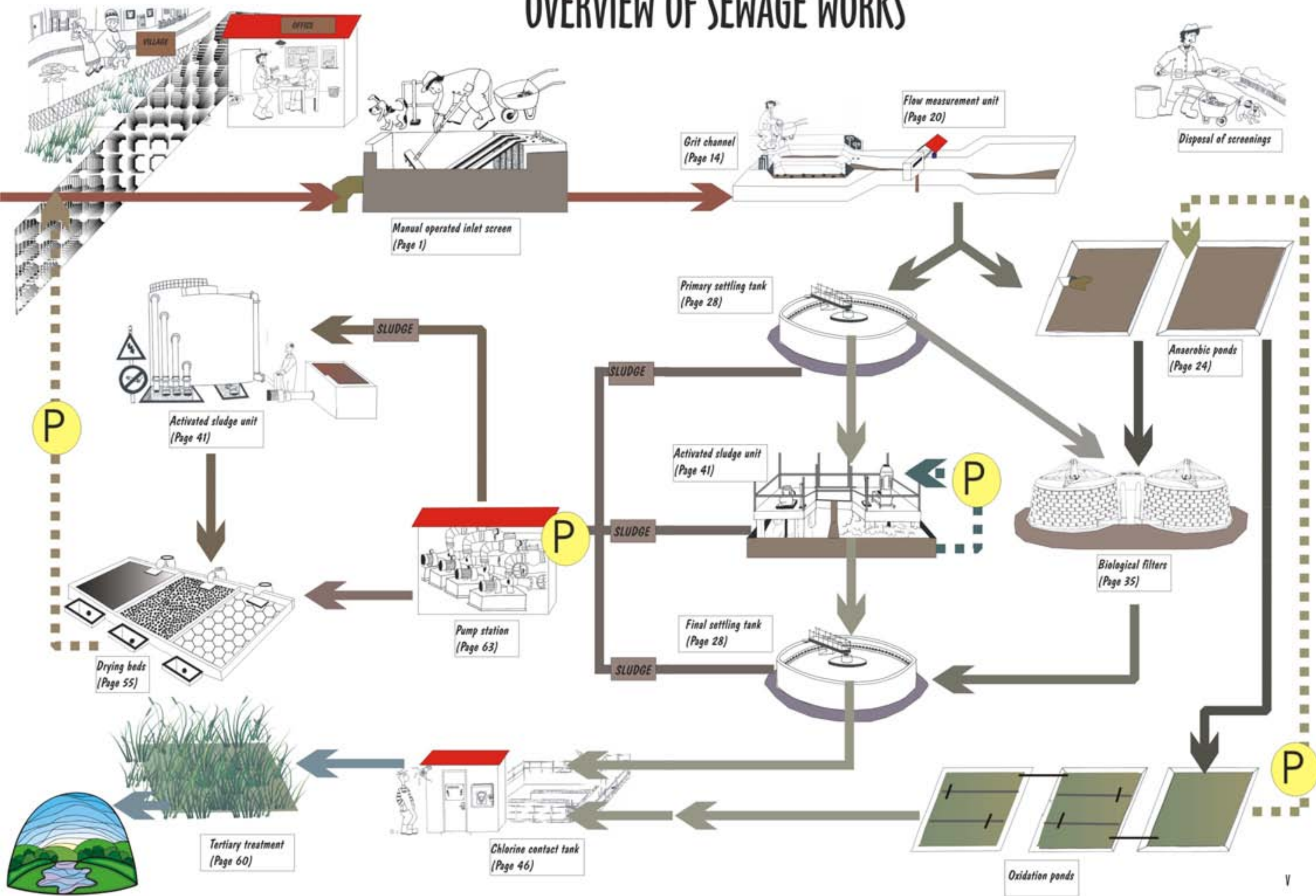
Water care operators and attendants - to apply the basic operating activities related to a sewage treatment works effectively and to develop an understanding why these tasks are important in the overall functioning of the works.

Water care managers - to provide guidance in basic sewage treatment operations to staff.

Educators - to develop an understanding of routine operation and maintenance activities of a sewage treatment works.



OVERVIEW OF SEWAGE WORKS



You will see the following symbols in the manual:



Correct action



Incorrect action



Trouble or problem



Manual Operated Inlet Screen 1

Isisefo lapho kusetsenziswa khona I harika yesandla
 Isefo esentjenziswa iharika yesandla
 Sisefo lapho kusetshentiswa iharika yesandla
 Sefo eo ho sebedisoang haraka ea letsoho
 Sefo e e dirisang haraka ya seatla
 Sefo e e somiřwago ka haraka ya seatla
 I sefo leyi yi tirisiwaka ihareka hi mavoko
 Sefo ine ha shumiswa haraga ya tshanda
 Inlaatwerke handrooster



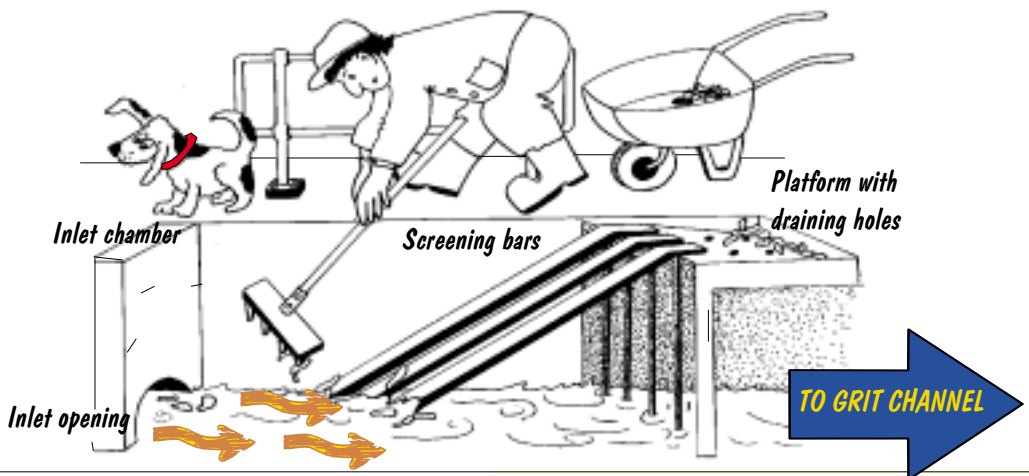


Manual Operated Inlet Screen 1

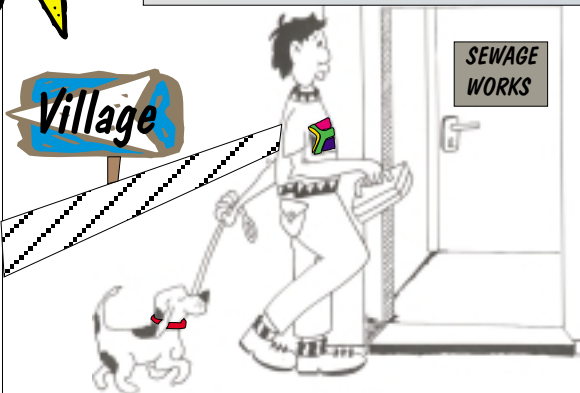
The Purpose of the manual operated inlet screen

Screening of the incoming raw waste water is part of the preliminary treatment phase and is applied to remove non-biodegradable floating objects. The purpose is to protect mechanical equipment in downstream process units and to reduce blockages in pipes, channels and sumps. In addition, floating material can encourage the development of odours and fly breeding.

The Manual Operated Inlet Screen Unit



Operator arrives at work - this procedure is the same for all operators



START OF THE DAY SHIFT The operator arrives at work wearing his own clothes and shoes

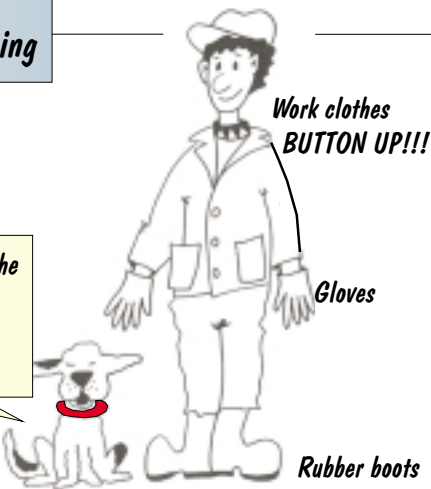


The operator changes into the correct work clothes and shoes



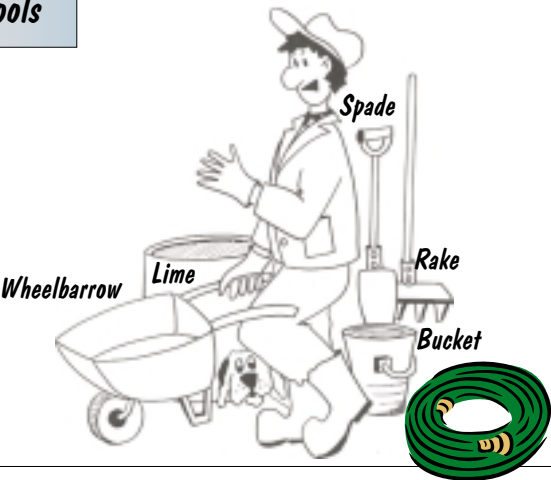
Correct clothing

No pets are allowed at the works - the **INLET DOG** is included to get your attention



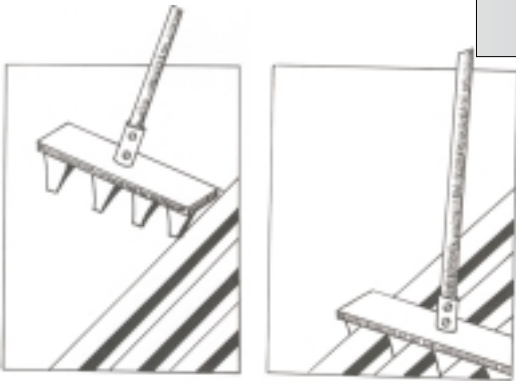
The operator with the correct work clothing, gloves and boots

Tools



The operator with the correct tools and equipment

The rake



The operator must use the correct rake with tines that fit snugly between the bars



The operator can use a wire hook to remove material which is stuck between the bars



Example of a rake that is not suitable for the work, the tines do not fit between the bars

Notes.....

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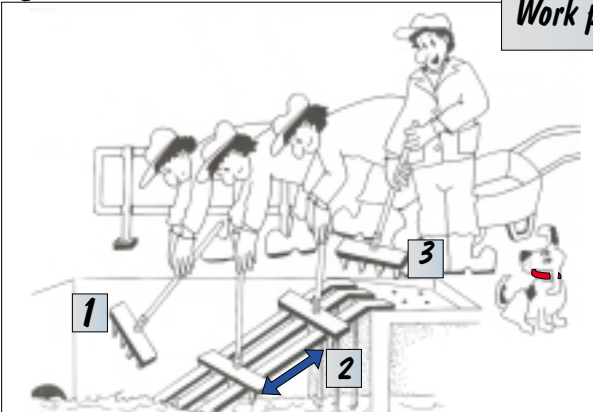
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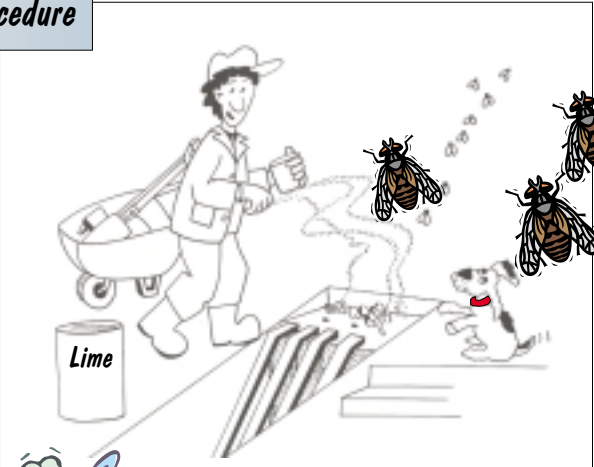


Manual Operated Inlet Screen 1

Work procedure



1. The operator places the rake with the tines between the bars. 2. He rakes with continuous up and down movement from the bottom to the top of the bars. 3. The collected material is then moved to the top, on the platform to drain and dry



The operator sprinkles lime on the drying screened material to discourage flies



Do not pull the screenable material over into the grit channel



Screenable material passing through screens



Do not wash screenings off with a water jet, it forces the residue through the bars into the downstream units



Notes

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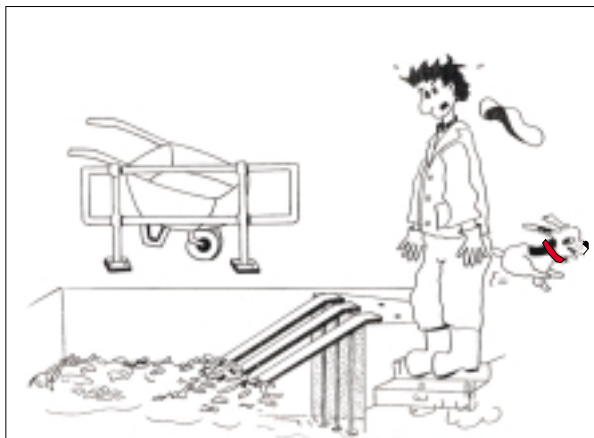
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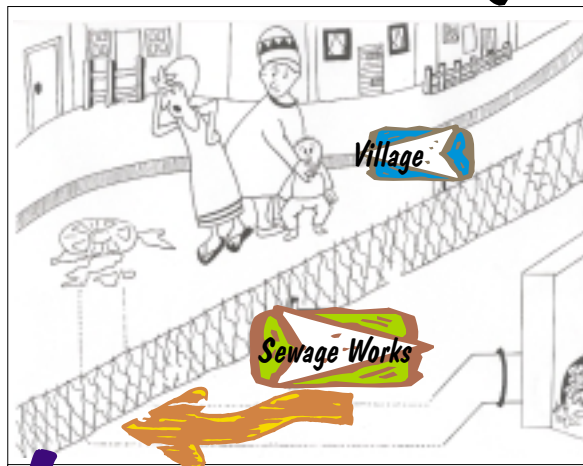
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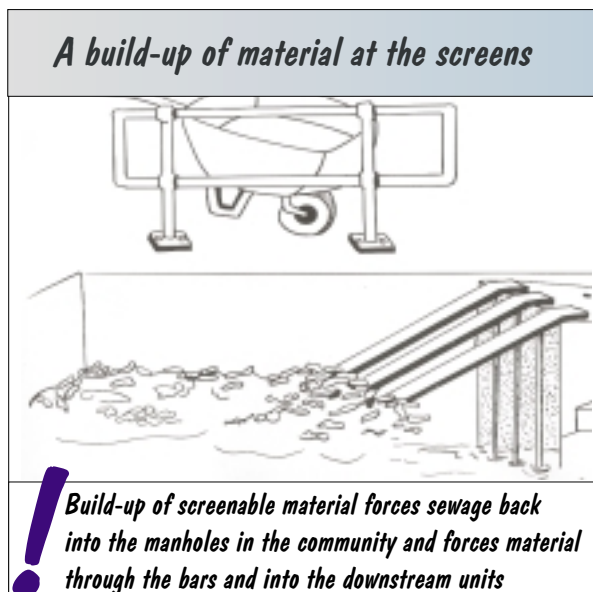
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The operator must not allow screenable material to build up in the inlet chamber



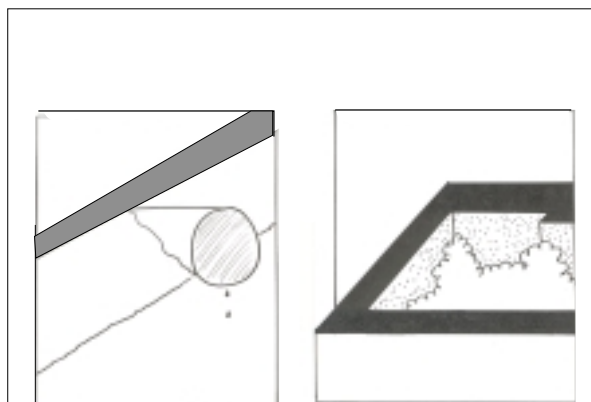
Screenable material has been allowed to build up and forces sewage back through the pipes into the manholes in the community



Build-up of screenable material forces sewage back into the manholes in the community and forces material through the bars and into the downstream units



Problems caused by screenable material accumulation at the inlet works include unpleasant odours and possible health problems in the community and at the works



Other problems at the plant include pipe blockages, scum formation and screenable material will occupy process volume in downstream units

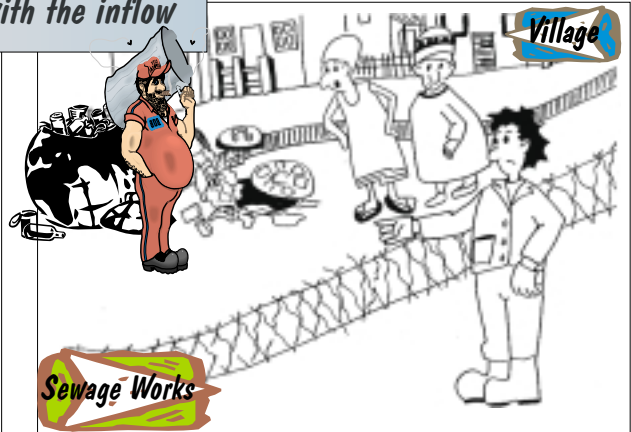


Manual Operated Inlet Screens 1

Problems with the inflow



X The community should not dump anything in the manhole. It leads to problems in the community and at the sewage works



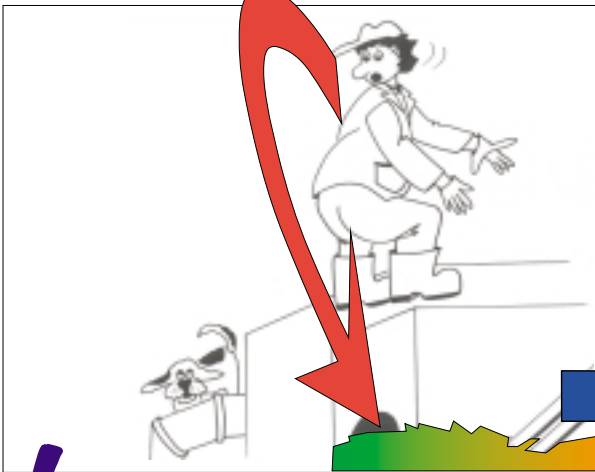
X The community can also be responsible for blockages and no inflow into the sewage works by dumping garbage and other materials in the manholes. The lid must always be on the manhole



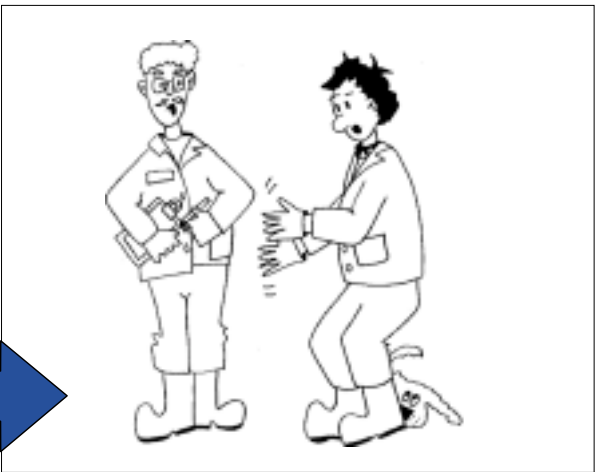
! The operator checks to see that there is inflow into the inlet chamber



The operator calls the supervisor if there is no inflow



! The operator checks the colour of the inflow



The operator calls the supervisor if the inflow is not the usual colour



Notes

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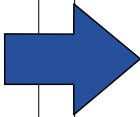
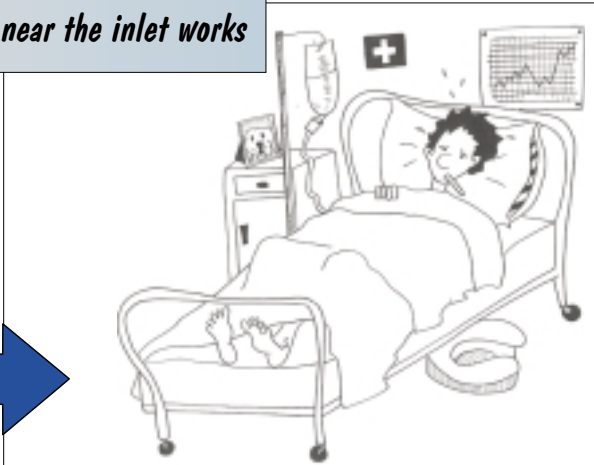
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Safety tip - do not eat near the inlet works



The operator should not eat or drink near the inlet works

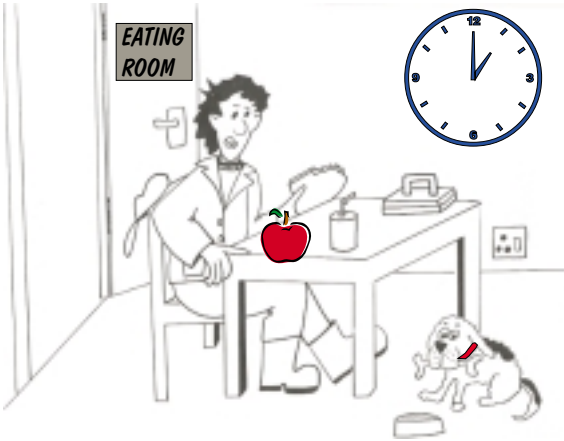
Unhygienic practices can lead to illness

BATHROOM



Before eating or drinking and after each cleaning cycle, the operator should wash hands with soap and water

EATING ROOM



The operator must eat and drink in designated areas



Manual Operated Inlet Screens 1

Disposal of screenings in designated area



✓ Once dried the operator disposes of the screening material in an excavated trench. He then covers the disposed screening material with a layer of soil



The operator sprinkles lime on the screening material before burying in the trench to discourage flies



The operator calls the supervisor when the trench reaches full capacity



✗ The operator must not dump the screening material in undesignated areas

OR



The operator can also dispose of the screening material in an incinerator, if available



! The operator must call the supervisor when the incinerator is not working



Notes.....

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The operator is also responsible for the general upkeep around the inlet works

BATHROOM



TIME TO GO HOME The operator takes a shower or washes before going home

CHANGING ROOM



The operator changes back into his own clothes and shoes before going home. Dirty clothes are taken home and washed

SEWAGE WORKS

Village



START OF NIGHT SHIFT The day shift operator goes home and the night shift operator starts his shift



Screenable material draining on the platform at the inlet



Mechanical Operated Inlet Screens 2



Mechanical Operated Inlet Screens 2

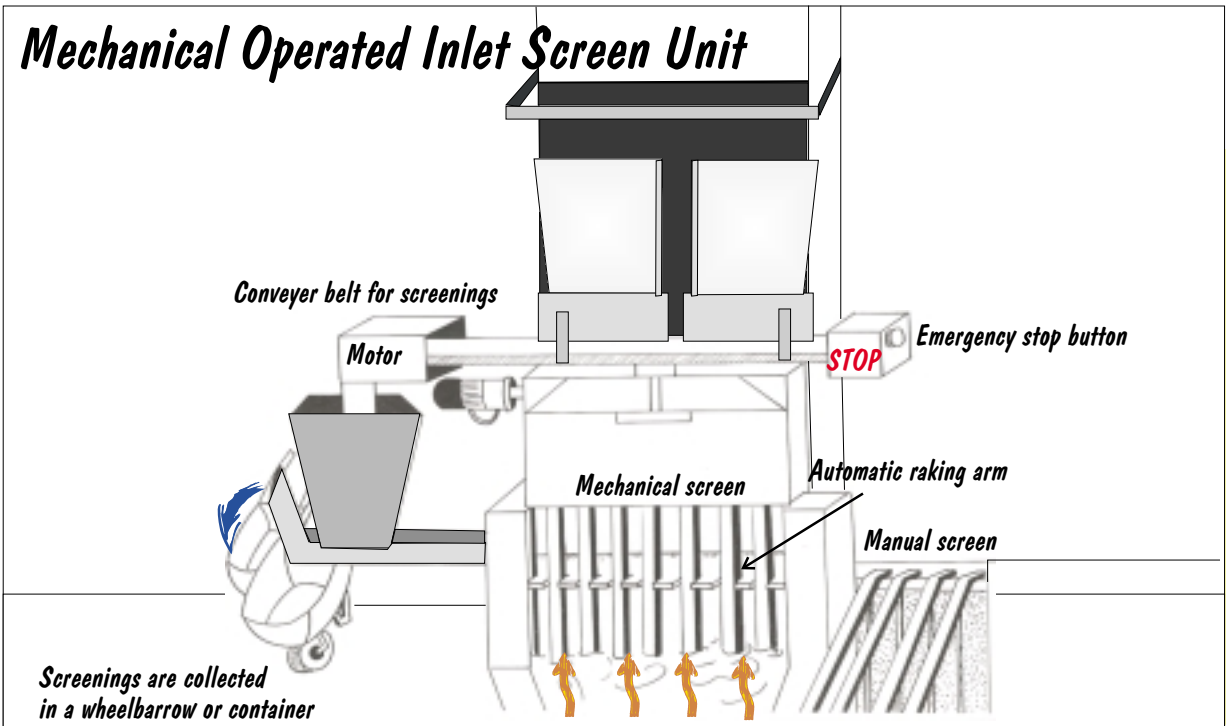
Esefo ezilawolayo
Isefo ezisebenzisayo
Sisefo lesitilawulako
Sefo eo e itaolang
Sefo e e itaolang
Sefo yeo e itaolaga
Sefo leyi yi tilawulaka
Sefo ine ya di laula
Inlaatwerke meganieserooster



The Purpose of the Mechanical Operated Inlet Screen

Screening of the incoming raw waste water is part of the preliminary treatment phase and is applied to remove non-biodegradable floating objects. The purpose is to protect the mechanical equipment in downstream process units, as well as to reduce blockages in pipes, channels and sumps. In addition, floating material can encourage the development of odours and fly breeding.

