T.R.
MINISTRY OF AGRICULTURE AND FORESTRY
GENERAL DIRECTORATE OF WATER MANAGEMENT

Water Efficiency Campaign

This Efficiency Directory Documents Series

HAND TOOLS, SET MACHINE ENDS, SAW BLADES , ETC. MANUFACTURING

NACE KODU: 25.73

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Ministry of Agriculture and Forestry, Water Management General Directorate by Contractor io Environment Solutions To Ar-Ge Ltd. Co. has been prepared.

Contents

Abbreviations

AAT	Wastewater Purification The facility
EU	Europe The Union
AKM	Hanging Thick Article
BREF	Available Most Good Techniques Reference Document
EMS	Environment Management The system
CSIDB	Republic of Türkiye Environment, Urbanism and Climate Change of Ministry of
DOM	Natural Organic Article
EMAS	Echo Management And Control The Program The directive
EPA	America Unified States Environment Protection Agency
IPC	Industrial Pollution Prevention And Control
ISO	International Standards The organization
MET	Available Most Good Techniques
NACE	Economic Activities Statistical Classification
SYGM	This Management General Directorate
TO	Opposite Osmosis
TOB	Türkiye Republic of Agriculture And Forest Ministry of
TUIK	Türkiye Statistics Institution
NF	Nanofiltration
MF	Microfiltration
WHEW	Ultrafiltration
AGE	Underground Water
YUS	Above ground Water

1 Introduction

is located in the Mediterranean basin where the effects of global climate change are felt intensely. is climate of the change negative from the effects of -most more will be affected regions accepted between is being done. In our basins This our existence climate to the change connected aspect How in the future? will be affected related Projections This our resources next face year in to 25 percent Arriving in proportions may decrease shows.

2022 year for In our country person per falling available annual This amount 1,313 m³ is, human With the pressures and the effects of climate change, the annual amount of usable water per person is expected to fall below 1,000 cubic meters after 2030. If the necessary measures are not taken, A lot close in the future Turkey's This scarcity attracting One country to the situation the future, It is obvious that it will bring with it many negative social and economic consequences. Future period projections from the results in It will be understood as follows our country waiting drought And This scarcity There is a risk This our resources productive And sustainable in this way to be used compulsory is performing.

This efficiency concept *"One the product or your service in production -most little in quantity This "use" can be defined* as . This efficiency approach; of water, amount And quality in terms of protected only people not, ecosystem sensitivity with all of living things requirements Consideration will take first of all drinking water, agriculture, industry And digit The people of uses to be as follows all in sectors rational, sharing, fair, productive And effective in this way to be used basis is taking.

Increasing demand for water resources, precipitation and temperature as a result of climate change regimes change, population, urbanization And contamination increase with usable water of resources users between fair And balanced One in this way distribution each last another day in importance is gaining. This For this reason, limited the one which... This of resources sustainable It has become necessary to create a road map based on efficiency and optimization in order to protect and use it with management practices.

In the sustainable development vision determined by the United Nations, within the scope of *Goal 7 of the Millennium Development Goals: Ensuring Environmental Sustainability* , Goal 9 of the Sustainable Development Goals : *Industry*, *Innovation and Infrastructure* and *Goal 12: Responsible Production and Consumption* This first to be as follows resources productive, fair And sustainable usage, environment Issues such as environment-friendly production and consumption that carries concerns for future generations are included.

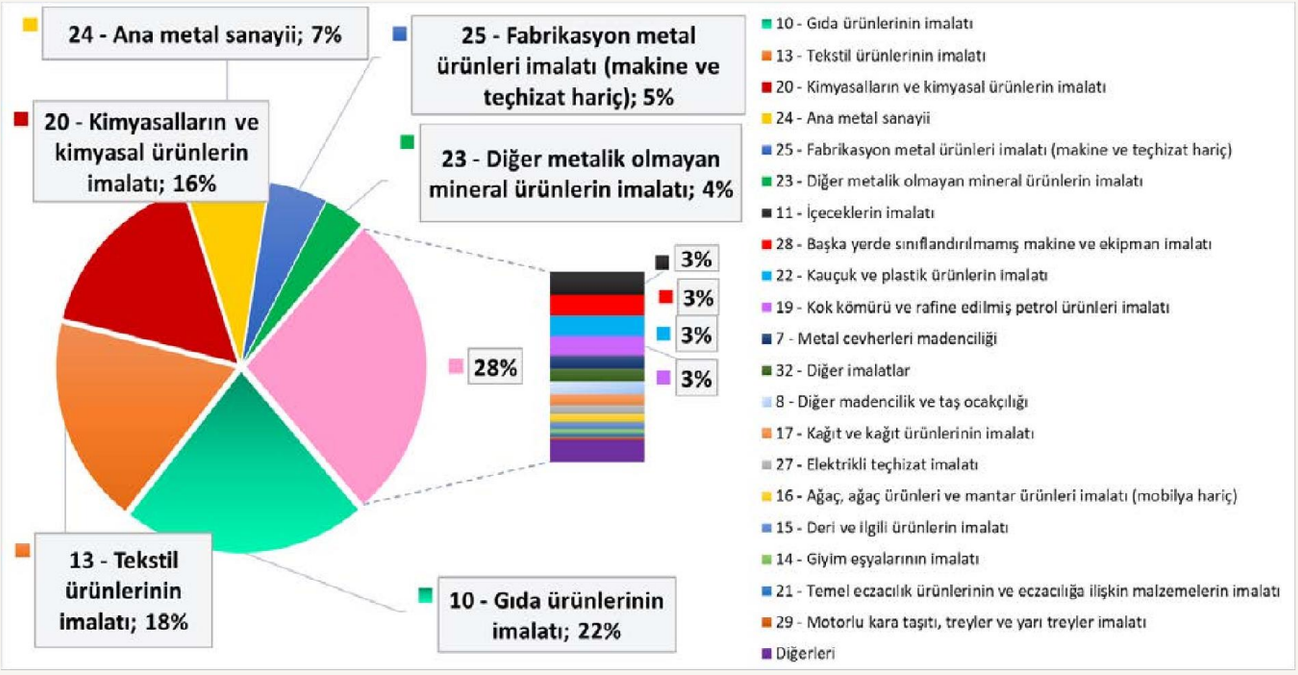
Carbon neutral with the aim of clean, cyclical One economy model to life spend, resources efficient use popularize And environmental effects to reduce like targets on member countries agreed Europe Green The agreement in the scope of our country prepared is Europe Green In the Consensus Action Plan, actions that emphasize water and resource efficiency in production and consumption have been determined in various areas, especially in industry .

Emissions ” is one of the most important components of the European Union environmental legislation in terms of industry. The directive (EED)” industry from activities originating from And weather, This And soil to be as buyer to the environment done discharges/emissions integrated One with approach control And prevention or to be reduced oriented to be taken required precautions contains. In the directive, clean production processes applicability systematic halo to bring And in practice happened eliminate difficulties to pick up for Available Most Good Techniques (MET) (Best Available Techniques-BAT/ MET) has been presented. METs cost And benefits eyelash in front when kept, high environment at level to be protected oriented -most effective APPLICATION techniques. Directive in accordance with, each a sector for METs detailed aspect as described Reference Documents (BAT-BREF) prepared. BREF in their documents METs, Good management applications, general measures in the nature of techniques, chemical usage And management, various production processes for techniques, wastewater management, Emission management And waste management like general One in the frame is presented.

Agriculture And Forest The Ministry, This Management General Directorate by urban, agricultural, industrial and individual This in their use productive applications dissemination And social Studies are being carried out to raise awareness . With the Presidential Circular No. 2023/9 come into force Entering ***"Water Efficiency Strategy Document within the Framework of Adaptation to a Changing Climate and Action The plan (2023-2033)" Water efficiency*** action plan that addresses all sectors and stakeholders plans has been prepared. Industrial This Efficiency Action In your plan 2023-2033 period A total of 12 actions have been determined for the actions and responsible and relevant institutions have been appointed. Within the scope of the Action Plan in question; carrying out studies on determining specific water usage intervals and quality requirements on the basis of sub-sectors in the industry, organizing technical training programs and workshops on a sectoral basis and preparing water efficiency guide documents have been defined as the responsibility of the General Directorate of Water Management.

On the other hand, with ***the "Industrial Water Use Efficiency Project According to NACE Codes" carried out by the General Directorate of Water Management of the Ministry of Agriculture and Forestry,*** in industry This Within the scope of studies to improve water efficiency , sectoral best techniques specific to our country have been determined. As a result of the study, sectoral guide documents and action plans classified with NACE codes containing recommended measures to improve water use efficiency in sectors with high water consumption operating in our country have been prepared.

As in the world, the sectors with the highest share in water consumption in our country are the food, textile, chemical and basic metal sectors. Within the scope of the studies, field visits were carried out in businesses representing 152 sub-sectors in 35 main sectors, primarily food, textile, chemical and basic metal industries, representing different capacity and variety of production areas within the scope of NACE Codes operating in our country and having high water consumption. supply, sectoral This uses, wastewater formation, back gain on the subjects data provided And Europe The Union by published available -most Good techniques (MET) And sectoral reference documents (BREF), This efficiency, clean production, This footprint, etc. on the subjects information was provided.