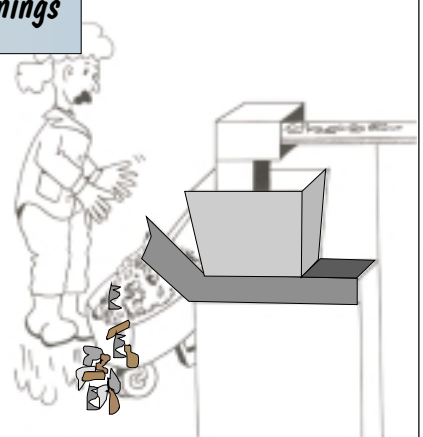
Mechanical Operated Inlet Screen Unit



Work procedure - collection of screenings



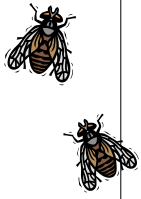
✓ The operator collects the screening material in the wheelbarrow/container. When the first wheelbarrow or container is full, it is removed and replaced with a second clean wheelbarrow or container



✗ The operator must not allow the wheelbarrow or container in which the screening material is collected to overflow

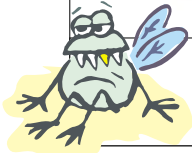


Mechanical Operated Inlet Screens 2



Lime

The operator sprinkles lime on the screening material to discourage flies



Notes.....

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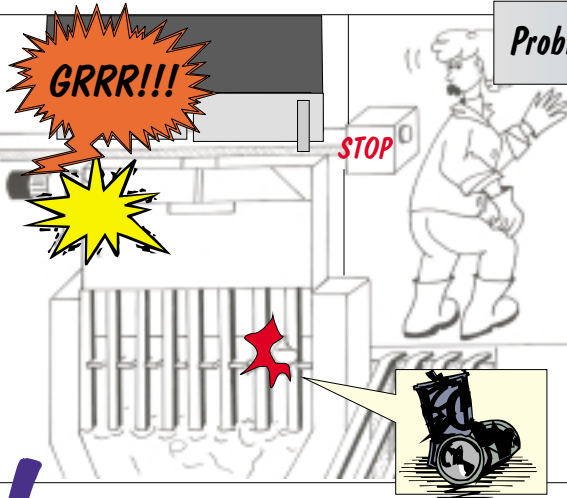
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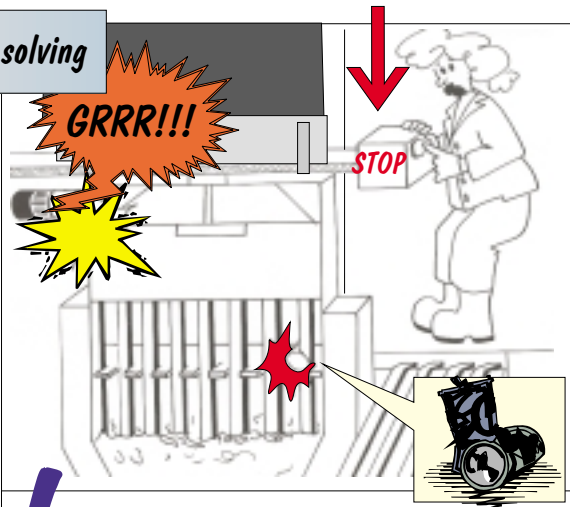
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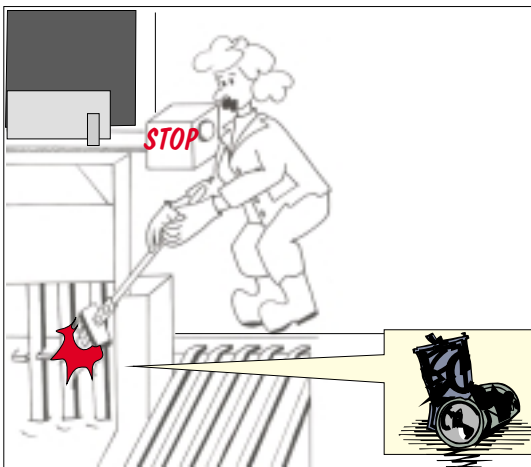
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The operator checks for unusual noises, caused by a possible obstruction, eg. cans



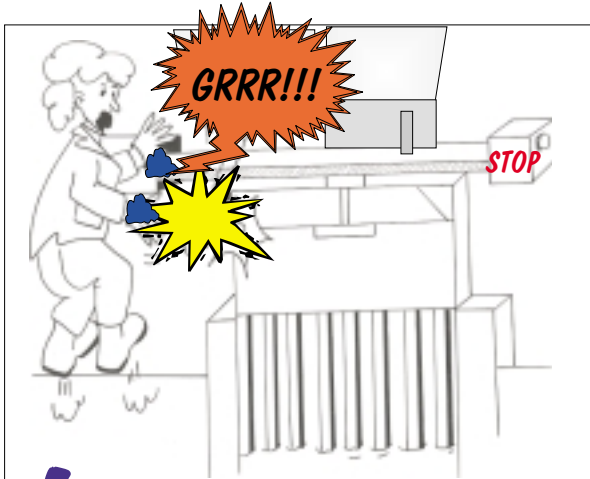
The operator switches the equipment off before removing the obstruction



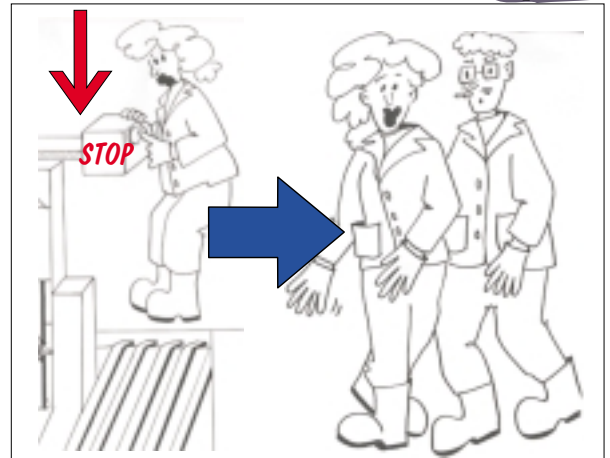
The operator removes the obstruction



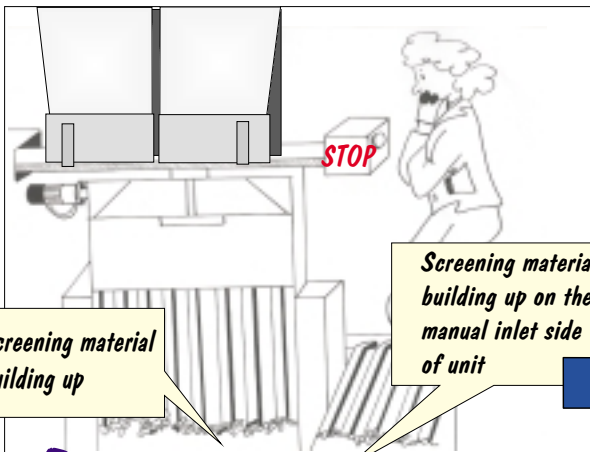
The operator reports any irregularities to the supervisor



! The operator checks to see if the motor is operational. Overheating and unusual noises should be reported



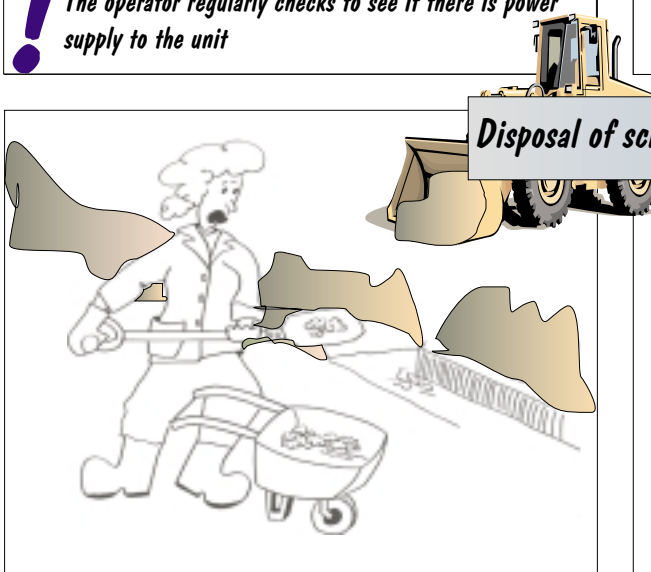
The operator switches the machine off and then calls the supervisor



! The operator regularly checks to see if there is power supply to the unit

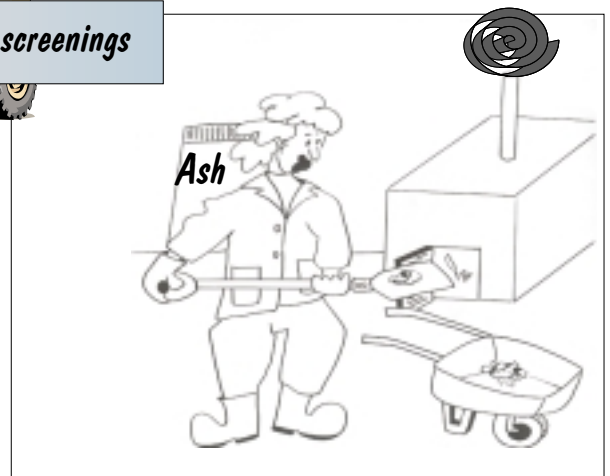


The operator calls the supervisor if there is no power to the unit



The operator buries the screenings in an excavated trench (see page 8)

OR



The operator places the screening material in the incinerator (see page 8)



Grit Channel 3

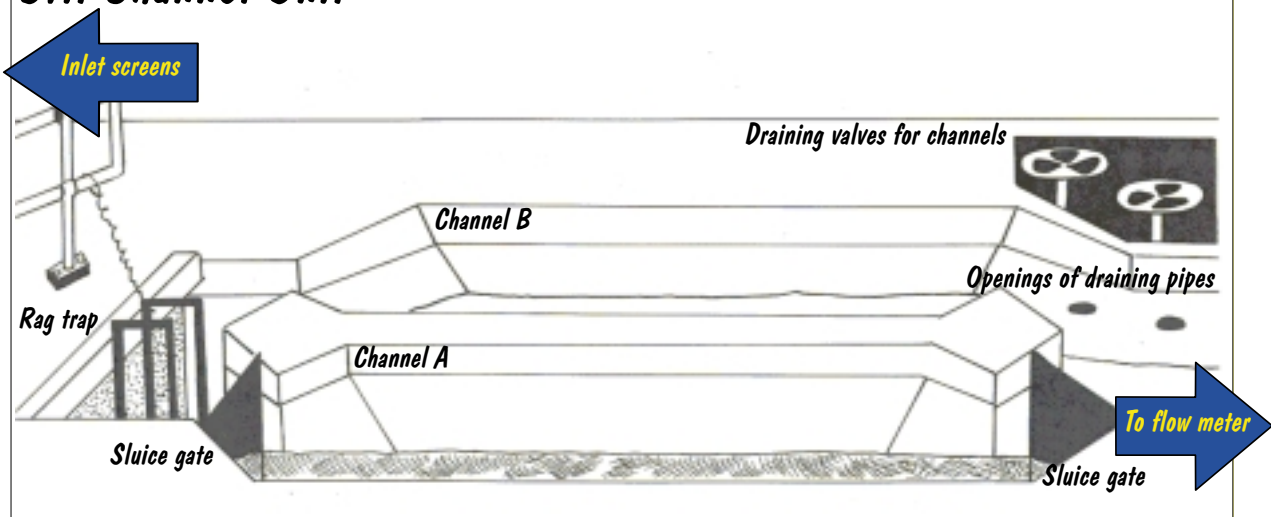
Umsele wesanti
Izekhewu zokuhluza ukungcola
Umsele wesihlabatsi
Mosele wa lekhoarana
Mosela wa lekgwarana
Mosela wa lekgwarana
Ndlela ya rikhwara
Mugero wa madi a no tshimbila na mutavha
Grint kanale



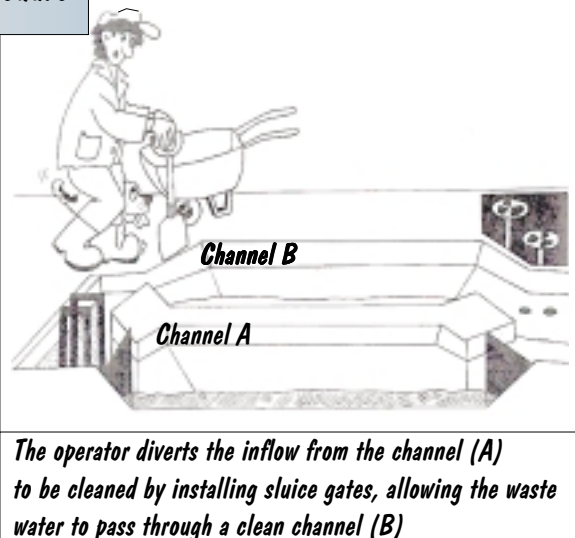
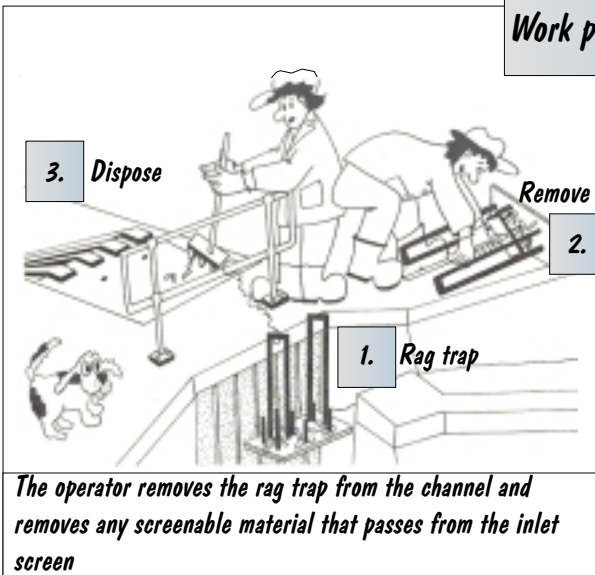
The Purpose of the Grit Channels

Grit removal takes place downstream of the inlet and forms part of the preliminary treatment phase. It is applied to remove inorganic material, or ditritus, from the suspended organic material in the raw waste water. The purpose is to protect mechanical equipment located in downstream process units, particularly pumps, from excessive wear and tear. Inorganic material that is allowed to pass through the preliminary treatment phase will also unnecessarily occupy process volume. Various mechanical grit removal operations are also available, which includes pista grit traps, vortex degritters and automatically driven suction devices.

Grit Channel Unit



Work procedure

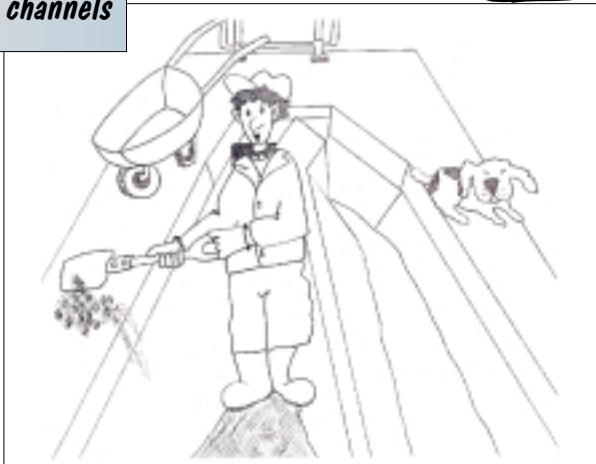




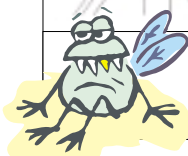
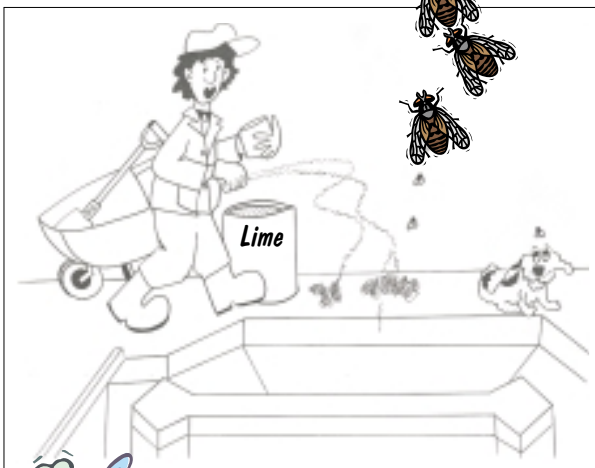
Cleaning of channels



After the channel has been drained, the operator removes the settled grit from the bottom of the channel



The operator places the grit on the area adjacent to the channel, to allow the grit to dry and the water to drain back into the channel



The operator sprinkles lime on the drying grit to discourage flies



The operator must not brush the settled grit along the channel into the down stream units



Settled grit washed along the channel into the downstream units may cause incorrect flow meter readings



Grit Channel 3



The operator must not hose the settled grit along the channel into the down stream units



Turbulence due to the grit being washed along the channel into the down stream units may cause incorrect flow meter readings



The operator must not hose the dry grit back into the channel into the down stream units



Turbulence due to the dry grit being washed back into the channel and into the downstream units may cause incorrect flow meter readings



Notes.....
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OR



Notes





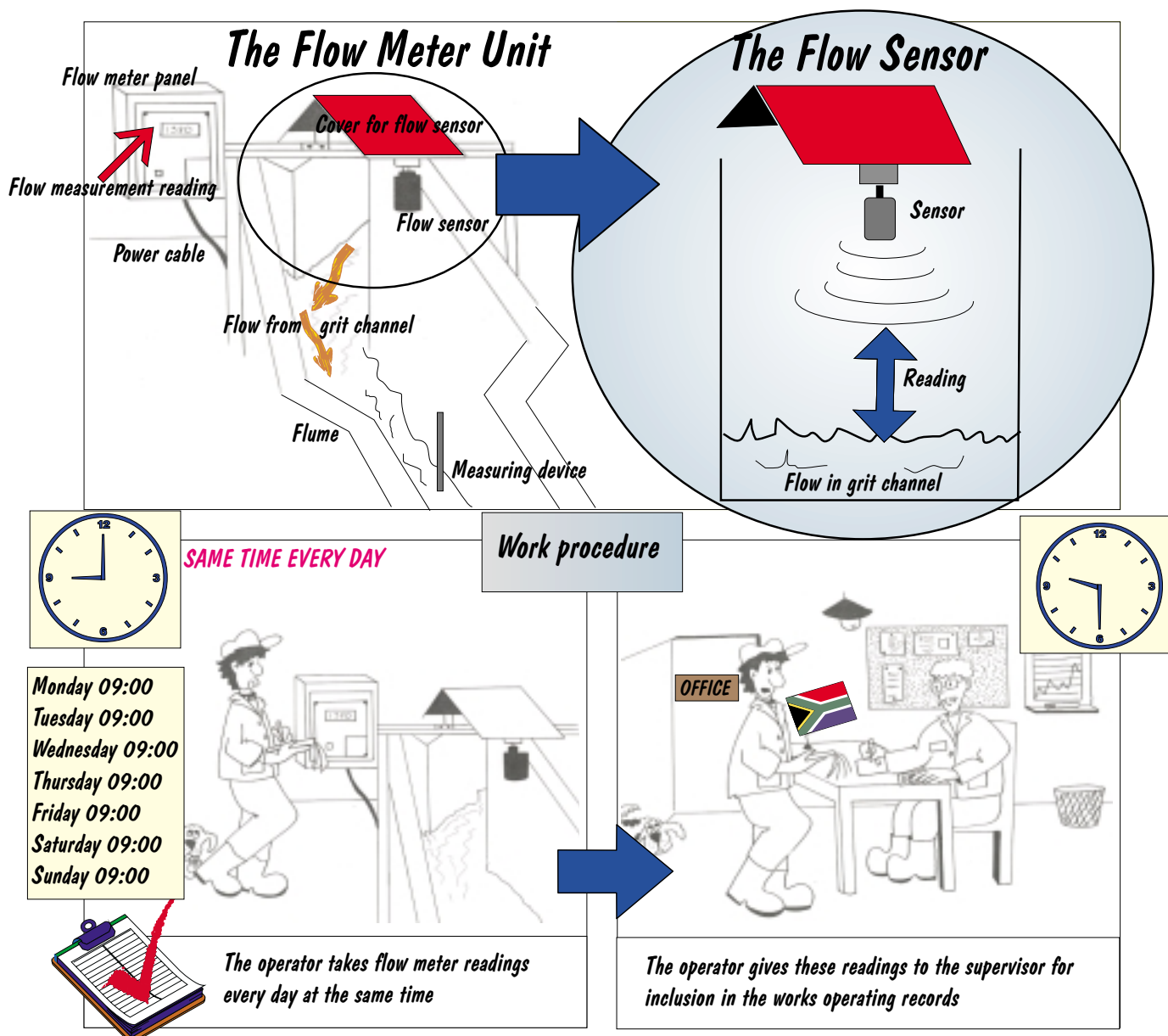
Flow Measurement 4

Iwashi elibonisa ukugeleza kwamanzi
Umatshini okhangela indlela amanzi ahamba gayo
Liwashi lelibonisa kuhamba kwemanti
Sesupa kelelo ea metsi
Sesupa kelelo ya metsi
Sesupa kelelo ya meetse
Nchumu/iwatch lowu wu kombaka nkhluluko wa mati
Watshi yo no sumbedza u tshimbila ha madi
Vloeimeting



The Purpose of the Flow Measuring Unit

Regular measuring of the flow is required to determine the hydraulic and organic loadings imposed on the works. In addition, regular flow recordings can provide warnings on blockages or pump failure in sewer reticulation. Peak flow factors can also be determined from flow recordings.



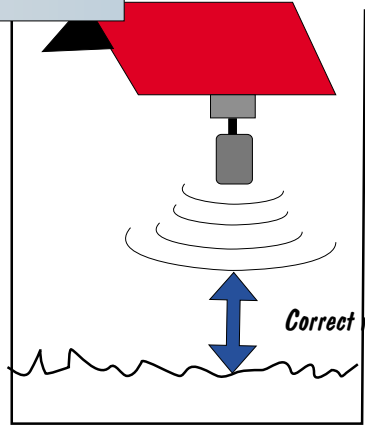


Flow Measurement 4

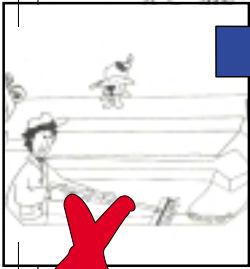
How does the flow sensor work?



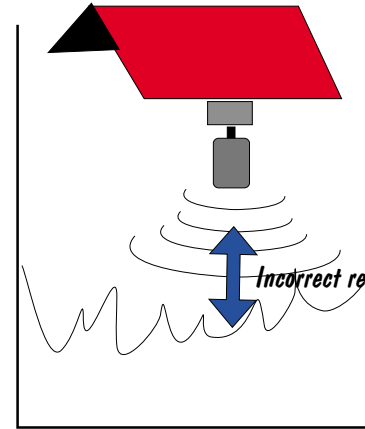
The operator maintains the correct work procedures and the correct flow meter readings are recorded (see page 17)



Normal flow



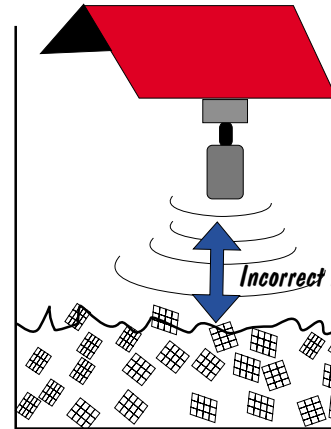
Inadequate grit removal or incorrect work procedure leads to turbulence and incorrect flow meter readings (see page 17 and 18)



Turbulent flow



Inadequate grit removal or incorrect work procedure leads to washed out grit and incorrect flow meter readings (see page 17 and 18)



Washed out grit

Notes

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! The operator checks on the flow regularly. Turbulence causes incorrect readings



The operator reports any turbulence to the supervisor



! Grit that has been washed out or not removed from the grit channels may cause incorrect flow meter readings



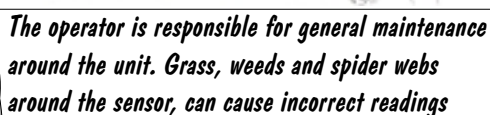
The operator reports any washed out grit that causes incorrect readings to the supervisor



If there is no power supply to the unit, the operator calls the supervisor



If there is no power due to cable damage, the operator calls the supervisor



Notes

[illegible]



Anaerobic Ponds 5

Amadamo ahlanza amanzi aqolile, angasebenzisi umoya ahlanzekile
 Amadanyana acoca umsele ngokusebenzisa umoya
 Emadamu ageza emanti ngaphandle kwemoya lohlobile
 Matangwana a ho hloekisa metsi, a ho sebedisa moea o o hloekilene
 Matangwana a go phepafatsa metsi, ao a dirisang moya o phepa
 Ditanka/matangwana a go hlwekisa meetse a go
 šomiša moya o hlwekileng
 Madamu lama ya tirhisaka moya lowo twnga ku tengisa mati
 Madamu a no shumisa muya wa kunaho kha u tanzwa madi
 Anaërobiese damme



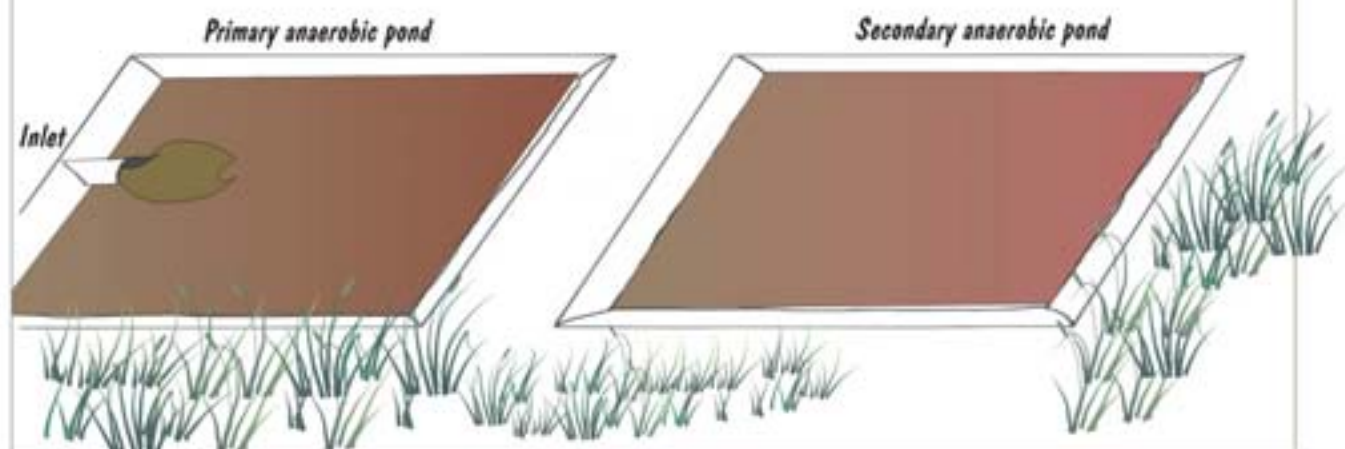


Anaerobic Ponds 5

The purpose of the anaerobic ponds

Anaerobic ponds are one of the primary phase separation methods that can be applied to the screened and dewatered waste water. Primary phase separation is applied for a set duration to allow a portion of the suspended solids in the waste water to settle out at the bottom of the ponds. The settled material is broken down by anaerobic bacteria. This process is slower than the rate that the organic material will settle out, resulting in the need to desludge the anaerobic ponds from time to time.

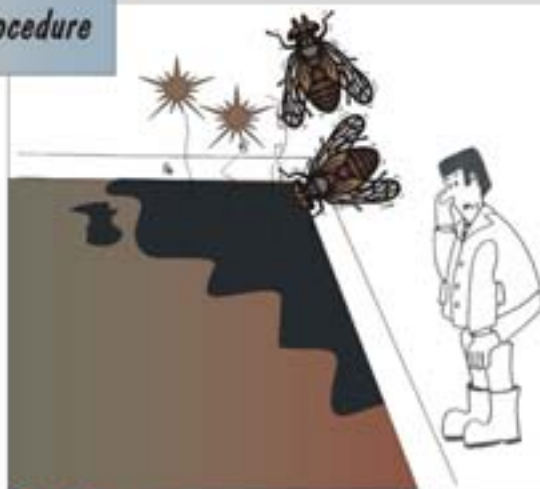
Anaerobic ponds



Work procedure



✓ The operator wets the surface regularly to prevent a crust from forming



A crust attracts flies and causes odour problems



The operator removes floating debris from the surface



The operator disposes of the debris together with the screenings removed at the inlet works. It is allowed to drain before disposal in an excavated trench (see page 8)

Notes

Desludging

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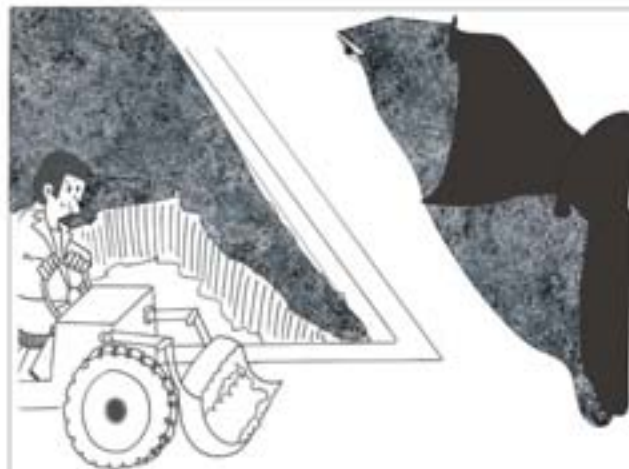
The operator opens the desludge valve when excessive rising bubbles are observed in the waste water in the ponds

OR



If there are no desludging valves, the pond is decommissioned and the sludge is allowed to dry. The operator can now remove the sludge with a spade and wheelbarrow

OR



The operator can also remove the dried sludge with a front loader, if available



Anaerobic Ponds 5



The operator keeps the embankments and inlet free from vegetation



Notes



Settling Tanks 6

Itanki elahlukanisa amanzi nodaka
 Itanki eyahlula amanzi edakeni
 Lithanki lehlukanisa nemanti neludzaka
 Tanka ya ho arohanya metsi le seretse
 Tanka e e arolang metsi le seretse
 Ditanka tse di arolago meetse le leraga
 Mathangi lama ya hambanisaka mati na ridaka
 Thannga ya u fhambanyisa madi na matope
 Besinktenks





Settling Tanks 6

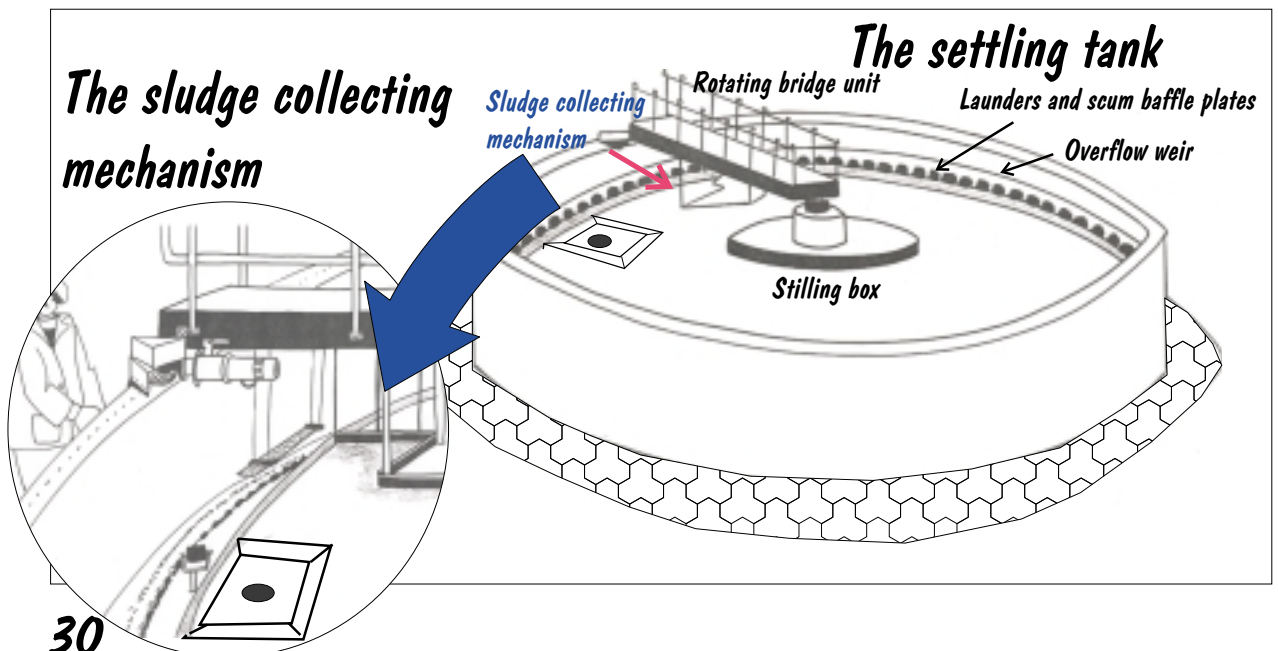
The purpose of settling tanks

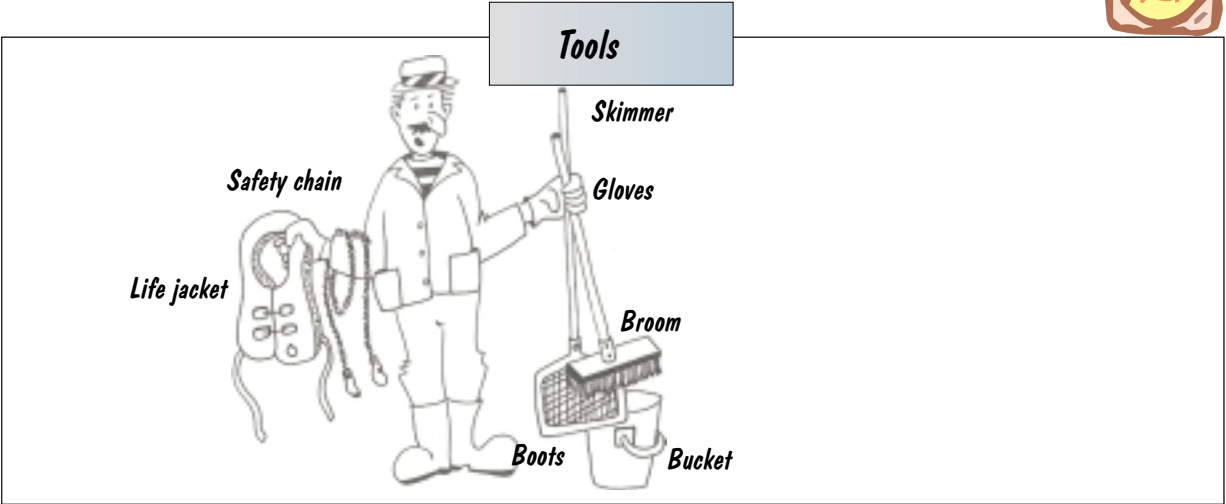
Settling tanks are used to separate the solid particles from the water. The specially designed tanks let the water flow slowly so that the solid particles have time to sink to the bottom of the tank. The particles collect at the bottom to form sludge. The water, which is now clearer, leaves from the top of the tank. From time to time the sludge is removed from the bottom of the tank for further treatment.

“Primary settling” or the “first” settling separates most of the solid waste - organic matter such as faeces and paper - from the water. The sludge from this tank is called primary sludge or raw sludge.

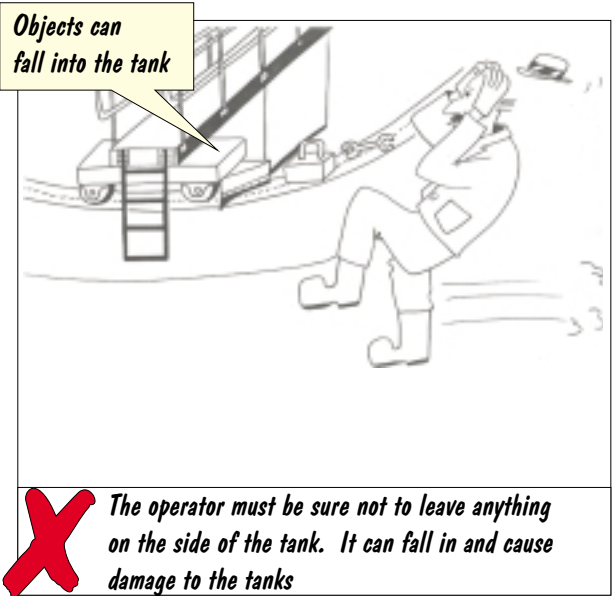
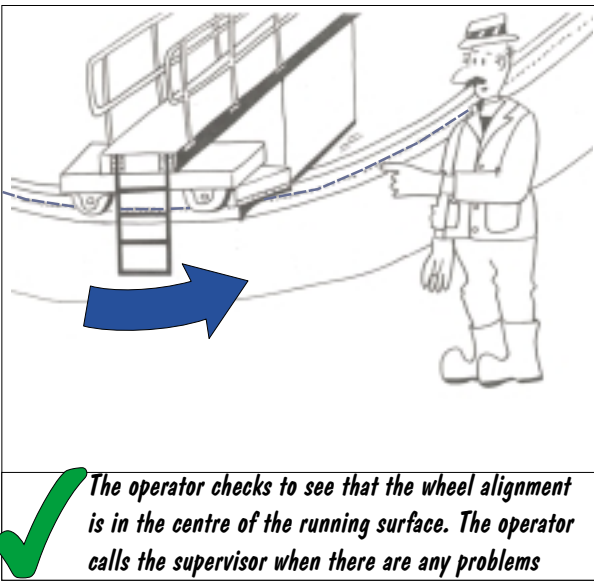
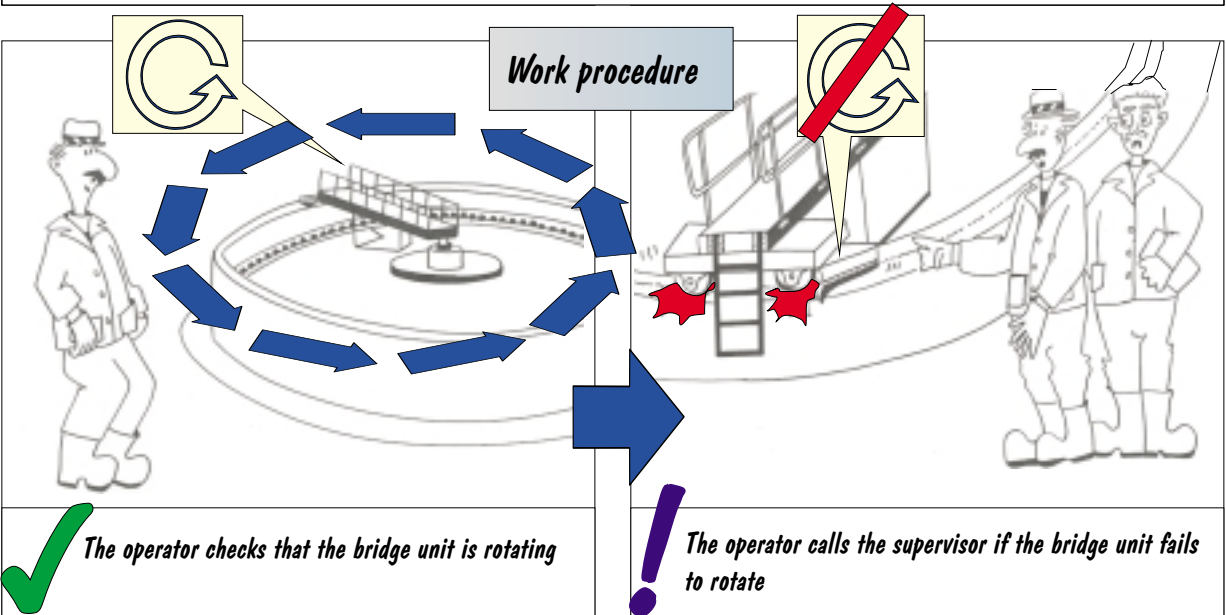
“Secondary settling” takes place after the water from the primary settling tank has been treated biologically. For example, the effluent leaving the biological filters (section 7, page 35) contains humus that is removed by settling. Humus is organic matter that has left the fixed media in the filter. The humus is mixed with the raw sludge and then treated.

Settling is also used as part of the activated sludge process. Sludge, which contains active bacteria, is separated from the water and returned to a reactor to maintain a constant concentration.



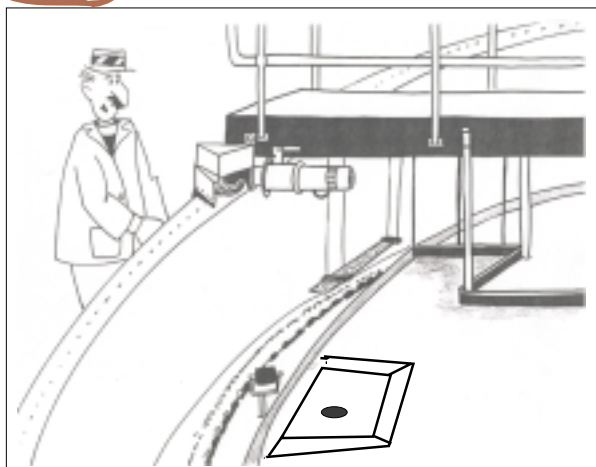


The operator working at the settling tank has to take extra safety precautions, eg. safety chains and life jackets





Settling Tanks 6

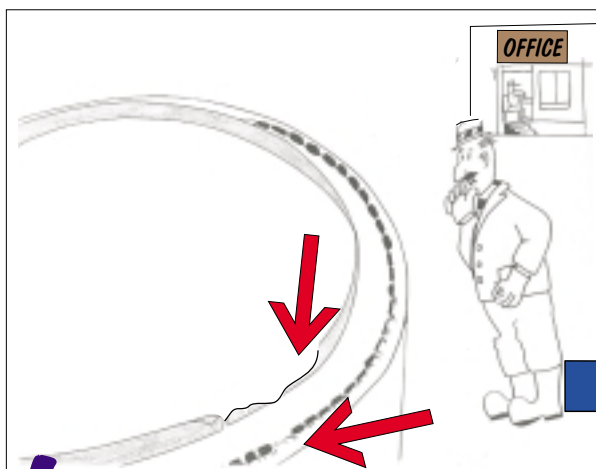


The operator makes sure that the surface skimming mechanism is in working order

Safety tip



The operator wears a safety jacket and chain when working in the tank. He brushes the effluent launders, scum baffle plates and overflow weir plates regularly to remove organic solids accumulation



The operator checks regularly that there are no loose plates in the settling tank



The operator reports any missing, damaged or loose plates to the supervisor



The operator skims floating debris from the surface of the tank

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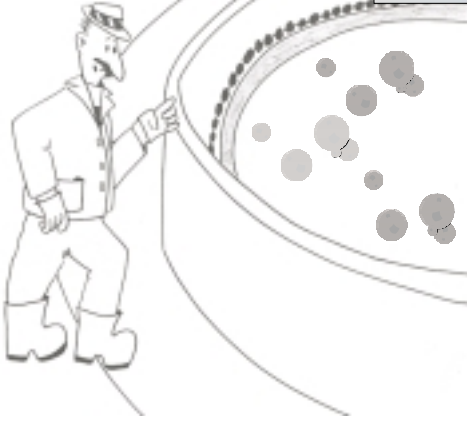
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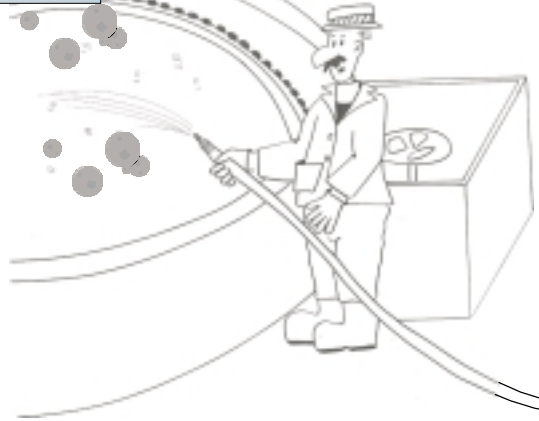
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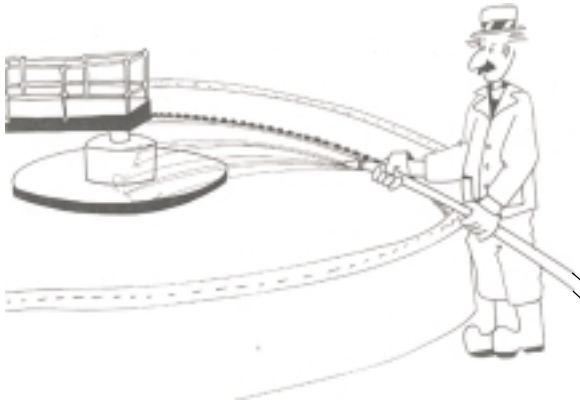
Desludging



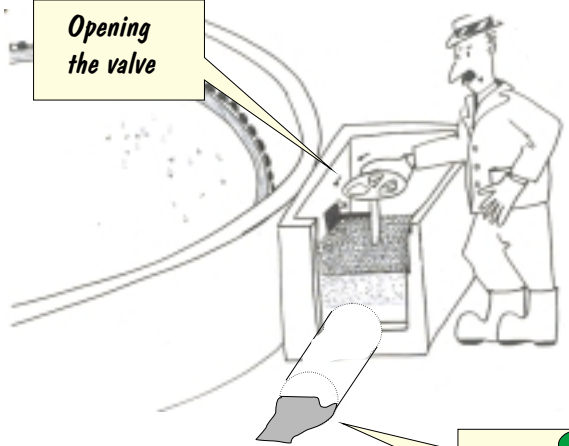
The operator checks to see if there are bubbles on the surface of the tanks. This is an indication that he should withdraw sludge (desludge)



The operator hoses the surface before desludging to settle floating sludge particles

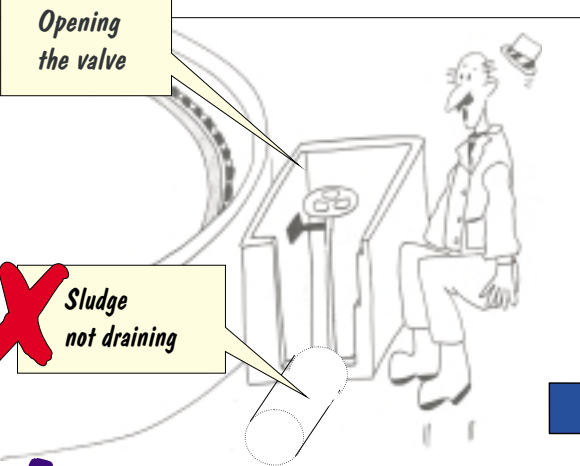


The operator hoses the stilling box areas to reduce scum accumulation

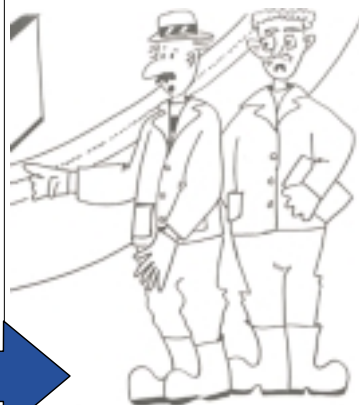


The operator opens the desludge valve slowly

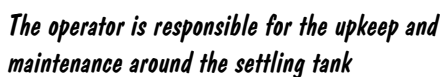
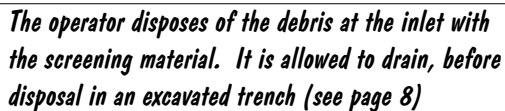
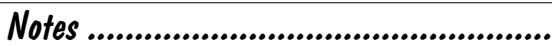
Sludge draining



The operator makes sure that there is outflow from the desludge pipe after opening the desludge valve



The operator calls the supervisor if there is no flow from the desludge pipe after opening the desludge valve





Biological Filtration 7

Indawo lapho amagciwane ehlelikhona
Indawo enentsholongwane e nqeda ecoceni kwa-manzi

Indzawo lenemagciwane

Tulo e tletseng dikokoanahloko tse thusang ho
hloekisa metsi a dihoerehoere

Karolo ya go hlwekisa maswe fao megare e funanvago tulo e lengwe

Karolo fao ditwatse di lego felo gotee

Maendlelo/ndhawu laha switsongwa-tsongwana

switshunguriwaka swiri ndhawu yinwe

Fhethu ho dalaho zwitshili

Biologiese filtrasie

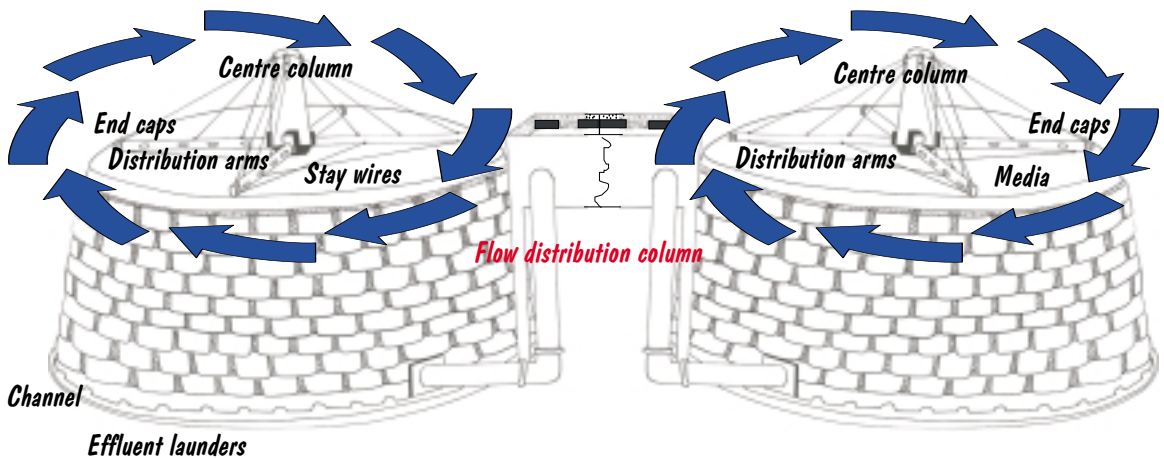




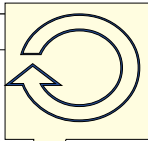
The purpose of the biological filtration unit

A biological filtration process entails the oxidation of carbon and ammonia nitrogen fractions in the waste water. This is achieved by passing the waste water over or through fixed surface media to which bacteria attach themselves. The presence of adequate available oxygen is necessary to ensure ammonia oxidation to nitrates.

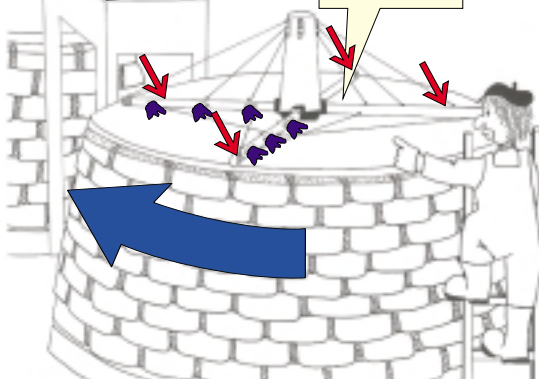
Biological filtration unit



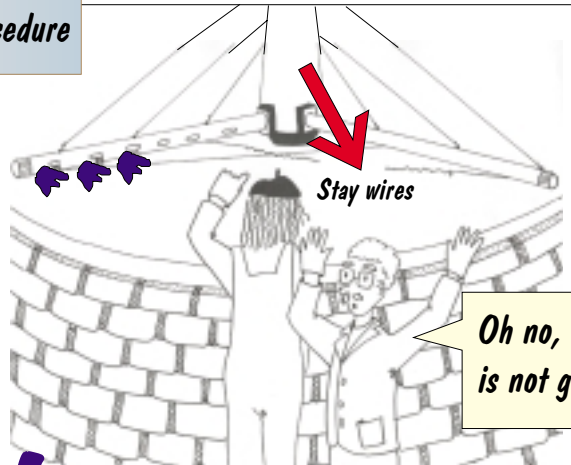
Flow distribution column



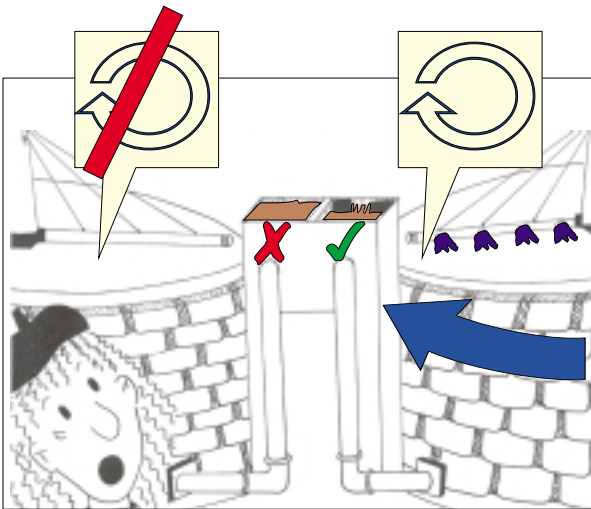
Work procedure



The operator checks that the distribution arms rotate evenly and that all the end caps are fitted



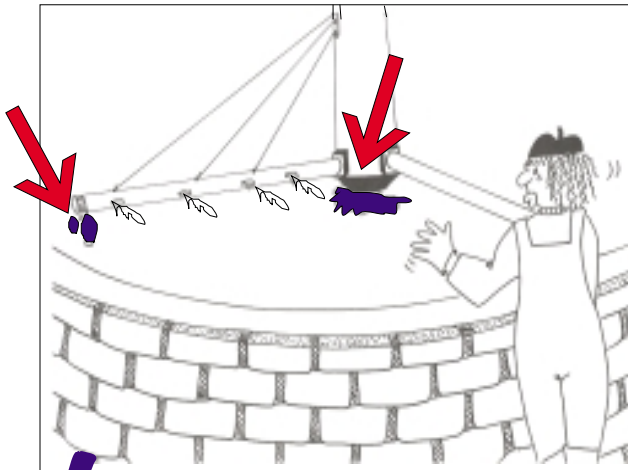
The operator makes sure that all the stay wires are in place. If the wires are not in place, it will cause uneven flow. The operator reports this to the supervisor



The operator must check that the distribution arms of both units rotate similarly. If the rotation speed is not equal, there may be a blockage in the flow distribution column



The operator and the supervisor inspect the flow distribution column to see if there is a blockage



The operator checks to see if there are any leaks. Leaks are reported to the supervisor

Notes

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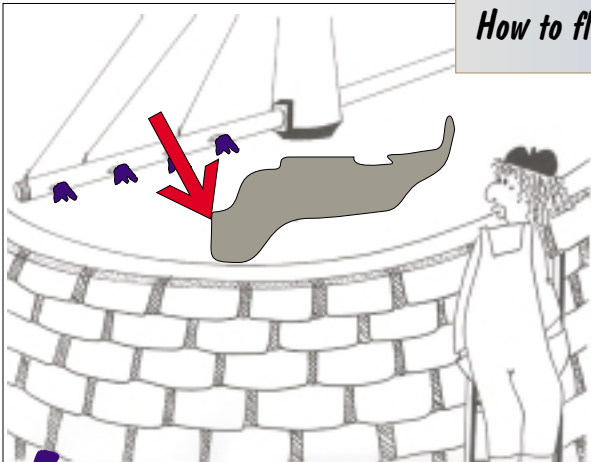
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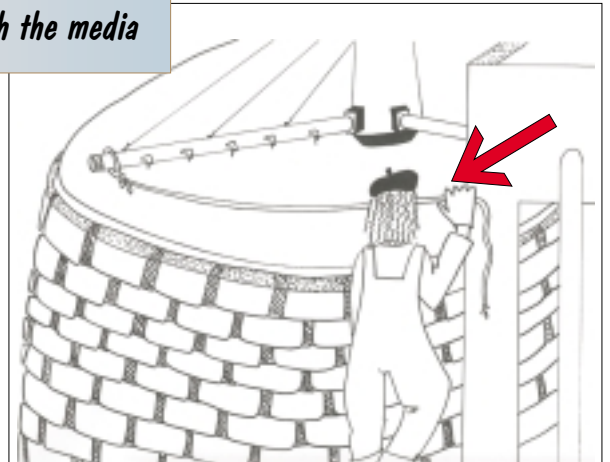
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How to flush the media



The operator checks for ponding on the surface of the media which he then reports to the supervisor. The media should be flushed



1

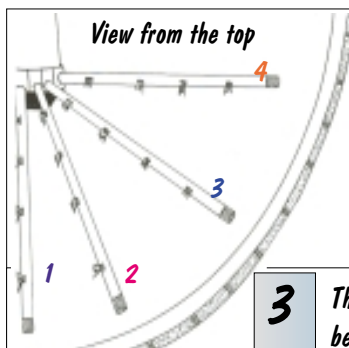
The operator fastens the distribution arm with a rope to a secure location. The arm should be stationary during the flushing



Biological Filtration 7

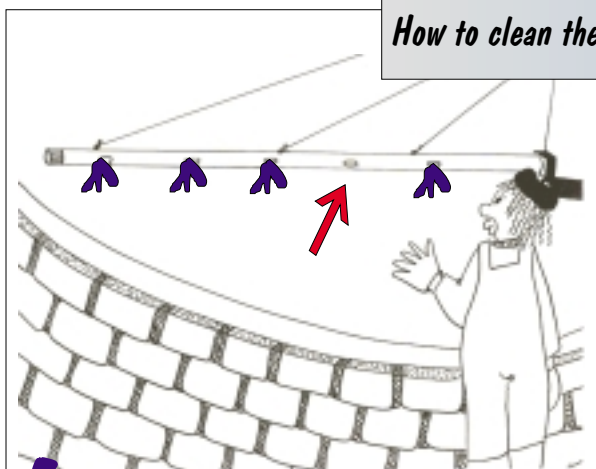


2 The operator loosens the media as much as possible with a fork or crowbar

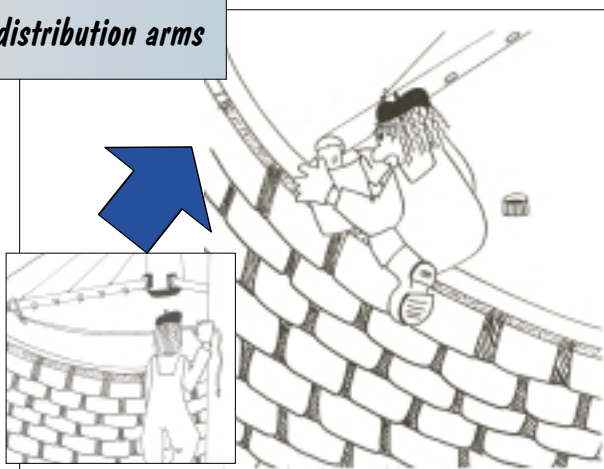


3 The distribution arm should be stationary while receiving flow for 5 min in a specific area (1) to flush the media. He then re-positions (2) the arm and flushes the media for another 5 min. On completion of a quarter of the circle with one distribution arm, the media should be adequately flushed to allow the free flow of waste water through the media bed

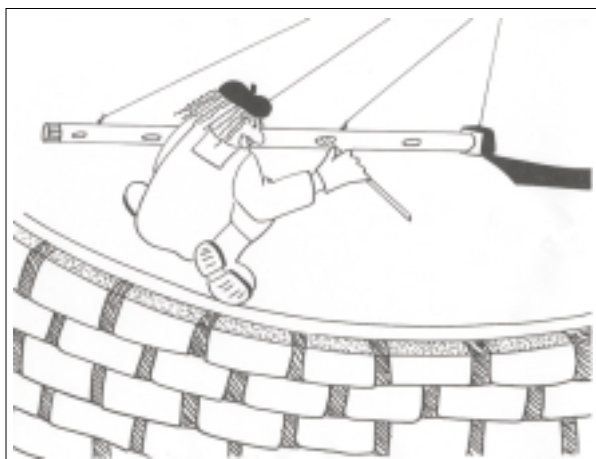
How to clean the distribution arms



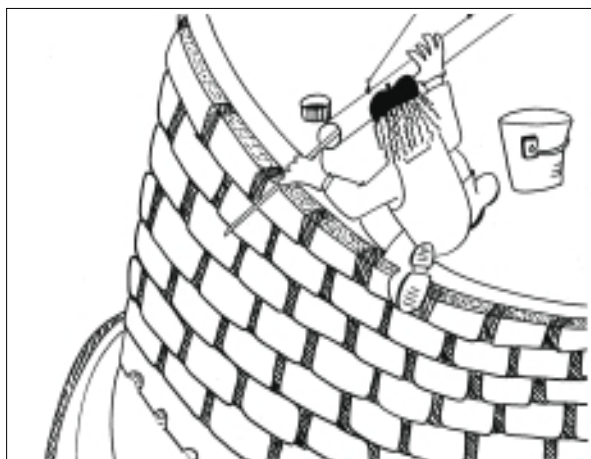
! The operator checks that all the ports in the distribution arms are discharging waste water freely



The operator stops the rotation of the distribution arms and removes the end caps so that the solids can be washed out of the distribution arm



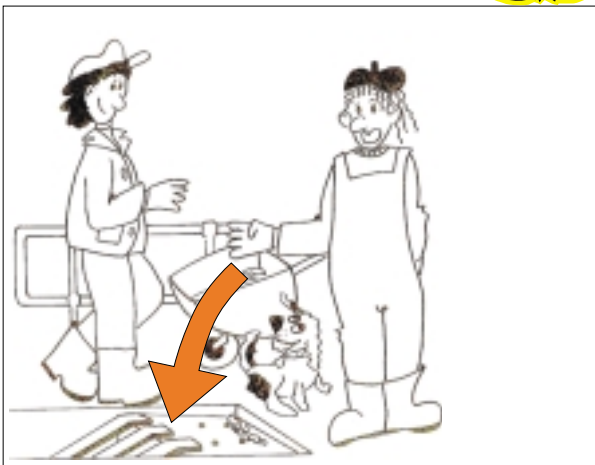
The operator rods the port holes to remove trapped solids



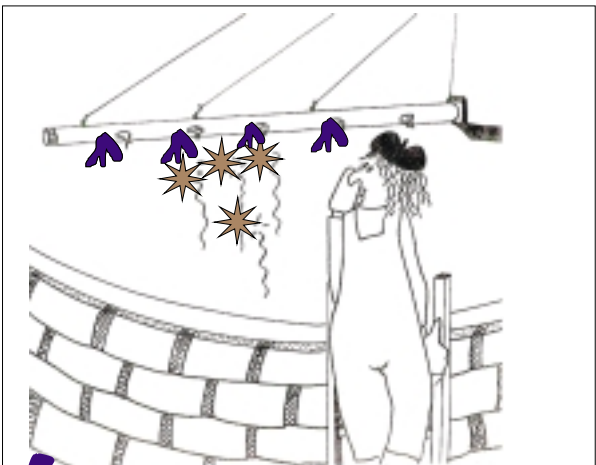
The operator also rods the distribution arm to remove any accumulation



The operator removes solids/debris from the media



The operator disposes of the debris at the inlet with the screenable material. It is allowed to drain and then disposed of in an excavated trench (see page 8)



The operator checks to see if there are any unpleasant odours coming from the media and reports this to the supervisor

Notes

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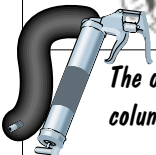
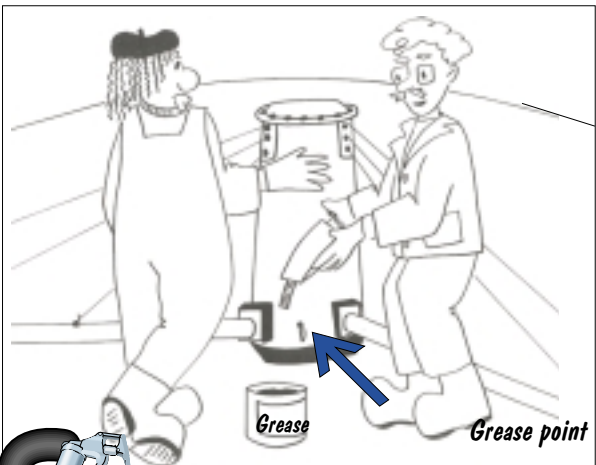
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The operator and supervisor lubricate the centre column at all the designated grease points





Biological Filtration 7



The operator cleans and brushes the effluent launders surrounding the unit



The operator is responsible for removing any vegetative growth around the unit



Notes.....





Activated Sludge Treatment 8

Indawo lapha amanzi a colile ahlanganiswa namaqiwane

Indlela yokucoca indle

Indawo lapho emagciwane ahlanganiswa khona nemanti langcolile

Tula fao dikokoanahloko di kopantshoang le metsi a dihoerehoere

Karola ya hlwekiso fao megare e kopantshwang le metsi a maswe

Karola ya hlwekiso fao ditwatse di hlakantshwago le meetse a ditshila

Indhawu laha switsongwa-tsongwana swi hlanganisiwaka na mati

lama ya nga tangangiki

Fhethu hu no tanganyiswa madi a tshika na zwitshili

Geaktiveerde slykproses



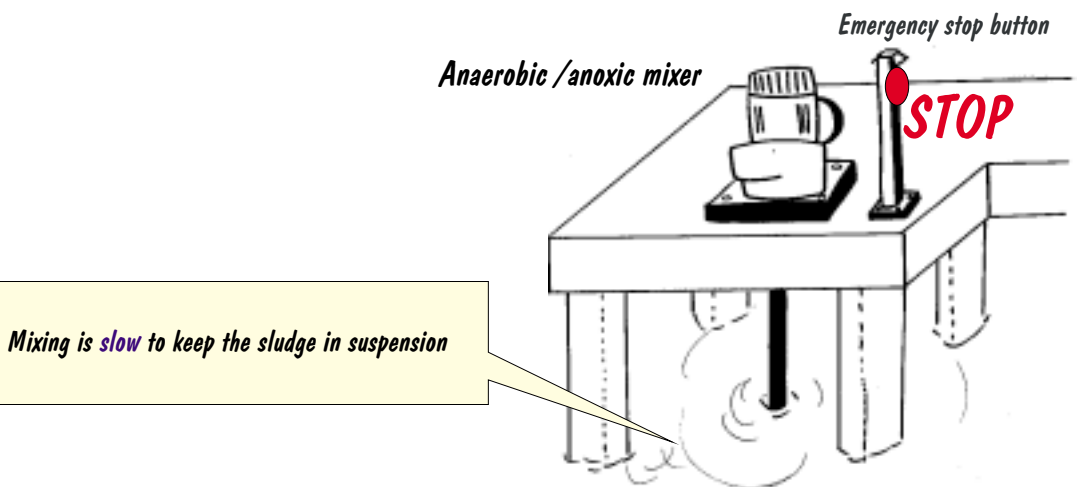


Activated Sludge Treatment 8

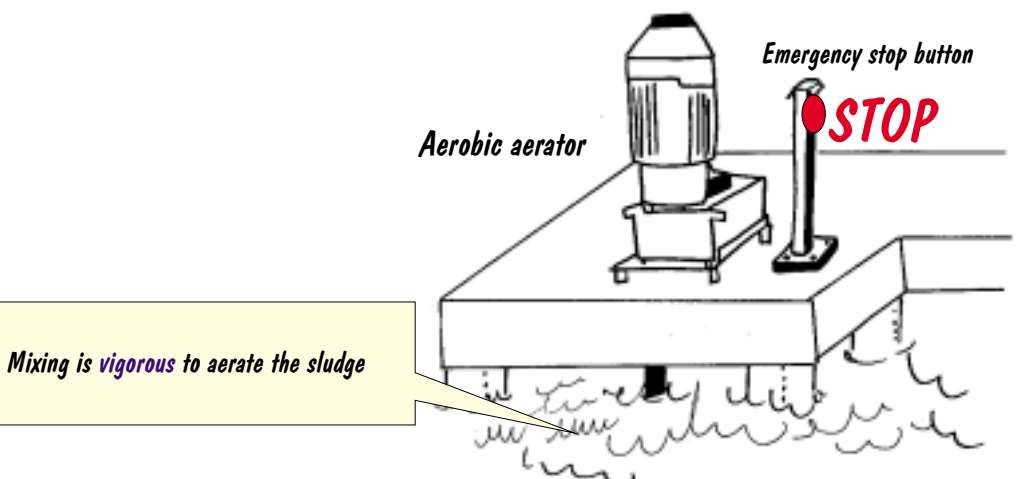
The purpose of the activated sludge unit

An activated sludge process refers to the oxidation of the carbon, nitrogen and phosphorous concentrations in the waste water, depending on the process configuration. The incoming waste water is mixed with sludge that is kept in suspension in a reactor. Oxygen is introduced into the process through surface mounted aerators or by diffused air.

The anaerobic/anoxic reactor - the first part of the activated sludge unit

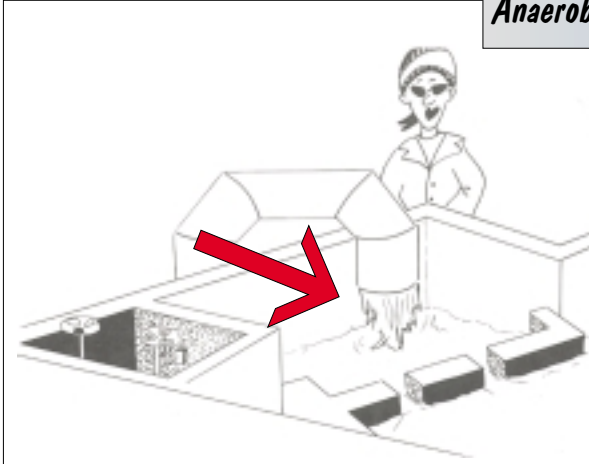


The aerobic reactor - the second part of the activated sludge unit

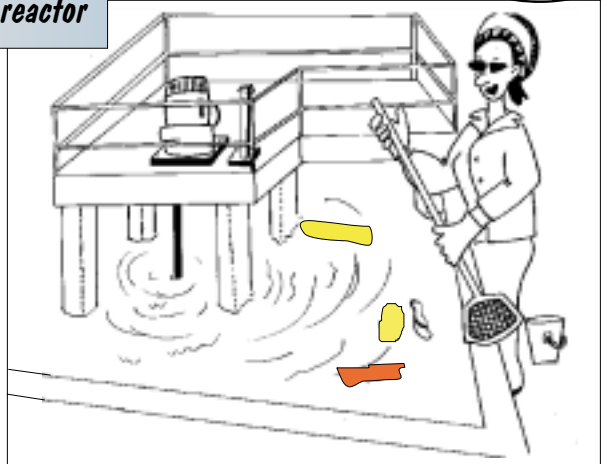




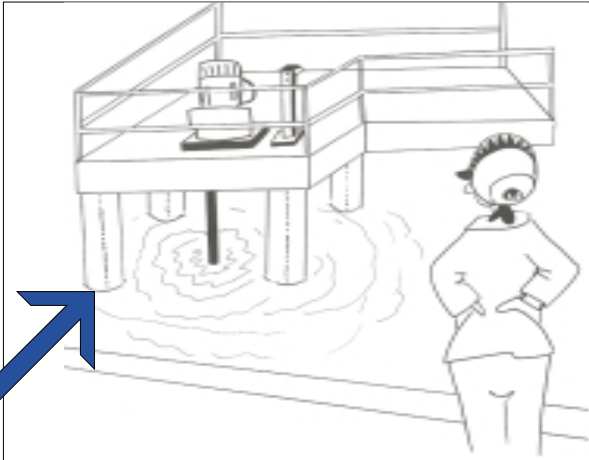
Anaerobic reactor



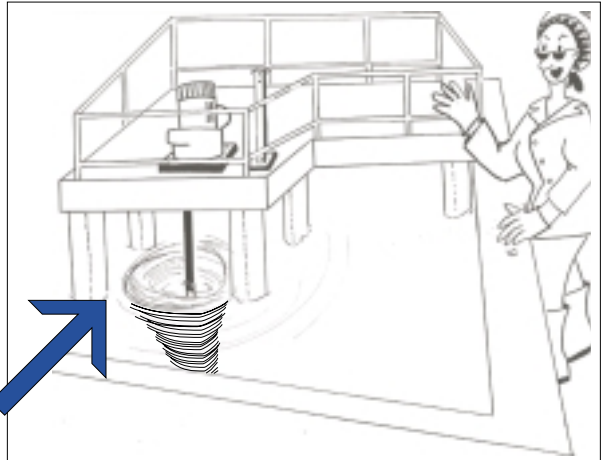
The operator checks and removes any restrictions from the inlet and outlet weirs



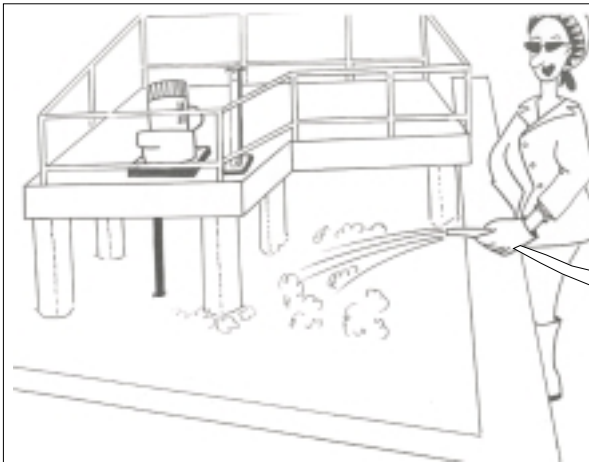
The operator removes any floating debris and disposes of the debris with the screenable material at the inlet (see page 8)



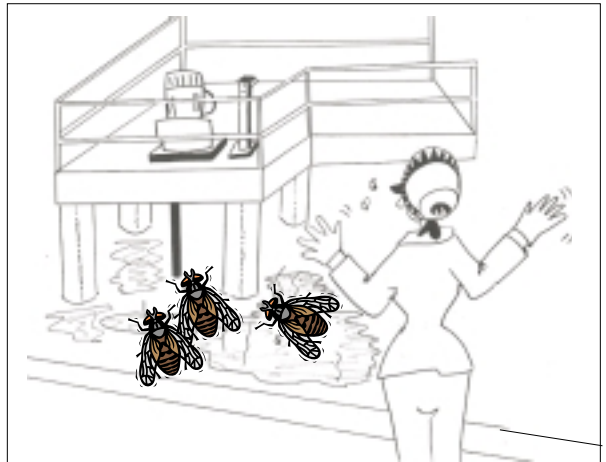
✓ *The operator checks that the anaerobic/anoxic reactor mixers are in continuous operation and reports any problems to the supervisor*




✗ *The operator checks that the anaerobic mixer does not form a vortex in the sludge during the mixing process. Report to the supervisor*



✓ *The operator hoses down any scum formation*



✗  *Scum formations will generate unpleasant odours and encourage fly breeding*

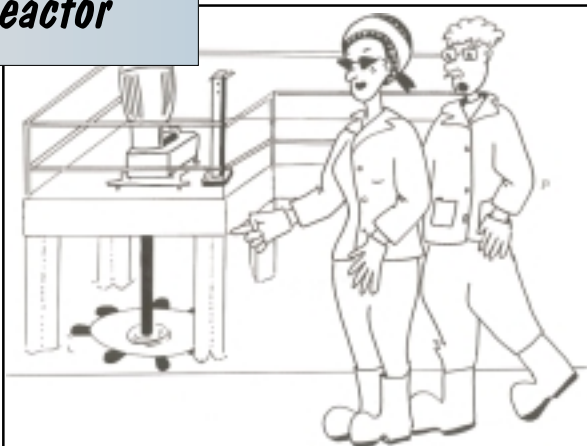


Activated Sludge Treatment 8

Aerobic reactor



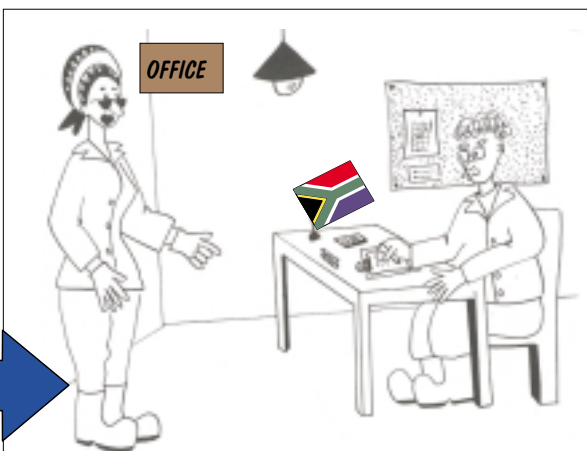
✓ The operator visually checks that the aerobic aerators are functioning properly and that the sludge is stirred effectively



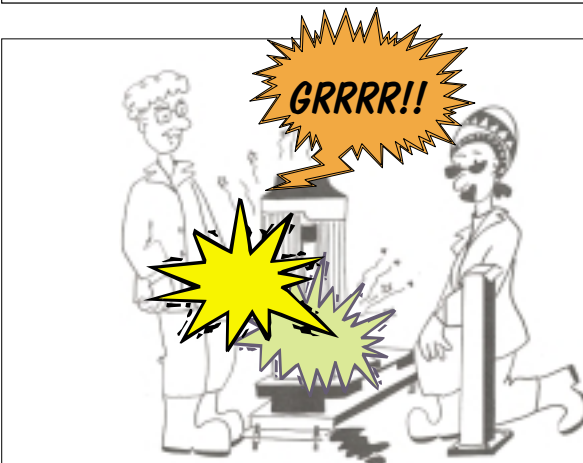
✗ The operator reports malfunctioning aerobic aerators to the supervisor



Malfunctioning aerators could cause excessive scum formation



The operator reports excessive scum production to the supervisor



! The operator reports all unusual noises and oil leaks from the motors and gearboxes to the supervisor

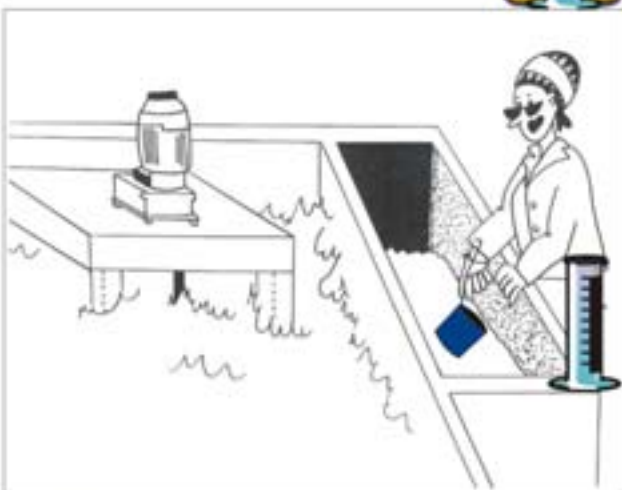


Aerobic reactor



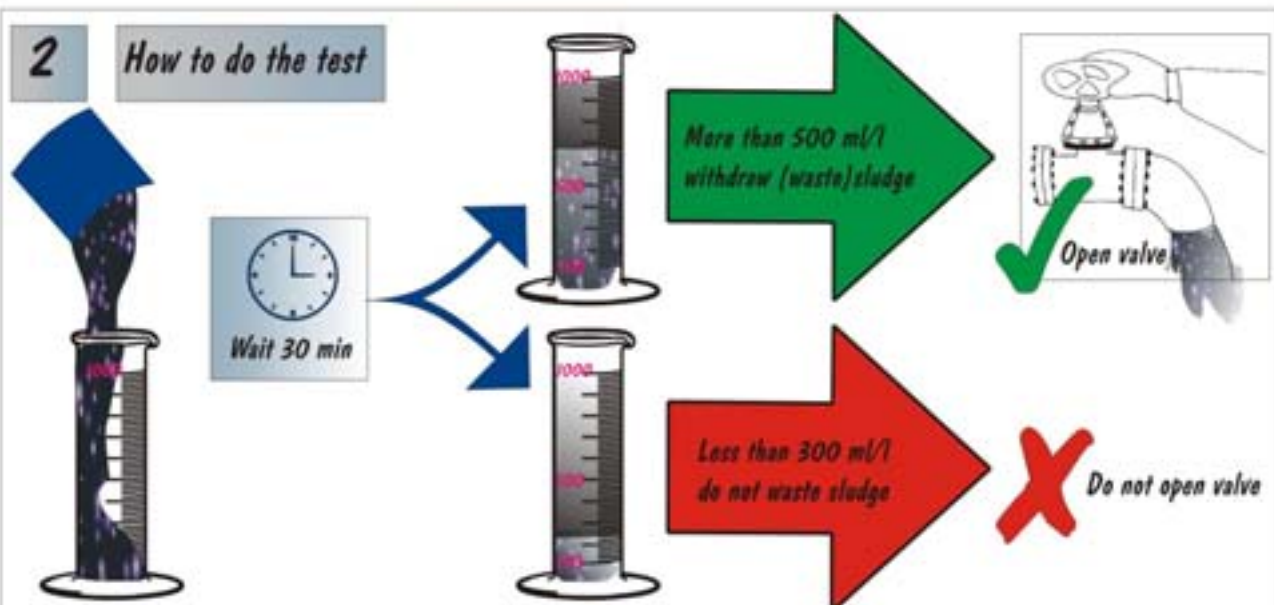
The sludge test

The sludge test is done to determine if sludge should be withdrawn from the process or allowed to accumulate in the process. The test should not be conducted in direct sunlight



1 The operator takes a sample of the overflow from the aerobic reactor for the sludge test

2 How to do the test



OFFICE



3 The operator discusses the results with the supervisor. The supervisor decides whether to waste or accumulate the sludge

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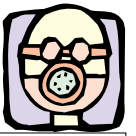


Disinfection 9



Disinfection 9

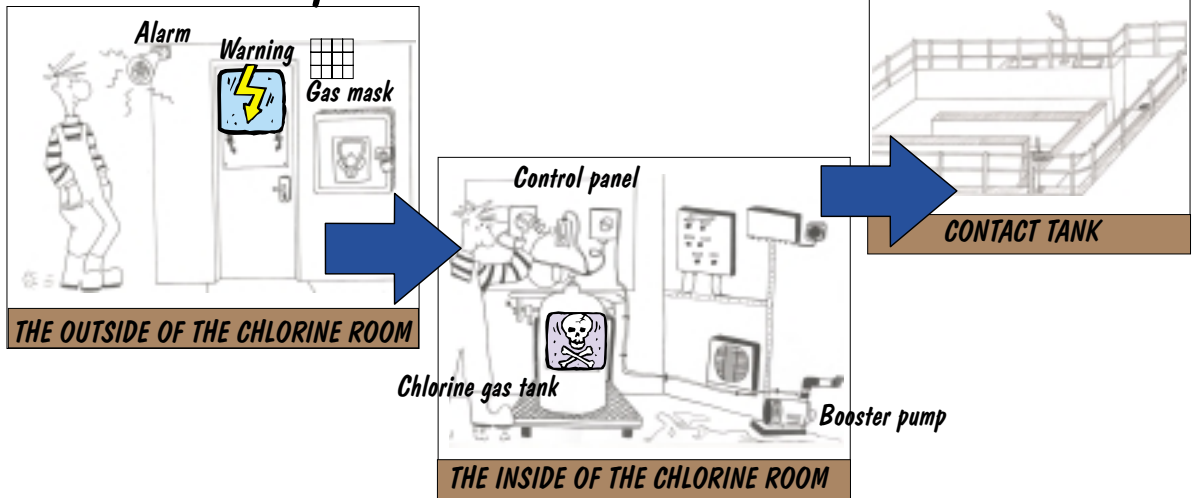
Ukubulala amagciwane
Ukubulala intsholongwane
Kukubulala emagciwane
Polao ea peo tsa mafu
Polao ya megare
Polao ya ditwatsē
Ku dlayiwa ka switsongwa-tsongwana
U vhulaya zwitshili
Ontsmetting



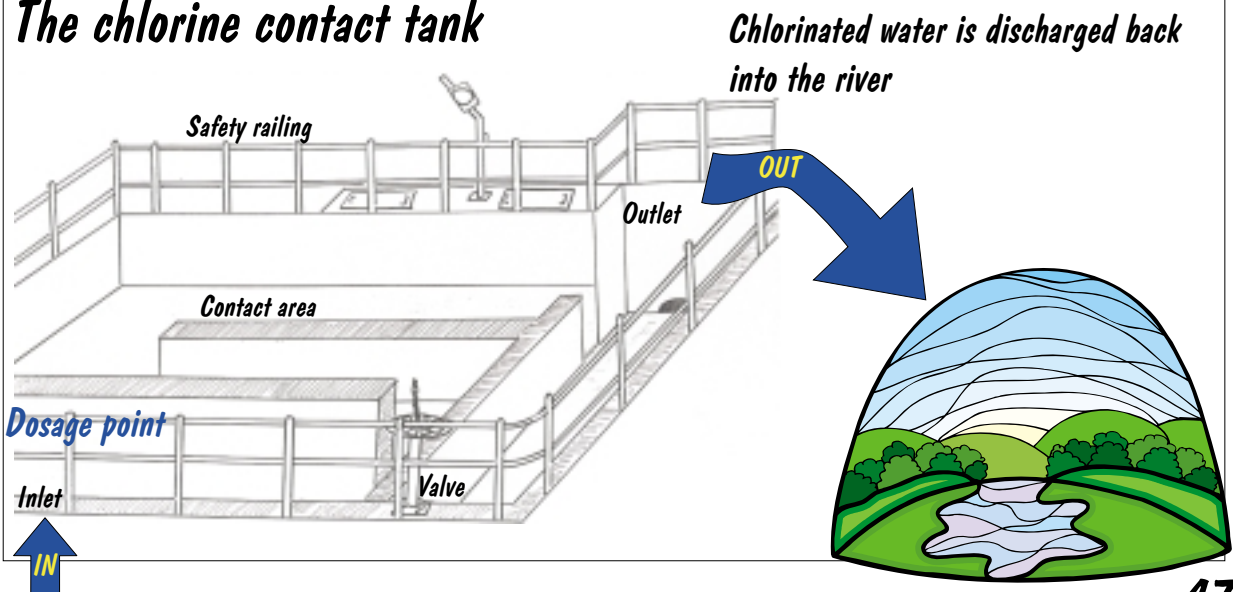
The purpose of disinfection

So far, the treated effluent from the process, usually the overflow from the secondary separation phase, still contains pathogenic (harmful) bacteria. To destroy the pathogenic bacteria, the effluent needs to be disinfected. Disinfection is usually done in the form of an applied chlorine gas dosage. Other forms of disinfection include the application of calcium hypochlorite (HTH), ozone and ultraviolet radiation. Chlorine gas is the most common application and is shown below.

The disinfection process



The chlorine contact tank





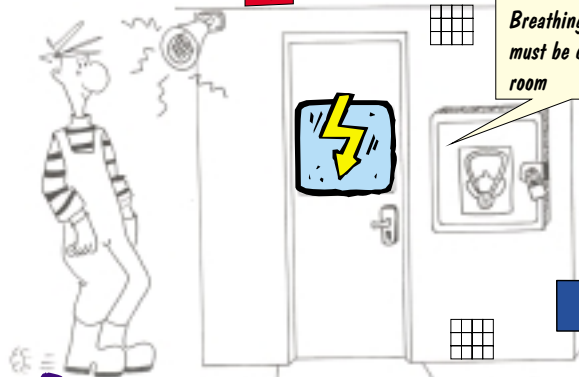
Disinfection 9



Flashing light

Disinfection room

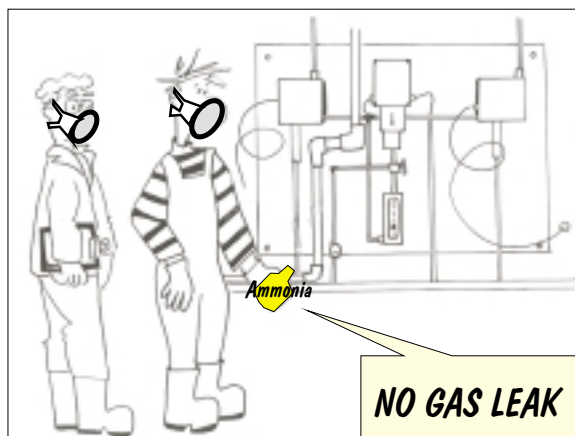
Breathing apparatus must be outside the room



! The operator notices the gas leak alarm is sounding

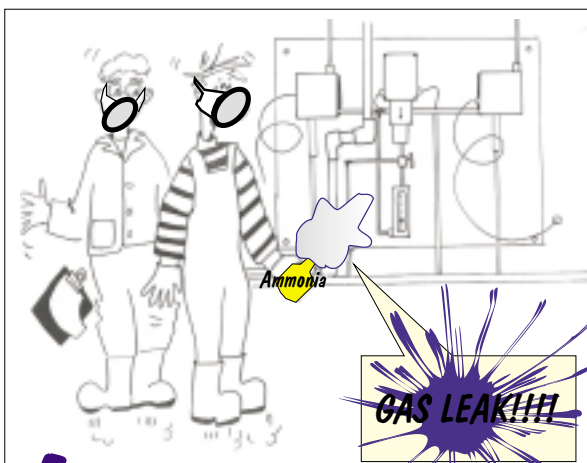


The operator reports the emergency to the supervisor



NO GAS LEAK

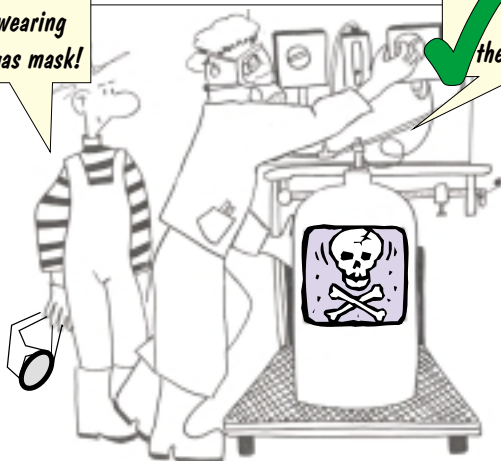
The supervisor uses ammonia vapour from an open bottle to detect possible gas leaks



! There is a gas leak if a little vapour cloud is noticed at any point

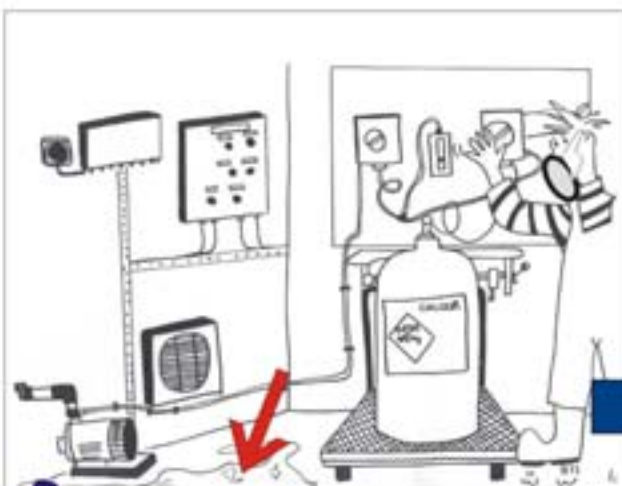
X Not wearing the gas mask!

✓ Wearing the gas mask!



Before entering the room, the operator and supervisor must put on masks. The supervisor is responsible for making any adjustments. Everyone entering the room should wear a mask





The operator makes sure that the booster pump is operational and that there are no leaks or irregular noises



The operator reports all irregularities to the supervisor

Chlorine contact tank



If there is no chlorine gas available, the operator mixes under the supervision of the supervisor, the correct amounts of granular chlorine and water in the solution tank. This is then dosed in the chlorine contact tank

Chlorine tablets



The operator can also use chlorine tablets for the disinfection process



The operator removes any floating debris from the contact tank and disposes of the debris at the inlet with the screenable material (see page 8)

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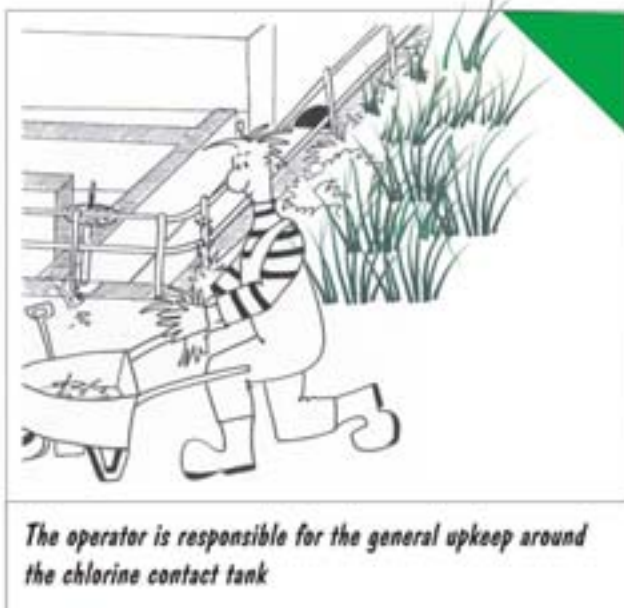
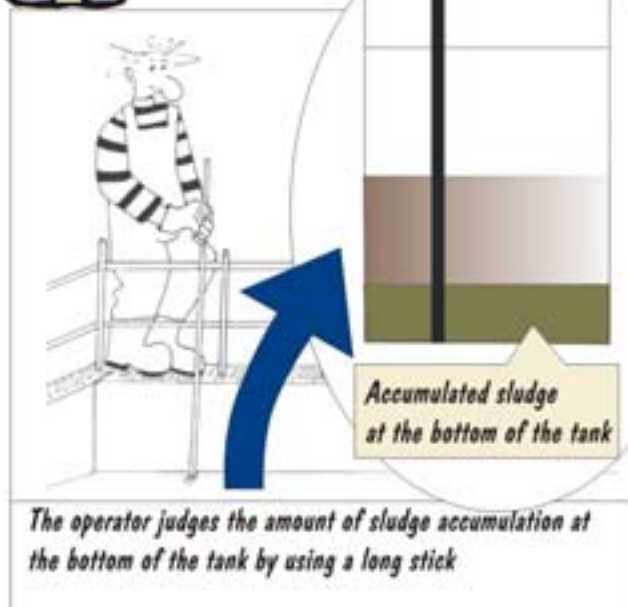
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Disinfection 9



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Anaerobic Sludge Digestion 10

Inqubekho yoku phula udaka ngaphandle kwe moya oqoqekile
Indlela yokwahlukanisa udaka kwindayo engena moya ococekileyo

Indlela yekuphula ludzaka ngaphandle kwemoya lohlantekile

Ketsahalo ea ho fokotsa seretse ntle le tshebediso ya moea o o hloekileng

Tiro ya go thubaganya seretse kwa ntle ga moya o phepa

Phetogo ya go fokotsa leraga ntle ga moya o hlwekilego

Maendlelo ya ku hunguta/ku faya ndzhope ku ngari na ku nghenelela

ka moya lowo tenga

Mushumo wo u fhungudza matope hu si na u shumisa muya wo kunaho

Anaerobiese slykvertering

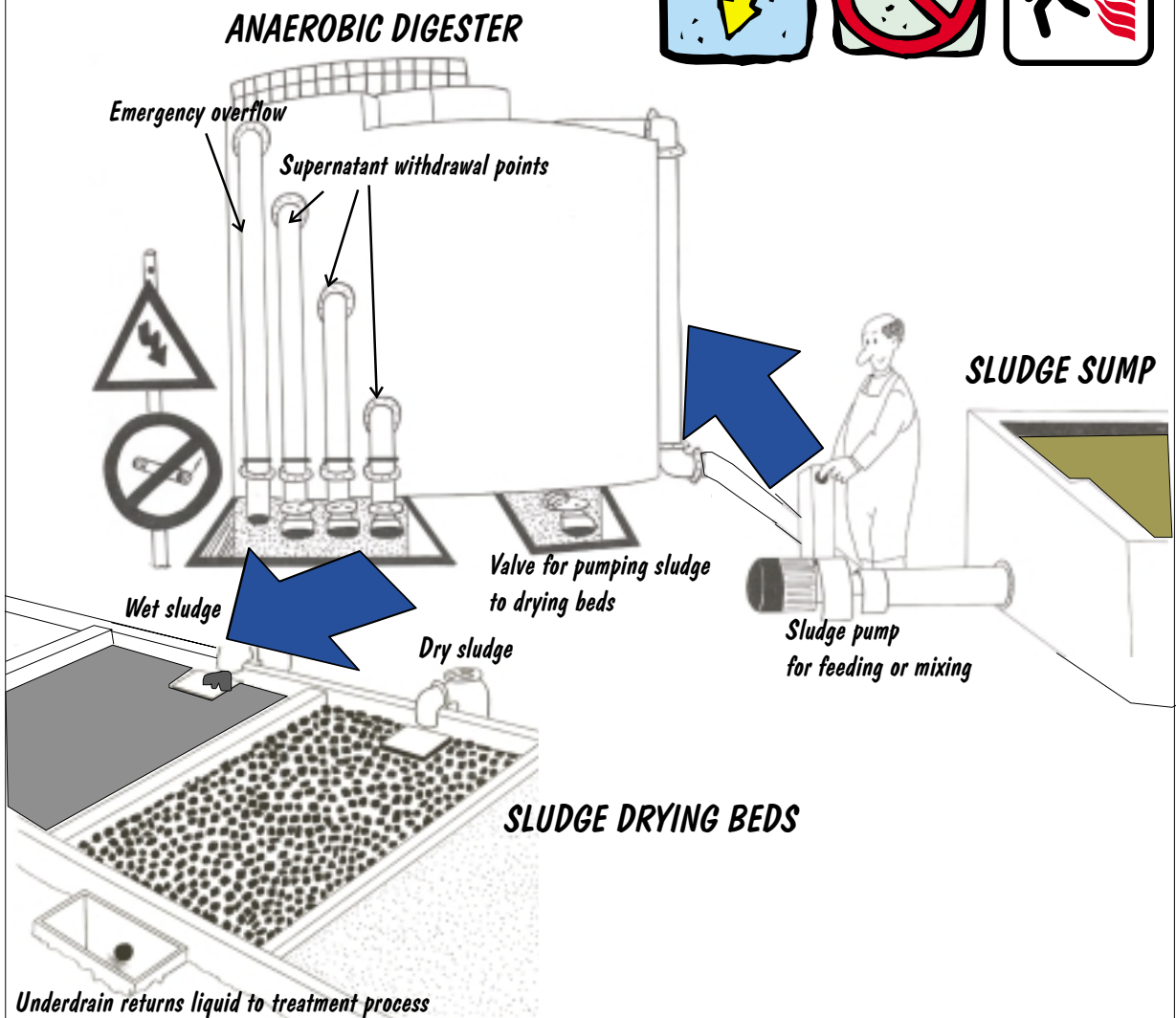


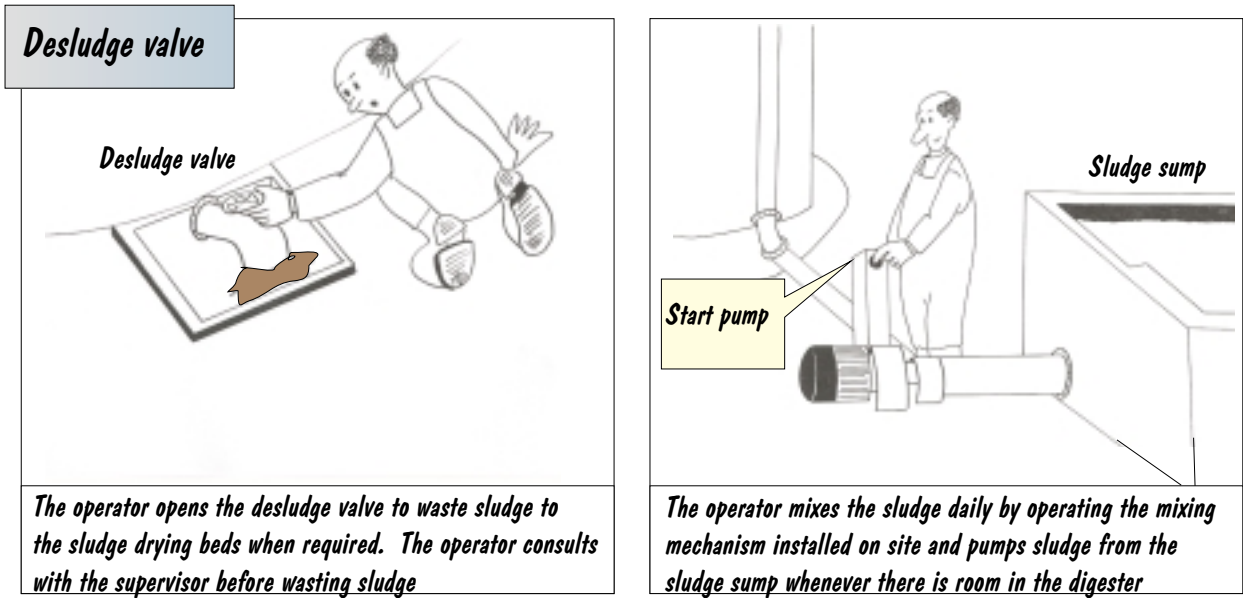
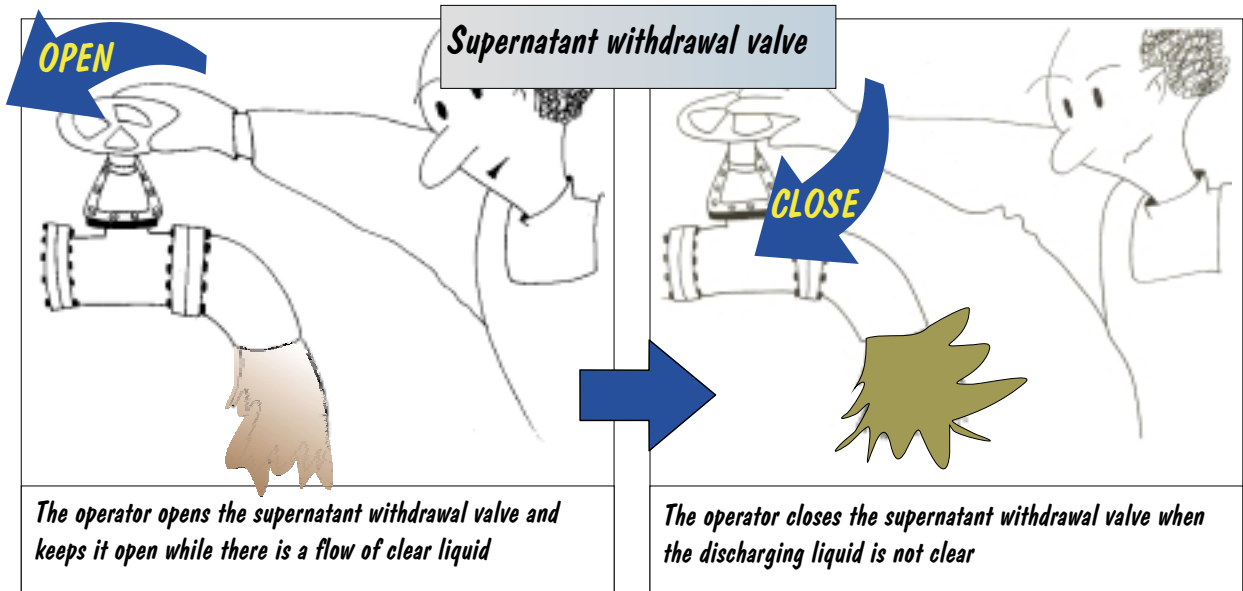
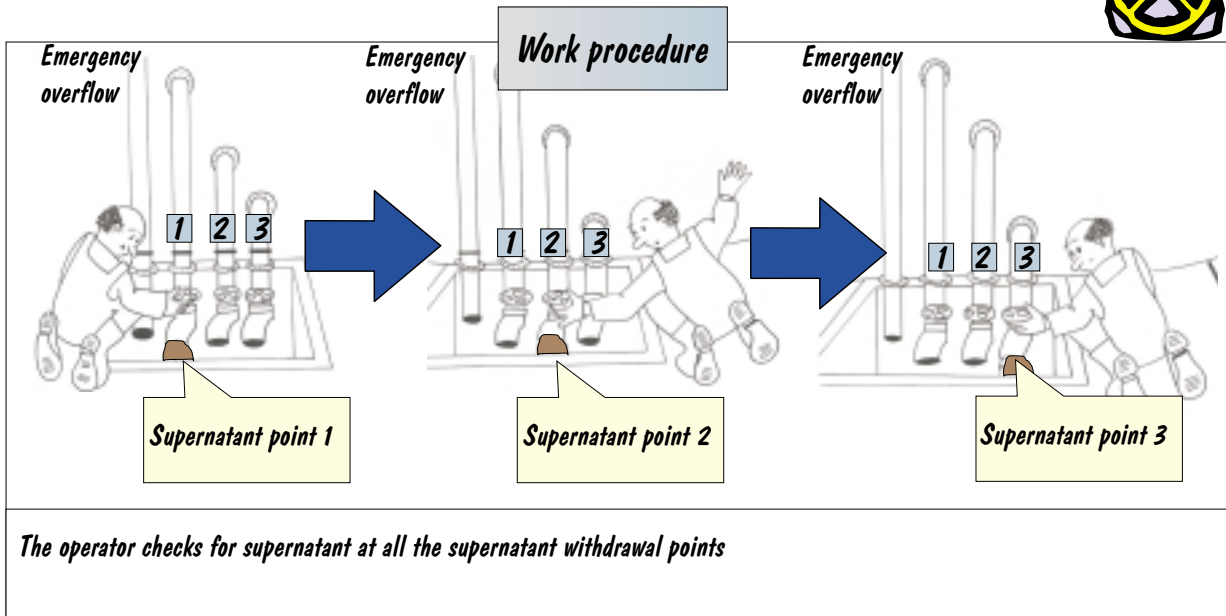


The purpose of the anaerobic sludge digestion

The anaerobic digestion of sludge is a tertiary treatment stage that stabilises surplus solids - the sludge that is generated through the sewage treatment process. The surplus sludge is retained in anaerobic digesters for a certain time period during which the sludge particles are anaerobically digested.

The anaerobic digestion



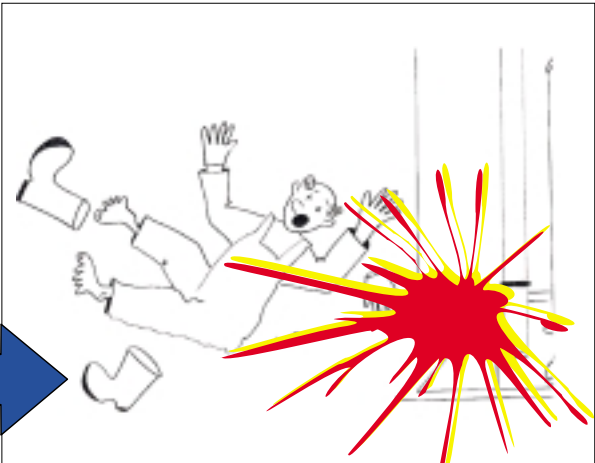




Anaerobic Sludge Digestion 10



SAFETY TIP The operator should not smoke near the anaerobic sludge digesters



Flammable methane gas is produced in the process. Smoking near the digesters may cause explosions



The operator is responsible for the general upkeep around the digester



Notes

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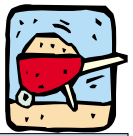
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Sludge Drying Beds 11

Indawo lapho komiswa khona udaka
Indawu yokomisa udaka
Indzawo lapho kumiswa khona ludzaka
Matamo a o omisa seretse
Tula ya go omisa seretse
Tulo tša so omisa leraga
Ndhawu laha ku omisiwaka ndzhope
Fhethu ha u omisa matope
Slykdroogbeddings

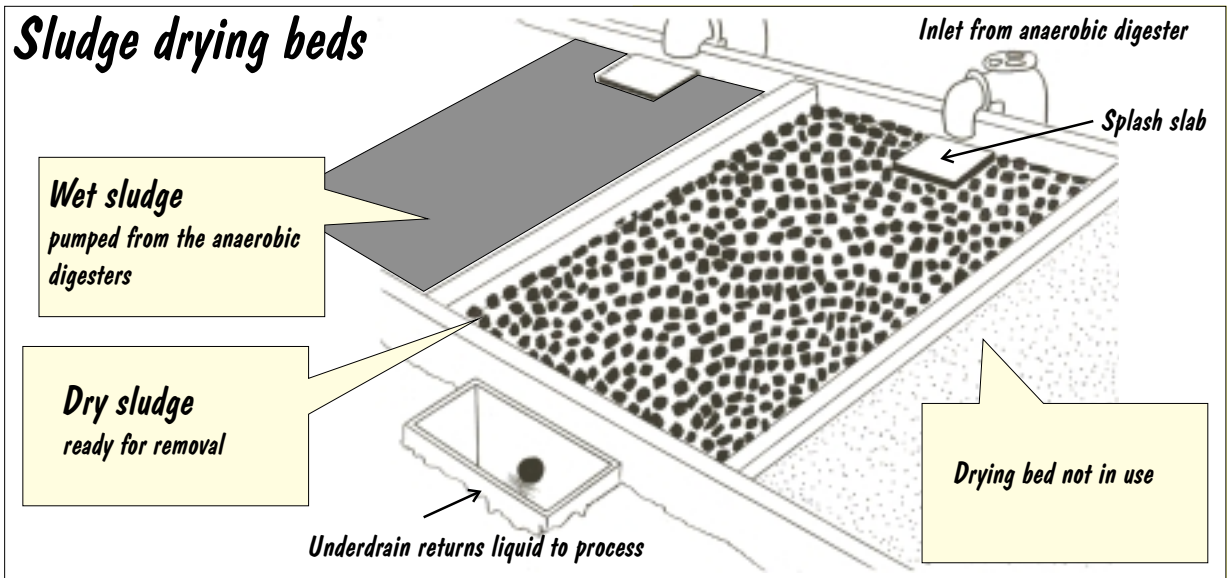




The purpose of the sludge drying beds

Sludge drying beds are provided to allow surplus sludge that is withdrawn from the process to dry for easier handling. Sludge drying relies on an underground drainage system as well as sunshine. Liquid from the underdrains should be returned to the sewage treatment process for further treatment.

Sludge drying beds



Wet sludge



✓ The operator makes sure that the sludge is wasted to the recommended depth of 300 mm



✗ The operator must make sure that the sludge drying beds are not filled to the brim



The operator checks that splash slabs are in place to ensure that the underdrain filter media is not disturbed



The operator sprinkles lime on the wet sludge to discourage flies



Flow from the underdrainage system



The operator checks that the media is filtering clear liquid, by inspecting the flow from the underdrainage system



The operator reports to the supervisor if the flow from the underdrainage system is not clear



The operator reports to the supervisor if there is no flow from the underdrainage system from a wet sludge drying bed

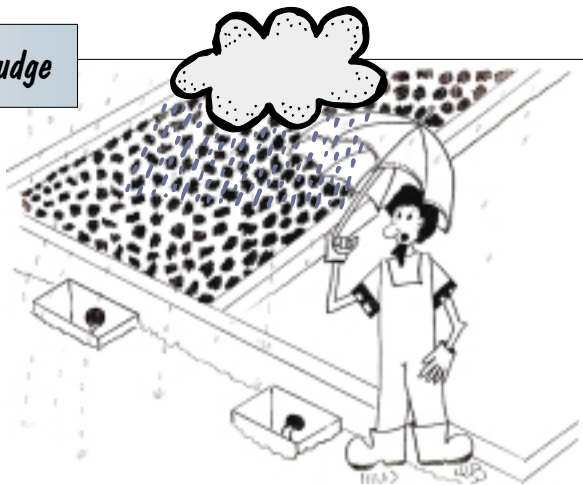
Notes

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Sludge Drying Beds 11

Dried sludge

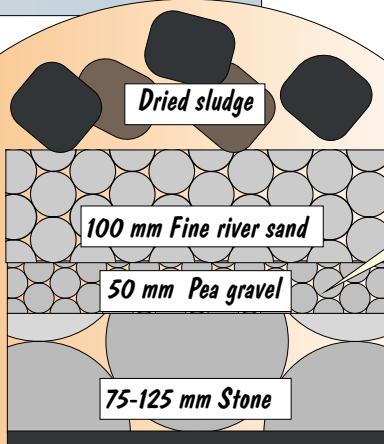
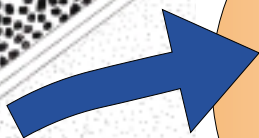
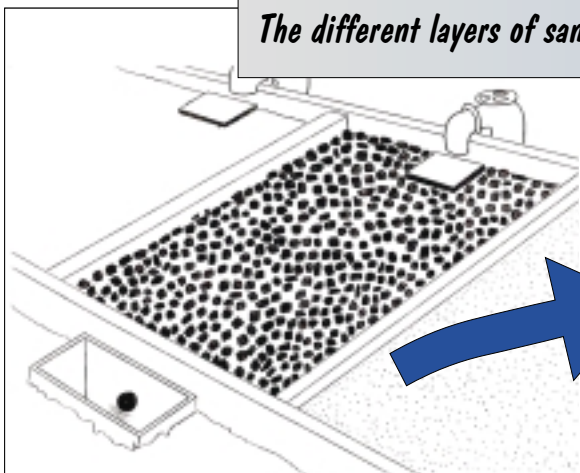


The operator should remove the dried sludge from the drying beds to make space for wasting sludge from the anaerobic digester

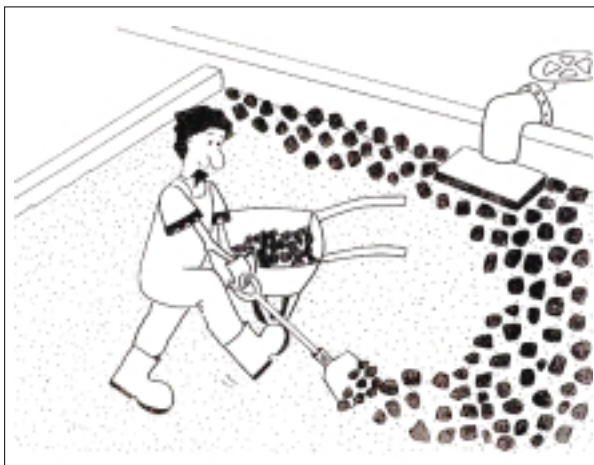


If the dry sludge in the drying beds gets wet again, there might be no beds to waste sludge from the anaerobic digester

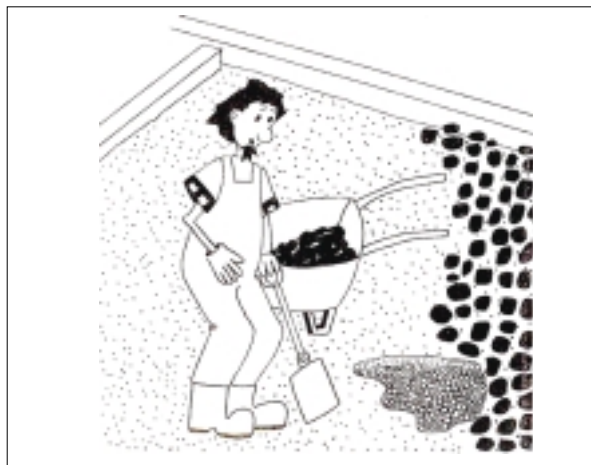
The different layers of sand, gravel and stone in the bed



DO NOT disturb the bottom layers when removing the dried sludge



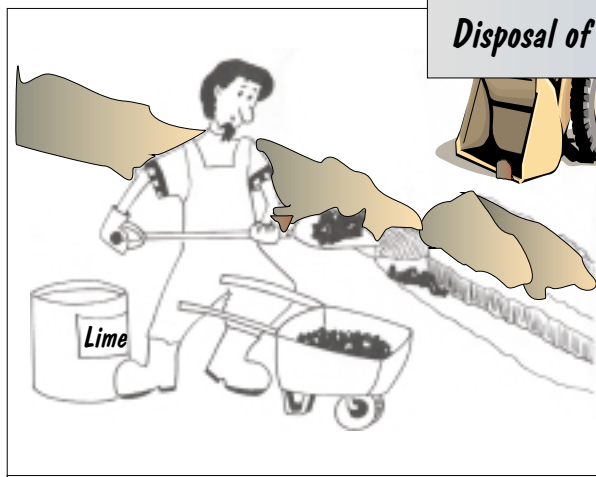
The operator removes the dried sludge, taking care not to disturb the top sand layer on the drying bed



The operator calls the supervisor in case the top media layers has been disturbed



Notes



Disposal of the dried sludge



OR



The operator puts the dried sludge in a designated area for composting





Tertiary Treatment 12

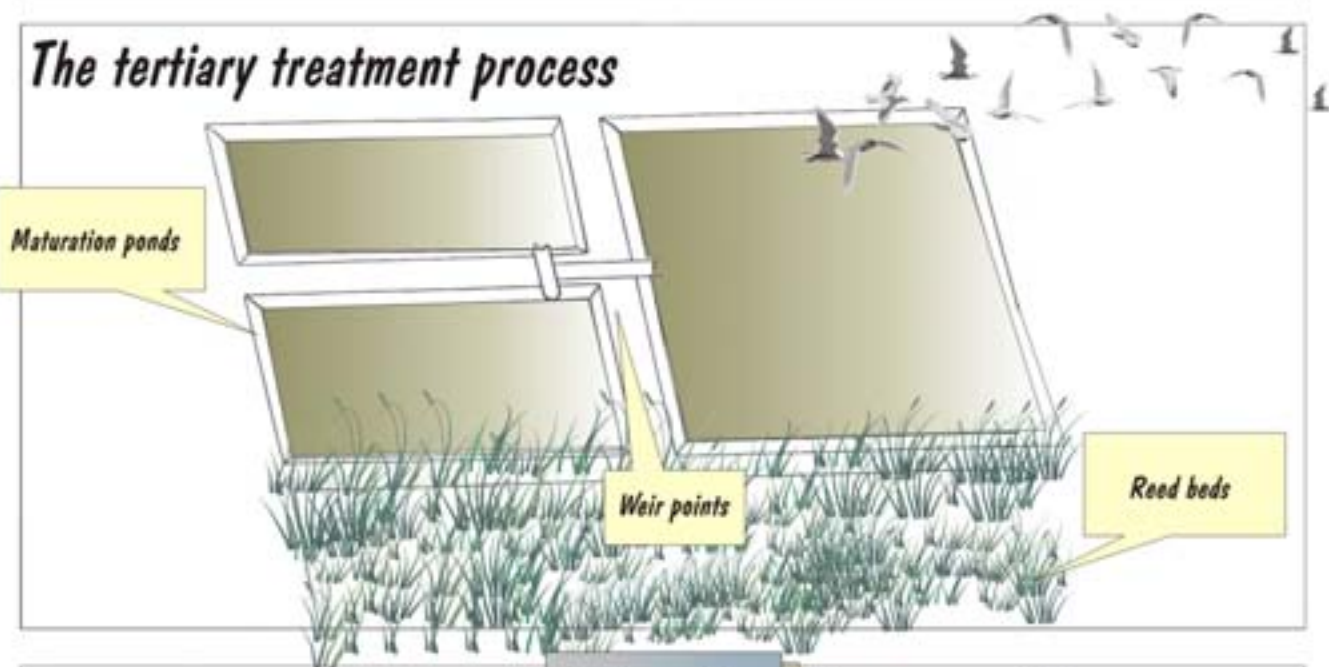
Indawo yoku hlwengisa ephezulu
Indawu yokucoca ephakamileyo
Indzawo lephezulu yekuhlobisa
Tulo ea ho hloekisa metsi e e hodingoana
Tulo ya go phepafatsa e godingwana
Karolo ya go hlwekiša e godingwana
Xiphemu xa ku tengisa xa xiyimo xa lehenhla
Fhethu ha nthu hu no tanziwa hone madi
Tersiêre behandelng



The purpose of the tertiary treatment process

Usually tertiary treatment at a sewage works involves a series of ponds, wetlands or reed beds that are installed to provide a degree of “polishing” of the treated effluent discharged from the mechanical treatment process. This is particularly important in the event of mechanical failure in the upstream process or during extended power failures.

The tertiary treatment process



Work procedure

The operator must check that there is a minimum of 500 mm freeboard (space between the embankment and the water level)



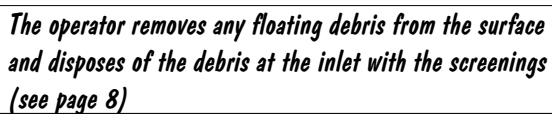
The operator removes any vegetation, plastic bags or dead birds from the inlet and outlet weir points. Dead animals and birds should be reported to the supervisor



The operator observes unusual odours and reports to the supervisor



The operator checks the colour of the water, and if not greenish in appearance, reports to the supervisor



Notes.....





Pump Stations,

Electrical Boards, Store Room 13

Indawo yamapompo, indawo lapha kulawulwa khona ugezi & indawo
lapho kubekwa khona imphahla

Isitishi sokupompa amanzi, ulawulondawo yombane & indlu yokugcina
Indzawo yemhpompi, indzawo lapho kulawulwa khona gezi & indzawo
yekubeka timphahla

Tulo eo dipompo, tulo ho laoloang motlakase & ntlo ya ho bolokela

Tulo ya dipompo, tulo fa go laolwang motlakase & tulo ya polokelo

Tulo ya dipompo, taolong ya motlakatse & ntlo ya bobolokelo

Xitixi laha ku pomperiwaka kona, laha ku lawuriwaka kona ghezi & yindlu
ya vuhlayiselo

Ho no dzula bommbo, ho no langulwa mudagasi & fhethu ha u vhlungela
Pompstasies, elektriese verspreidingsborde, stoorkamer

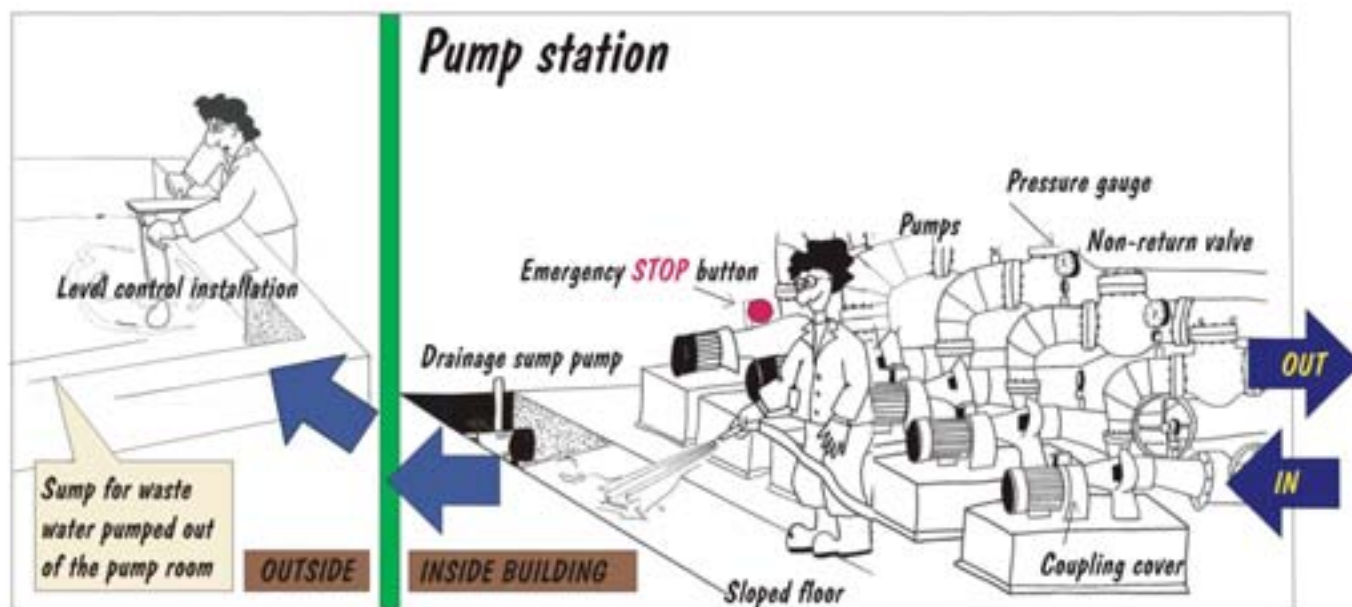




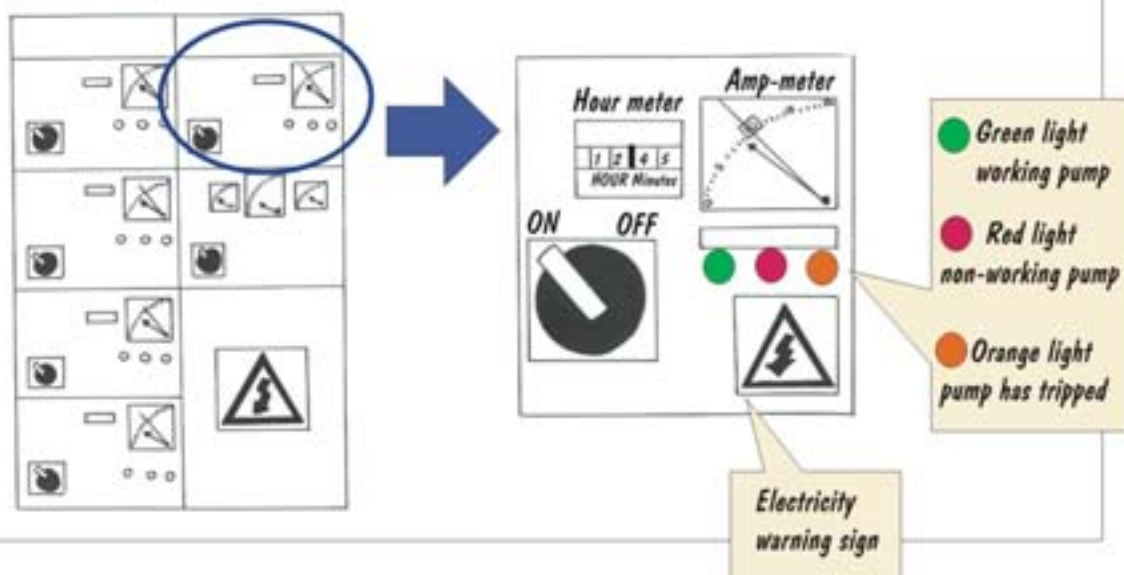
The purpose of the pump stations and electrical boards

Pump stations are provided in situations where the flow of waste water into and out of a sewage works under gravity (unassisted natural flow) is not possible

Electrical control boards are necessary to ensure that the correct power is supplied to each mechanical item and to protect equipment from damage by lightning. Electrical control panels also provide information on the operation of mechanical equipment.



The electrical board





How to read the electrical board



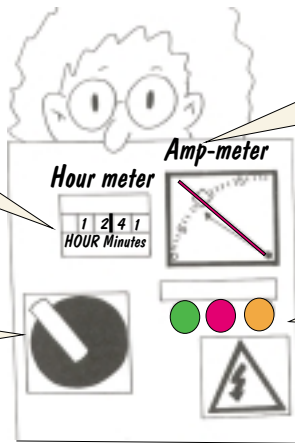
The operator takes regular readings



The operator calls the supervisor when there is a flashing orange light on the board. This is an indication that a pump has tripped

The hour meter shows the time that the pump has been working

ON/OFF-switch



The amp-meter reading must not be higher than the marked line on the meter. If the reading is higher, switch OFF the pump and call the supervisor

- Green light working pump*
- Red light non-working pump*
- Orange light pump has tripped*

The operator records the various readings on the board

Notes

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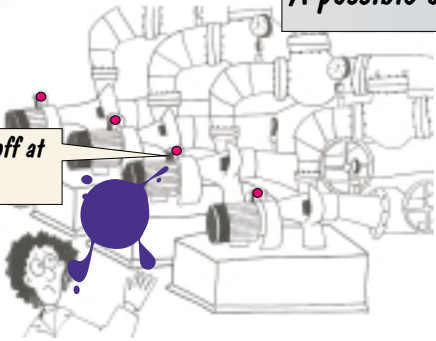
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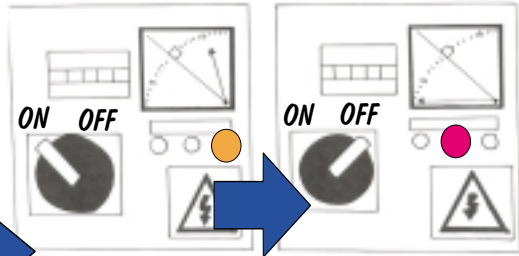


A possible obstruction in the pump

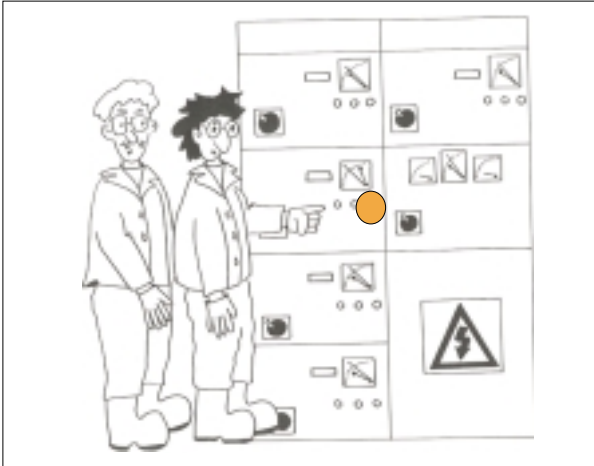
Switch pump off at
STOP button



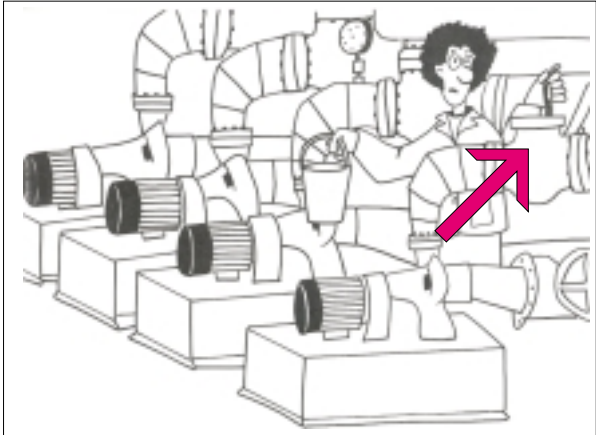
The operator notes that all the pumps are switched on, but that one of the pumps switches on/off at irregular intervals. This might be an indication that there is an obstruction in the pump. He switches the pump off at the emergency button and then goes to the electrical board



The operator switches the pump off at the appropriate switch



The operator reports this to the supervisor



The operator removes any obstruction from the non-return valve or a pipe bend

Notes

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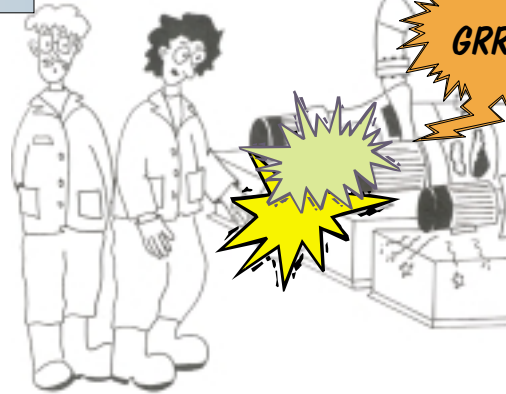
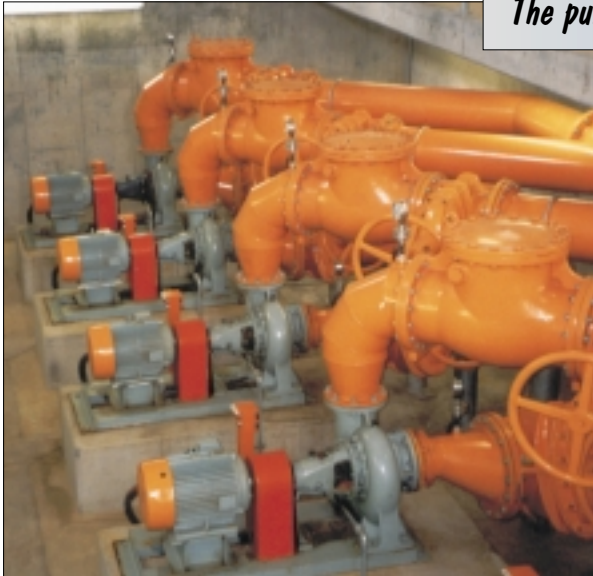
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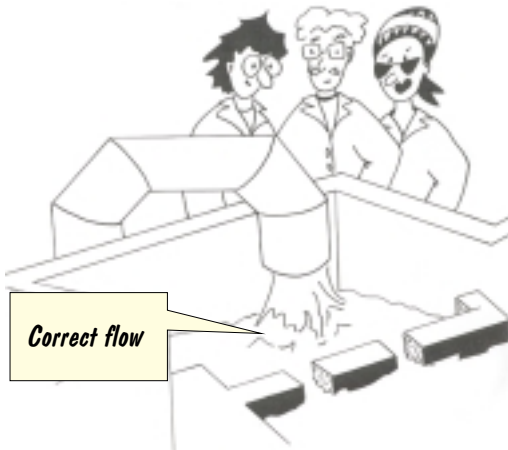
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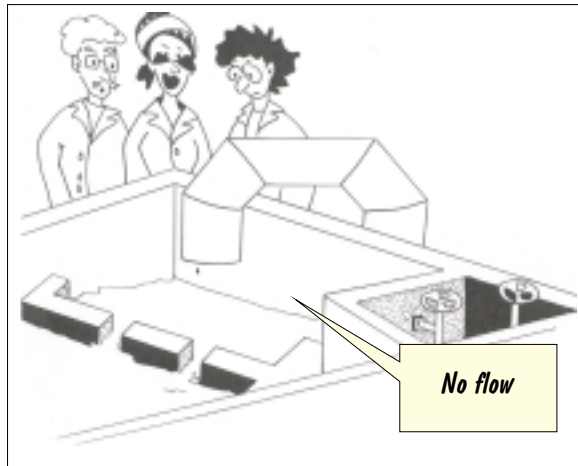
The pump station



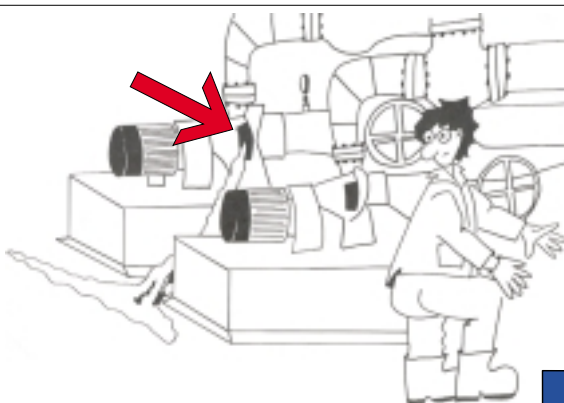
The operator notes that the pump is overheating and making a noise. He calls the supervisor



The operator and supervisor make sure that there is flow at the inlet and discharge at the outlet



If there is no flow, it is usually an indication of a blockage



The operator notes that there is excessive water leaking from the gland or pipe connections (not the normal slow drip from the gland)



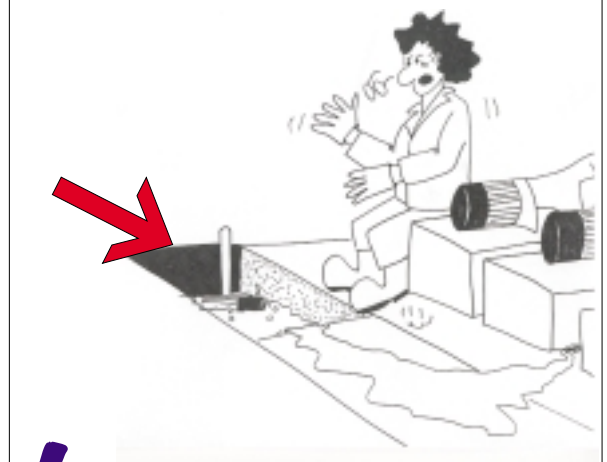
The operator reports all leaks to the supervisor



Pump Stations, Electrical Boards, Store Room 13



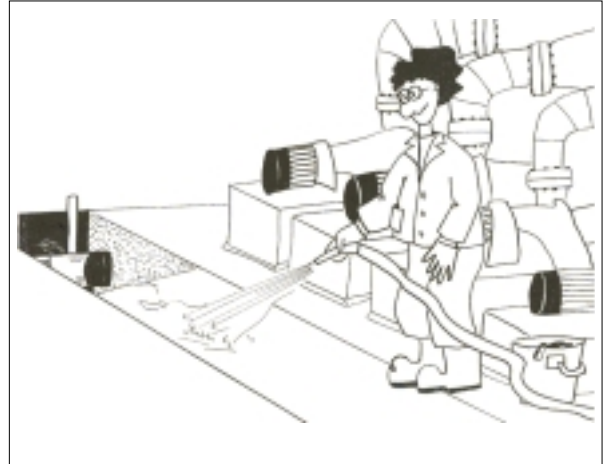
The operator checks that the water from the leaks runs down the sloped floor towards the drainage sump. The drainage sump pump removes the water to avoid flooding inside



! *The operator makes sure that the drainage sump pump is operational. If it is not operational the drainage sump pump and the entire pump station can be flooded*



Call the supervisor in case of any emergency



The operator cleans the floor with clean water

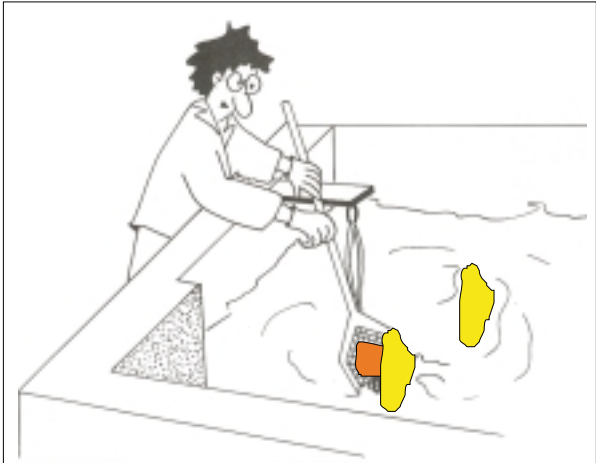


The sump

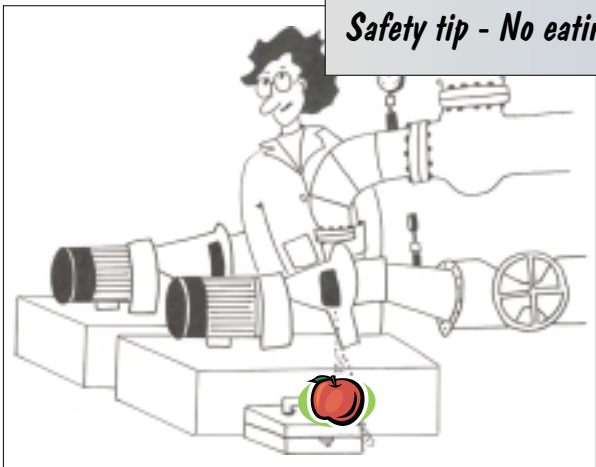
Waste water is usually collected in a sump. The operator checks that the sump does not overflow and checks the level control installation



The operator hoses and cleans the level control installation

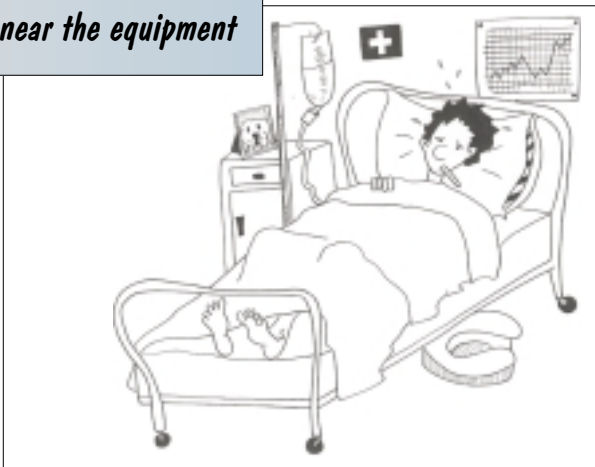


The operator cleans the sump and collects any debris. The debris is disposed of with the screenable material at the inlet (see page 8)

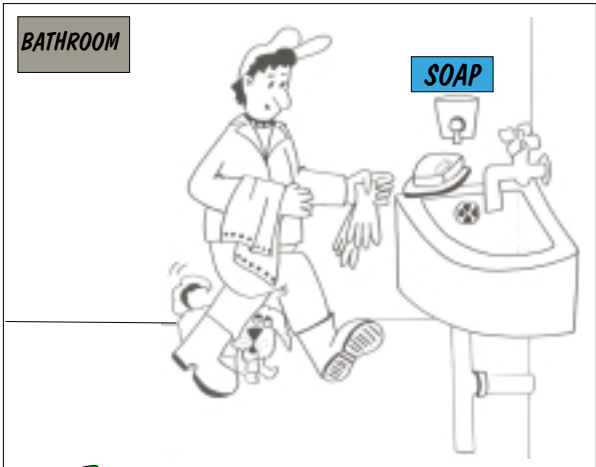


Safety tip - No eating near the equipment

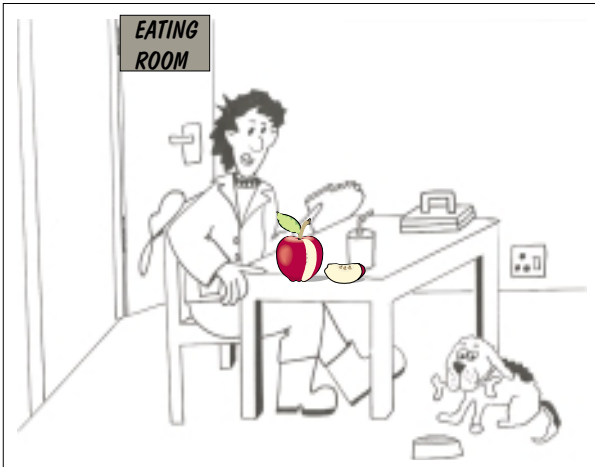
X *Do not leave any food stuffs in the pump station room*



Contaminated food can lead to illness



✓ *The operator washes before eating*



The operator eats in the designated area



Pump Stations, Electrical Boards, Store Room 13

Safety tip - No loose clothing near the equipment

Coupling cover lying on floor

The operator must not wear any loose clothing near the pumps. Operators must button up any loose clothing near mechanical equipment

Coupling cover lying on floor

Button up!

Accidents might happen and injuries might occur

Safety tip - Store room

STORE ROOM

✓ *Always keep the store room neat and tidy*

STORE ROOM

✗ *An untidy store room can lead to injury*

Notes

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Activated Sludge Process A sewage treatment process where bacteria are mixed with waste water and the mixture is aerated

Indawo lapha amanzi a colile ahlanganiswa namaqiwane

Aerobic In the presence of oxygen

Ephila ngomoya ohlanzekile

Ammonia Vapour A cloud that consists of the chemical ammonia

Intuthu ene chemical ye amonia

Anaerobic Ponds

Amadamo ahlanza amanzi aqolile, angasebenzisi umoya ohlanzekile

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Inqubekho yoku phula udaka ngaphandle kwe moya oqoqekile

Anaerobic A condition without oxygen

Isikhathi kungane moya oqoqekile

Anoxic A reaction that takes place without the presence of free oxygen

Isenzo lapho kungana khona umoya oqoqekile

Bacteria Microscopic living animals

Izibungu eziphilayo, ezibonakalayo ngaphansi komshini okhulisayo

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Indawo lapho amagciwane ehlelikhona

Blockage Obstruction

Ukuvaleka

Center Column Conical tower in center of biological filter

Umyango wophoshongo wongaphakathi nendawo ena matshe

Contaminated Infected with dirt, polluted

Eqolile

Debris Scattered fragments afloat

Ezitantayo / Eziphaphamele

Desludging Removal of surplus sludge

Ukususwa kwedaka elisele

Detritus Sand and grit

Umhlabathi

Disinfection Killing of germs

Ukubulala amagciwane

Distribution Arm Rotating pipes with openings on a biological filter

Amaphayiphi anemibhobo azungezwayo phezu kwendawo ena amatshe

Effluent The discharge (outflow) from a sewage works

Amanzi a gelezelayo abuya endaweni lakhona kungezwa amanzi aqolile

Electrical Boards

Indawo lapha kulawulwa khona ugezi

Excavate To dig up

Ukugubha

Flow Instrument An instrument which measures the flow of water

Iwashi elibonisa ukugeleza kwamanzi

Glossary

Amagama okungena nenqazelo

Granular Chlorine A white, coarse powder chemical

E chemical emhlophe enamagwargwar

Grit

Umhlabathi

Grit Channel

Umsele wesanti

Incinerator A structure in which objects can be burned

Indawo lapho kushiselwa khona



Inorganic
Eya vuthuluga
Launders Channel like structures in which effluent flows
Umsele lapho kugelezela khona amanzi anqolile
Macerator A machine that can chop up material into small pieces
Umshini onga gawula izinto cezu-cezu
Manual Operated Inlet Screen A hand raked screen
Isisefo lapho kusetsenziswa khona I harika yesandla
Mechanical Operated Inlet Screen
Esefo ezilawolayo
Media Uniformed shaped stones or plastic wheels
Amatse alinganayo noma amavili we plasitiki
Methane Gas A highly flammable and dangerous gas
E gas eyengozi evutha masinyane
Non-Biodegradable Cannot be broken down biologically
Enga kwazi ukuphungulwa
Operator
Umlawuli woku hambisa
Organic
Ayi vuthulugi
Overview
Amaqampunqampu
Oxidation A reaction that uses oxygen
Indawo esebenzisa umoya ohlanzekile
Ozone Type of chemical used for disinfection
Umhlobo we chemical osetsenziswayo ukuthi kuhlanzeke
Pathogenic Bacteria Potential disease forming germs
Amagciwane anamandla abanga ukugula
Phase Separation Separating solids from liquids
Ehlukanisa amanzi na loku okuqinile
Primary First
Ukucala
Pump Station
Indawo yamapompo
Safety
Ukuphepha
Secondary Second
Yesibili
Settling Tanks
Itanki elahlukanisa amanzi nodaka
Sludge Drying Beds
Indawo lapho komiswa khona udaka
Store Room
Indawo lapho kubekwa khona imphahla
Supernatant
Amanzi aphuma ekuhlolweni kodaka
Supervisor
Umholi
Tertiary Treatment
Indawo yoku hlwengisa ephezulu
Vortex Degritter
Umshini woku khipha umhlabathi

Activated Sludge Process A sewage treatment process where bacteria are mixed with waste water and the mixture aerated

Indlela yokucoca indle

Aerobic In the presence of oxygen

Iphila apho kukhoyo umoya ococekileyo

Ammonia Vapour A cloud that consists of the chemical ammonia

Umophu we amonia

Anaerobic A condition without oxygen

Indawu engena moya ococekileyo

Anaerobic Ponds

Amadanyana acoca umsele ngokusebenzisa umoya

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Indlela yokwahlukanisa udaka kwindayo engena moya ococekileyo

Anoxic A reaction that takes place without the presence of free oxygen

Isimo sokungabiko kwe moya ococekile

Bacteria Microscopic living animals

Intsholongwane ezibonakala kuphela ngendlela yokukhulisiwa

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Indawo enentsholongwane e nqeda ecoceni kwa-manzi

Blockage Obstruction

Ukuvaleka

Center Column Conical tower in center of biological filter

Isimiselo esime maphakathi nendau egcwaleswe nga matye

Contaminated Infected with dirt, polluted

Ukungcola

Debris Scattered fragments afloat

Ubumdaka phezulu kwamanzi

Desludging Removal of surplus sludge

Ukukupha udaka aluqgithileyo

Detritus Sand and grit

Inhlabathi

Disinfection Killing of germs

Ukubulala intsholongwane

Distribution Arm Rotating pipes with openings on a biological filter

Imibhobho ejikeleli e ne ngxuma

Effluent The discharge (outflow) from a sewage works

Amanzi a setshenzwayo a kalungelwayo akuselwa

Electrical Boards

Ulawulondawo yombane

Excavate To dig up

Ukumba

Flow Instrument An instrument which measures the flow of water

Umatshini okhangela indlela amanzi ahamba gayo

Glossary

Isihlomelo

Granular Chlorine A white, coarse powder chemical

E chemical emhlophe

Grit

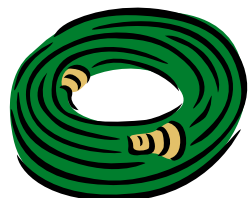
Inhlabati

Grit Channel

Izikhewu zokuhlaza ukungcola

Incinerator A structure in which objects can be burned

Indawu yokutshisela



Inorganic
 Utho olu ngavuthuleki
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 Isefo esentjenziswa iharika yesandla
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 Intsholongwane ebangela isifo
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 Ukwahlula amanzi kumqa
 Primary First
 Sokuqala
 Pump Station
 Isitishi sokupompa amanzi
 Safety
 Ukhuseleko
 Secondary Second
 Isahlulo sesibini
 Settling Tanks
 Itanki eyahlula amanzi edakeni
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 Indawu yokomisa udaka
 Store Room
 Indlu yokucina
 Supernatant
 Amanzi acocekileyo aphuma eludakeni
 Supervisor
 Umlawuli
 Tertiary Treatment
 Indawu yokucoca ephakamileyo
 Vortex Degritter
 Umachini woku khupha isihlabathi

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Lephilako ngaphansi kwemoya lohlantekile

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Intuthu lene chemical ye amonia

Anaerobic Ponds

Emadamu ageza emanti ngaphandle kwemoya lohlobile

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Indlela yekuphula ludzaka ngaphandle kwemoya lohlantekile

Anaerobic A condition without oxygen

Indzawo lengenawo umoya lohlantekile

Anoxic A reaction that takes place without the presence of free oxygen

Loku lokwentekako ngaphandle kwemoya lohlantekile

Bacteria Microscopic living animals

Tilwane letiphilako letibonakala ngaphansi kwesibonisakhulu

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Indzawo lenemagciwane

Blockage Obstruction

Ukuvimbana

Center Column Conical tower in center of biological filter

Umakhiwo lophakatsi kwendzawo yematje

Contaminated Infected with dirt, polluted

Lengcolile

Debris Scattered fragments afloat

Letintantako

Desludging Removal of surplus sludge

Ukusula ludzaka lelisele

Detritus Sand and grit

Umhlabatsi

Disinfection Killing of germs

Kukubulala emagciwane

Distribution Arm Rotating pipes with openings on a biological filter

Emaphayiphi anetimbhobo ayijikeleza phezu kwendzawo enematje

Effluent The discharge (outflow) from a sewage works

Ngemanti laphuma lapho kugezwa khona langcolile

Electrical Boards

Indzawo lapho kulawulwa khona gezi

Excavate To dig up

Ukugubha

Flow Instrument An instrument which measures the flow of water

Liwashi lelibonisa kuhamba kwemanti

Glossary

Kwatiswa kwemagama nencazelo

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E chemicali lemhlophe

Grit

Umhlabatsi

Grit Channel

Umsele wesihlabatsi



Incinerator A structure in which objects can be burned
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Inorganic
[Iya vutfuluka](#)
Launders Channel like structures in which effluent flows
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[Emanti laphuma lapho kuhlohlwa khona ludzaka](#)
Supervisor
[Indvuna](#)
Tertiary Treatment
[Indzawo lephezulu yekuhlobisa](#)
Vortex Degritter
[Umshini lokhipha umhlabatsi](#)

Activated Sludge Process A sewage treatment process where bacteria are mixed with waste water and the mixture aerated

Tula fao dikokoanahloko di kopantshoang le metsi a dihoerehoere

Aerobic In the presence of oxygen

Mo boemong ba moea o hloekileng

Ammonia Vapour A cloud that consists of the chemical ammonia

Musi o nang le khemikhale ea amonia

Anaerobic Ponds

Matangwana a ho hloekisa metsi, a ho sebedisa moea o o hloekilene

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Ketsahalo ea ho fokotsa seretse ntle le tshebediso ea moea o o hloekileng

Anaerobic A condition without oxygen

Tulo e senang moea o hloekileng

Anoxic A reaction that takes place without the presence of free oxygen

Ketsahalo e e etsahalang ntle le moea o o hloekileng

Bacteria Microscopic living animals

Dikokoana tse phelang, tse bonalang ka tlase ga mochene oa ho hodisa

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Tulo e tletseng dikokoanahloko tse thusang ho hloekisa metsi a dihoerehoere

Blockage Obstruction

Ho thibana

Center Column Conical tower in center of biological filter

Karolo e e mo hare ha boalo ba majwe

Contaminated Infected with dirt, polluted

E e ditshila

Debris Scattered fragments afloat

Tse phaphametseng

Desludging Removal of surplus sludge

O tlosa seretse se se oketsehileng

Detritus Sand and grit

Lekhoarana

Disinfection Killing of germs

Polao ea peo tsa mafu

Distribution Arm Rotating pipes with openings on a biological filter

Dipeipi tse potologang tse nang le masoba holimo ha boalo ba majwe

Effluent The discharge (outflow) from a sewage works

Metsi a dihoerehoere a hlahang tulong ea ho hloekisa

Electrical Boards

Tulo ho laoloang motlakase

Excavate To dig up

Ho tshoka

Flow Instrument An instrument which measures the flow of water

Sesupa kelelo ea metsi

Glossary

Mantsoe a ho gala a a hlahosang

Granular Chlorine A white, coarse powder chemical

Khemikhale e tshoeu e lekhoarana

Grit

Lekhoarana

Grit Channel

Mosele wa lekhoarana



Incinerator A structure in which objects can be burned
Moaho o ho tshiselwang teng
Inorganic
E fokotsehang
Launders Channel like structures in which effluent flows
Mesela ea ho elela ha metsi
Macerator A machine that can chop up material into small pieces
Motshene oa ho ripaganya disebediswa ho ba dikarolo tse nnyane
Manual Operated Inlet Screen A hand raked screen
Sefo eo ho sebedisoang haraka ea letsoho
Mechanical Operated Inlet Screen
Sefo eo e itaolang
Media Uniformed shaped stones or plastic wheels
Majwe a a lekalekanang kapa mabile a polasetiki
Methane Gas A highly flammable and dangerous gas
Gase e e kotsi e e tukang hanghang
Non-Biodegradable Cannot be broken down biologically
E e kekeng ea fokotsoa
Operator
Molaola mosebetsi / Molaodi
Overview
Matseno a a akaretsang
Organic
E sa fokotsehang
Oxidation A reaction that uses oxygen
Ketsahalo e e sebedisang moea o o hloekileng
Ozone Type of chemical used for disinfection
Mofuta oa khemikhale o o sebedisoang ho hloekisa
Pathogenic Bacteria Potential disease forming germs
Dikokoanyana tse matla tse bakang mafu
Phase Separation Separating solids from liquids
Ea ho arohanya metsi le tse thata
Primary First
Ea ho qala
Pump Station
Tulo ea dipompo
Safety
Ho sireletseha
Secondary Second
Ya bobedi
Settling Tanks
Tanka ya ho arohanya metsi le seretse
Sludge Drying Beds
Matamo a o omisa seretse
Store Room
Ntlo ya ho bolokela
Supernatant
Metsi a a hlahang mo tlhotlhong ya seretse
Supervisor
Molaodi
Tertiary Treatment
Tulo ea ho hloekisa metsi e e hodingoana
Vortex Degritter
Motshini o ntshang lekgoarana

Activated Sludge Process A sewage treatment process where bacteria is mixed with waste water and the mixture aerated

Karolo ya hlwekiso fao megare e kopantshwang le metsi a maswe

Aerobic In the presence of oxygen

Tse phelang ka moya o phepa

Ammonia Vapour A cloud that consists of the chemical ammonia

Mosi o nang le khemikhale ya amonia

Anaerobic Ponds

Matangwana a go phepafatsa metsi, ao a dirisang moya o phepa

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Tiro ya go thubaganya seretse kwa ntle ga moya o phepa

Anaerobic A condition without oxygen

Maemo a se nang moya o phepa

Anoxic A reaction that takes place without the presence of free oxygen

Phetogo e e tswelang pele ntle le moya o phepa

Bacteria Microscopic living animals

Megare e phelang e bonagalang ka tlase ga segodiso

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Karolo ya go hlwekisa maswe fao megare e funanwago tulo e lengwe

Blockage Obstruction

Go thibana

Center Column Conical tower in center of biological filter

Karolo ya mogare e godimo ga boalo ba matlapa

Contaminated Infected with dirt, polluted

E e maswe

Debris Scattered fragments afloat

Diphaphamadi godimo ga metsi

Desludging Removal of surplus sludge

Tloso ya seretse se se okeditsweng

Detritus Sand and grit

Lekgwarana

Disinfection Killing of germs

Polao ya megare

Distribution Arm Rotating pipes with openings on a biological filter

Dipeipi tse di potologang tse nang le masoba di leng godimo ga boalo ba matlapa

Effluent The discharge (outflow) from a sewage works

Metsi a a tswang mo tulong ya go phepafatsa metsi

Electrical Boards

Tulo fa go laolwang motlakase

Excavate To dig up

Go epa

Flow Instrument An instrument which measures the flow of water

Sesupa kelelo ya metsi

Glossary

Mantswe a matseno a hlaloso

Granular Chlorine A white, coarse powder chemical

Khemikhale e sweu e lekgwarana

Grit

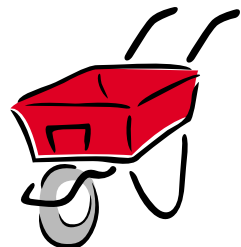
Lekgwarana

Grit Channel

Mosela wa lekgwarana

Incinerator A structure in which objects can be burned

Tulo fao go fisetswang teng



Inorganic

E foforegang

Launders Channel like structures in which effluent flows

Dikago tsa mesela fao metsi a elelang teng

Macerator A machine that can chop up material into small pieces

Motshene wa go ripaganya didiriswa go ba tse nnye

Manual Operated Inlet Screen A hand raked screen

Sefo e e dirisang haraka ya seatla

Mechanical Operated Inlet Screen

Sefo e e itaolang

Media Uniformed shaped stones or plastic wheels

Matlapa a a leka-lekanang gotsa mabili a polasitiki

Methane Gas A highly flammable and dangerous gas

Gase e kotsi e e tukang bonolo

Non-Biodegradable Cannot be broken down biologically

E e ka sekeng ya kgona go fokotswa

Operator

Molaola tsamaiso / Molaodi

Organic

E sa foforegeng

Overview

Matseno a a akaretsang

Oxidation A reaction that uses oxygen

Phetoso e e dirisang moya o phepa

Ozone Type of chemical used for disinfection

Mofuta wa khemikhale o o diriswang go phepafatsa

Pathogenic Bacteria Potential disease forming germs

Megare e matla e e bakang malwetse

Phase Separation Separating solids from liquids

E e aroganyang metsi le tse thata

Primary First

Ya pele

Pump Station

Tulo ya dipompo

Safety

Tshireletso

Secondary Second

Ya bobedi

Settling Tanks

Tanka e e arolang metsi le seretse

Sludge Drying Beds

Tulo ya go omisa seretse

Store Room

Tulo ya polokelo

Supernatant

Metse a tlhagang mohlohlolong ya seretse

Supervisor

Molaodi

Tertiary Treatment

Tulo ya go phepafatsa e godingwana

Vortex Degritter

Motshini o ntshang mohlaba

Activated Sludge Process A sewage treatment process where bacteria is mixed with waste water and the mixture aerated

Karolo ya hlwekišo fao ditwatši di hlakantshwago le meetse a ditshila

Aerobic In the presence of oxygen

Tse di phelago tlase ga moya o hlwekilego

Ammonia Vapour A cloud that consists of the chemical ammonia

Muši wo o nago le khemikhale ya amonia

Anaerobic Ponds

Ditanka / matangwana a go hlwekisa meetse a go šomiša moya o hlwekileng

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Phetogo ya go fokotša leraga ntle ga moya o hlwekilego

Anaerobic A condition without oxygen

Tulo fao go se nago moya o o hlwekileng

Anoxic A reaction that takes place without the presence of free oxygen

Phetogo yeo e tšwelang pele ntle le moya o hlwekileng

Bacteria Microscopic living animals

Ditwatše tse phelang, tse bonagalang ka fase ga motshene wa go godiša

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Karolo fao ditwatši di lego felo gotee

Blockage Obstruction

Go thibana

Center Column Conical tower in center of biological filter

Moago wa mo gare, o godimo ga boalo bja maswika

Contaminated Infected with dirt, polluted

E e ditshila

Debris Scattered fragments afloat

Diphaphamalo godimo ga meetse

Desludging Removal of surplus sludge

Go tlosa leraga la koketšo

Detritus Sand and grit

Lekgwarana

Disinfection Killing of germs

Polao ya ditwatši

Distribution Arm Rotating pipes with openings on a biological filter

Dipeipi tse mašoba tse thethago godimo ga boalo bja maswika

Effluent The discharge (outflow) from a sewage works

Meetse ao a tšwago tulong ya go hlwekiša meetse

Electrical Boards

Taolong ya motlakatse

Excavate To dig up

Go epa

Flow Instrument An instrument which measures the flow of water

Sesupa kelelo ya meetse

Glossary

Mantšu-matseno a hlaloso

Granular Chlorine A white, coarse powder chemical

Khemikhale e šweu ya lekgwarana

Grit

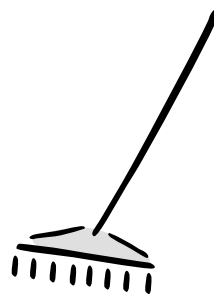
Lekgwarana / Mohlaba

Grit Channel

Mosela wa lekgwarana

Incinerator A structure in which objects can be burned

Tulo fao go fisetšwago gona



Inorganic

E foforegago

Launders Channel like structures in which effluent flows

Meago ya meselana fao go elelago meetse a go tšwa hlwekišong

Macerator A machine that can chop up material into small pieces

Motshini wa go ripantsha dišomišwa go ba tse nnyane

Manual Operated Inlet Screen A hand raked screen

Sefo e e šomišwago ka haraka ya seatla

Mechanical Operated Inlet Screen

Sefo yeo e itaolaga

Media Uniformed shaped stones or plastic wheels

Maswika a go leka-lekana goba mabili a polasetiki

Methane Gas A highly flammable and dangerous gas

Gase e kotsi ya go tuka ka pela

Non-Biodegradable Cannot be broken down biologically

Yeo e sa kgonego go fokotšwa

Operator

Molaola tshepetso

Organic

E sa foforegego

Overview

Matseno-kakaretšo

Oxidation A reaction that uses oxygen

Phetogo yeo e šomišago moya

Ozone Type of chemical used for disinfection

Mohuta wa khemikhale o o šomišwago go hlwekisa

Pathogenic Bacteria Potential disease forming germs

Ditwatši tše maatla tse bakago malwetši

Phase Separation Separating solids from liquids

Yeo e aroganyang meetse le tse thata

Primary First

Ya pele

Pump Station

Tulo ya dipompo

Safety

Tshireletšo

Secondary Second

Karolo ya bobedi

Settling Tanks

Ditanka tse di arolago meetse le leraga

Sludge Drying Beds

Tulo tša go omisa leraga

Store Room

Ntlo ya bobolokelo

Supernatant

Meetse a hlohlilwego a tšwago ka gare ga tshilo ya leraga

Supervisor

Molaodi

Tertiary Treatment

Karolo ya go hlwekiša e godingwana

Vortex Degritter

Motshini wa go ntsha lekgwarana

Activated Sludge Process A sewage treatment process where bacteria are mixed with waste water and the mixture aerated

Indhawu laha switsongwa-tsongwana swi hlanganisiwaka na mati lama ya nga tangangiki

Aerobic In the presence of oxygen

Yi hanya laha ku nga na moya lowo tenga

Ammonia Vapour A cloud that consists of the chemical ammonia

Musi lowu nga na khemikhali ya amonia

Anaerobic Ponds

Madamu lama ya tirhisaka moya lowo tenga ku tengisa mati

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Maendlelo ya ku hunguta / ku faya ndzhope ku ngari na ku nghenelela ka moya lowo tenga

Anaerobic A condition without oxygen

Ndhawu laha ku nga riki na moya lowo tenga

Anoxic A reaction that takes place without the presence of free oxygen

Maendlelo lama ya ka emahlweni ya humelela e handle ka ku nghenelela ka moya lowo tenga

Bacteria Microscopic living animals

Switsongwa-tsongwana leswi swivoniwaka ntsena hi michini ya ku kurisa

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Maendlelo / ndhawu laha switsongwa-tsongwana switshunguriwaka swiri ndhawu yinwe

Blockage Obstruction

Ku-pfaleka

Center Column Conical tower in center of biological filter

Xiphemu xa le ndzeni ka byiandlalo bya maribye

Contaminated Infected with dirt, polluted

Leyi yinga na thyaka

Debris Scattered fragments afloat

Leswi swinga papamala ehenhla ka mati

Desludging Removal of surplus sludge

Ku susiwa ka ndzhope lowu nga ngeteleleka

Detritus Sand and grit

Rikhwarha

Disinfection Killing of germs

Ku dlayiwa ka switsongwa-tsongwana

Distribution Arm Rotating pipes with openings on a biological filter

Tiphayiphi leti ti nga na mimbhovo laha byi andlalani bya maribye

Effluent The discharge (outflow) from a sewage works

Masalela lama ya salaka loko ku heta ku hlantswiwa mati

Electrical Boards

Laha ku lawuriwaka kona ghezi

Excavate To dig up

Ku cela

Flow Instrument An instrument which measures the flow of water

Nchumu / iwath lowu wu kombaka nkholuko wa mati

Glossary

Marito ya manghenelo

Granular Chlorine A white, coarse powder chemical

Khemikhali yo basa ya tikhwarha

Grit

Rikhwarha

Grit Channel

Ndlela ya rikhwarha

Incinerator A structure in which objects can be burned

Ndhawu laha ku hisiwaka kona



Inorganic
 Swo hlanhleka
 Launderers Channel like structures in which effluent flows
 Ndhawu laha ku nga na mati lama ya ngatengisiwa
 Macerator A machine that can chop up material into small pieces
 Muchini lowu nga kotaka ku ghaya switirhisiwa swiva leswi ntsongo
 Manual Operated Inlet Screen A hand raked screen
 I sefo leyi yi tirisiwaka harika ya mavoko
 Mechanical Operated Inlet Screen
 Sefo leyi yi tilawulaka
 Media Uniformed shaped stones or plastic wheels
 Maribye lama ya ringanaka yatlhela ya fana
 Methane Gas A highly flammable and dangerous gas
 Ximoko xa nghozi lexi xipfurhaka hiku hatlisa
 Non-Biodegradable Cannot be broken down biologically
 Lowu wu nga hungutekiki
 Operator
 Mulawuri wa vufambisi
 Organic
 Swo ka swi nga hlankeki
 Overview
 Manghenelo hi ku angarheta
 Oxidation A reaction that uses oxygen
 Ku hundzuka lo ku kutirhisaka moya
 Ozone Type of chemical used for disinfection
 Makhuva / muxaka wa khemikhale lowu wu tirhisiwaka ku tengisa
 Pathogenic Bacteria Potential disease forming germs
 Switsongwa-tsongwana swa matimba leswi va nga ka mavabyi
 Phase Separation Separating solids from liquids
 Ku hambanisiwa ka mati na leswi swi nga kotiki ku n'oka
 Primary First
 Xo sungula
 Pump Station
 Xitixi laha ku pomperiwaka kona
 Safety
 Vuhlayiseki
 Secondary Second
 Xiphemu xa vumbirhi
 Settling Tanks
 Mathangi lama ya hambanisaka mati na ridaka
 Sludge Drying Beds
 Ndhawu laha ku omisiwaka ndzhope
 Store Room
 Yindlu ya vuhlayiselo
 Supernatant
 Mati lama ya nga hlutlwa lama ya humaka eridakeni
 Supervisor
 Mufambisi
 Tertiary Treatment
 Xiphemu xa ku tengisa xa xiyimo xa lehenhla
 Vortex Degritter
 Mutshini lowu wu humesaka rikwarha

Activated Sludge Process A sewage treatment process where bacteria is mixed with waste water and the mixture aerated

Fhethu hu no tanganyiswa madi a tshika na zwitshili

Aerobic In the presence of oxygen

Zwi tshilaho nga muya wo kunaho

Ammonia Vapour A cloud that consists of the chemical ammonia

Mutsi une wavha na mushonga wa ammonia

Anaerobic A condition without oxygen

Fhethu hu si na muya wo kunaho

Anaerobic Ponds

Madamu a no shumisa muya wa kunaho kha u tanzwa madi

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Mushumo wa u fhungudza matope hu si na u shumisa muya wo kunaho

Anoxic A reaction that takes place without the presence of free oxygen

Tshanduko yo bvelelaho hu so ngo shumiswa muya wo kunaho

Bacteria Microscopic living animals

Zwitshili zwi tshilaho zwi kona u vhonwa nga mutshini wa u hulisa

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Fhethu ho dalaho zwitshili

Blockage Obstruction

Yo valea

Center Column Conical tower in center of biological filter

Tshifhato tshi re nga ngomu hu re na matombo

Contaminated Infected with dirt, polluted

Ina tshika

Debris Scattered fragments afloat

Zwo papamalaho

Desludging Removal of surplus sludge

U bviswa matope o dalesaho

Detritus Sand and grit

Mutavha

Disinfection Killing of germs

U vhulaya zwitshili

Distribution Arm Rotating pipes with openings on a biological filter

Phaiphi ine ya vha na mabuli ine ya shuma u fafadzela fhasi hu re na matombo

Effluent The discharge (outflow) from a sewage works

Madi a no bva fhethu hu tanziwaho madi

Electrical Boards

Ho no langulwa mudagasi

Excavate To dig up

U gwa

Flow Instrument An instrument which measures the flow of water

Watshi yo no sumbedza u tshimbila ha madi

Glossary

Maipfi a mathomo a u talusa

Granular Chlorine A white, coarse powder chemical

Mushonga mutshena wa madzhoru

Grit

Muthava

Grit Channel

Mugero wa madi a no tshimbila na mutavha

Incinerator A structure in which objects can be burned

Fhethu hune ra fhisela hone zwithu zwa tshika



Inorganic
 I fhufhurea nga utavhanya
 Launderers Channel like structures in which effluent flows
 Mugeru wa u tshimbidza madi
 Macerator A machine that can chop up material into small pieces
 Mutshini u vundekanyaho zwithu u ri zwi vhe zwi tuku-tuku
 Manual Operated Inlet Screen A hand raked screen
 Sefo ine ha shumiswa haraga ya tshanda
 Mechanical Operated Inlet Screen
 Sefo ine ya di laula
 Media Uniformed shaped stones or plastic wheels
 Matombo a linganaho / mavhili a pulasitiki
 Methane Gas A highly flammable and dangerous gas
 Xasi ine ya vha vuhali ine ya duga nga u tavhanya
 Non-Biodegradable Cannot be broken down biologically
 Tshine tsha so kone u fhungudzea
 Operator
 Mulanguli wa mushumo
 Organic
 I sa fhufhurei
 Overview
 Ho no dzheniwa hone nga u angaredza
 Oxidation A reaction that uses oxygen
 Tshanduko yo bvelelalo ho shumiswa muyo wo kunaho
 Ozone Type of chemical used for disinfection
 Mofuda wa mushonga u no shumiswa u kulumaga
 Pathogenic Bacteria Potential disease forming germs
 Zwitshili zwa maanda zwine zwa ita malwadze
 Phase Separation Separating solids from liquids
 Tshi fhambanyisa madi na zwithu zwi no konda
 Primary First
 Ya mathomo
 Pump Station
 Ho no dzula bommbo
 Safety
 Ho tsireledzeaho
 Secondary Second
 Lwa vhuvhili
 Settling Tanks
 Thannga ya u fhambanyisa madi na matope
 Sludge Drying Beds
 Fhethu ha u omisa matope
 Store Room
 Fhethu ha u vhulungela
 Supernatant
 Madi a nobva fhethu hune ha vha na matope
 Supervisor
 Mulanguli
 Tertiary Treatment
 Fhethu ha nthu hu no tanziwa hone madi
 Vortex Degritter
 Mutshini wa u ntsha mutavha

Activated Sludge Process A sewage treatment process where bacteria is mixed with waste water and the mixture aerated

Geaktiveerde slykproses 'n Rioolsuiweringsproses bestaande onder meer uit anaërobiese, anoksiese en aërobiese aktiwiteite en waarin bakterieë en belugting met suurstof 'n belangrike rol speel

Aerobic In the presence of oxygen

Aërobies 'n Proses waar suurstof aanwesig is

Ammonia Vapour A cloud that consists of the chemical ammonia

Ammoniak damp Ammoniak wat in die teenwoordigheid van chloor as 'n witterige damp sigbaar is

Anaerobic A condition without oxygen

Anaërobies 'n Proses waarin suurstof nie aanwesig is nie

Anaerobic Ponds

Anaërobiese damme Damme waarin organiese materiaal afgebreek word in die afwesigheid van suurstof

Anaerobic Sludge Digestion The process of breaking down sludge in the absence of oxygen

Anaërobiese slykvertering 'n Proses waarin slyk afgebreek word in die afwesigheid van suurstof

Anoxic A reaction that takes place without the presence of free oxygen

Anoksies 'n Gedeelte van die geaktiveerde slykproses wat plaasvind sonder die teenwoordigheid van vrye suurstof

Bacteria Microscopic living animals

Bakterieë Mikroskopiese eensellige organismes

Biological Filtration Process A sewage treatment process where bacteria attaches to a fixed surface

Biologiese filtrasie proses 'n Rioolsuiweringsproses bestaande uit media waaroor riool oor 'n sytelbed gefiltreer word en die bakterieë wat op die media groei met die suiweringsproses help

Blockage Obstruction

Verstopping Obstruksie veroorsaak deur materiaal wat saampak

Center Column Conical tower in center of biological filter

Middelste roterende verspreidingskolom Kolom in die middel van 'n biologiese sytelbed waardeur die riool na die verspreidingsarms gevoer word

Contaminated Infected with dirt, polluted

Gekontamineerd Besoedelde water

Debris Scattered fragments afloat

Opdrifsel Opdrifsel of skuim wat bo-op die water dryf

Desludging Removal of surplus sludge

Ontsluyking Onttrekking van oortollige slyk en skuim

Detritus Sand and grit

Detritus Gruis en growwe materiaal

Disinfection Killing of germs

Ontsmetting Uitwissing van kieme deur onder andere chloor

Distribution Arm Rotating pipes with openings on a biological filter

Roterende verspreidingsarm Roterende pype met openinge wat riool oor 'n biologiese sytelbed versprei

Effluent The discharge (outflow) from a sewage works

Uitvloei Die vloei vanuit 'n riolsuiweringsaanleg nadat dit gesuiwer is

Electrical Boards

Elektriese verspreidingsborde Verspreidingsborde waarin die skakeltuig vir die verskillende toerusting geïnstalleer is

Excavate To dig up

Opgraving Om uit te grawe

Flow Instrument An instrument which measures the flow of water

Vloei-instrument 'n Instrument wat die vloei van water meet

Glossary

Verklarende woordelys

Granular Chlorine A white, coarse powder chemical

Korrelrige chloor Chloor in 'n wit korrelrige poeier vorm

Grit

Grint Growwe materiaal wat teen 'n lae vloeiensnelheid uitsak

Grit Channel

Grint kanale Kanale waarin die vloeiensnelheid verlaag word sodat grint en growwe materiaal kan uitsak



Incinerator A structure in which objects can be burned
 Verbrandingsoond 'n Oond waarin lappe en ander vuilgoed verbrand word
 Inorganic
 Anorganiese materiaal
 Launder Channel like structures in which effluent flows
 Kanale Kanale waarin uitvloeisel oorloop en weggelei word
 Macerator A machine that can chop up material into small pieces
 Masereerder Toerusting waardeur growwe materiaal in die riool fyngemaak word
 Manual Operated Inlet Screen A hand raked screen
 Hand inlaatrooster 'n Rooster by die inlaatwerke wat met die hand gehark word
 Mechanical Operated Inlet Screen
 Meganiese inlaatrooster 'n Meganiese rooster by die inlaatwerke wat outomaties die riool sif
 Media Uniformed shaped stones or plastic wheels
 Media Uniforme materiaal wat in biologiese sytelbeddings geplaas word
 Methane Gas A highly flammable and dangerous gas
 Metaangas 'n Gevaarlike, hoogs vlambare gas
 Non-Biodegradable Cannot be broken down biologically
 Nie-biodegradeerbaar Materiaal wat nie biologies afbreekbaar is nie
 Operator
 Operateur Persoon wat die aanleg begryf
 Organic
 Organiese materiaal
 Overview
 Oorsig van aanleg
 Oxidation A reaction that uses oxygen
 Oksidasie 'n Proses waarin suurstof gebruik word
 Ozone Type of chemical used for disinfection
 Osoon 'n Tipe chemikalie wat gebruik word vir ontsmetting
 Pathogenic Bacteria Potential disease forming germs
 Patogene bakterieë Bakterieë wat die potensiaal het om siekte te veroorsaak
 Phase Separation Separating solids from liquids
 Vloeistof skeiding Skeiding van growwe materiaal en vloeistowwe
 Primary First
 Primêre Eerste
 Pump Station
 Pompstasie
 Safety
 Veiligheid
 Secondary Second
 Sekondêre Tweede
 Settling Tanks
 Besinktenks Tenks waarin die besinking van slyk plaasvind
 Sludge Drying Beds
 Slykdroogbeddings Beddings waarin slyk gedroog word
 Store Room
 Stoorkamer Kamer vir die stoor van toerusting en benodighede
 Supernatant
 Bowater
 Supervisor
 Toesighouer
 Tertiary Treatment
 Tersêre behandeling
 Vortex Degritter
 Draaikolk ontgrinter Tipe ontgrinter waardeur growwe materiaal en grint deur besinking uit riool verwyder word

Congratulations !!
YOU HAVE COMPLETED
THIS WORK BOOK