In our country in industry sectoral on the basis This their use distribution

As a result of the studies, 152 different 4-digit NACE codes with high water consumption were found in the processes of the businesses. oriented specific This consumption And potential saving rates set, EU Water efficiency guidance documents, taking into account best available techniques (BAT) and other cleaner production techniques has been prepared. Guides in This to its efficiency oriented 500 piece technical (MET);
(i) Good Management Applications, (ii) General Measures In the nature of Measures, (iii) Helper They are examined under 4 main groups: (iv) Process-Related Measures and (iv) Sector-Specific Measures.

Executed project in the scope of each One to the sector oriented METs Determination in the phase; environmental benefits, operational data, technical specifications-requirements and applicability criteria were taken into consideration. In determining the BATs, it was not limited to BREF documents only, but also globally up-to-date literature data, real case studies, innovative applications, opinions of sector representatives reporting like different data resources in detailed in this way by examining Sectoral MET Lists has been created. Created MET their lists our country local industry In order to assess the suitability of the MET lists for each NACE code, they were prioritized by scoring businesses based on the criteria of water saving, economic saving, environmental benefit, applicability, and cross-media impact. Results using final MET Lists has been determined. Project in the scope of visit of the facilities provided This And wastewater data with sectoral stakeholders by what's that issued And to our country specific local dynamics Consideration by taking determined final MET Lists over NACE code Sectoral water efficiency guides have been created on the basis of

2 The study Scope

The guide documents prepared within the scope of water efficiency measures in industry cover the following main sectors: includes:

- Vegetable And animal production with hunting And relating to service activities (6 piece four digit With NACE Code representation said lower production area including)
- Fisheries and aquaculture (sub-production area represented by 1 four-digit NACE Code) including)
- Coal And lignite removal (2 piece four digit NACE With code representation said lower production (including area)
- including sub-production area represented by 1 four-digit NACE Code)
- Metal ores mining (2 piece four digit NACE With code representation said lower production (including area)
- Other mining And stone quarrying (2 piece four digit NACE With code representation said lower production area including)
- Food of their products manufacturing (22 piece four digit NACE With code representation said lower production area including)
- Drinks manufacturing (4 pieces of four represented by the digit NACE Code sub-production area including)
- Tobacco products manufacturing (1 piece four digit NACE With code representation said lower production area including)
- Manufacturing of textile products (including sub-production areas represented by 9 four-digit NACE Codes)
- Clothes your belongings manufacturing (1 piece four digit NACE With code representation said lower production area including)
- Manufacture of leather and related products (including sub-production areas represented by 3 four-digit NACE Codes)
- Manufacture of wood, wood products and cork products (excluding furniture); reeds, straw and similar materials by knitting done your things manufacturing (5 piece four digit NACE With code (including the sub-production area represented)
- Paper And paper of their products manufacturing (3 piece four digit NACE With code representation said lower production area including)
- Manufacture of coke and refined petroleum products (including the sub-production area represented by 1 four-digit NACE Code)
- Chemicals And chemical of products manufacturing (13 piece four digit NACE With code representation (including the sub-production area)
- Manufacture of basic pharmaceutical products and pharmaceutical materials (with 1 four-digit NACE Code) representation said lower production area including)
- area represented by 6 four-digit NACE Codes) including)
- Other metallic non- mineral of products manufacturing (12 piece four digit NACE With code (including the sub-production area represented)
- Main metal industry (11 piece four digit NACE With code representation said lower production area including)
- Manufacturing of fabricated metal products (excluding machinery and equipment) (with 12 four-digit NACE Codes) representation said lower production area including)
- including sub-manufacturing areas represented by 2 four-digit NACE Codes)
- Electric equipment manufacturing (7 piece four digit NACE With code representation said lower production area including)
- Manufacturing of machinery and equipment not classified elsewhere (including sub-production areas represented by 8 four-digit NACE Codes)
- Motor land vehicle, trailer (trailer) and semi-trailer (semi-trailer) manufacturing (3 four-digit (including the sub-production area represented by the NACE Code)

- Other transport of their vehicles manufacturing (2 piece four digit NACE With code representation said lower production area including)
- Other manufacturing (2 piece four digit NACE With code representation said lower production area including)
- including sub-production area represented by 2 four-digit NACE Codes)
- Electric, gas, steam And ventilation system production And distribution (2 piece four digit (Including the sub-production area represented by the NACE Code)
- Waste collection, treatment and disposal activities; recovery of materials (1 four-digit NACE With code representation said lower production area including)
- Building female structures construction (1 piece four digit NACE With code representation said lower production area including)
- including sub-production area represented by 1 four-digit NACE Code)
- Accommodation (1 four-digit NACE Sub-production area represented by code including)
- Education Activities (Higher Education Campuses) (1 piece four digit NACE With code representation (including the sub-production area)
- Sport activities, entertainment And recreational activities (1 piece four digit NACE With code representation (including the sub-production area)

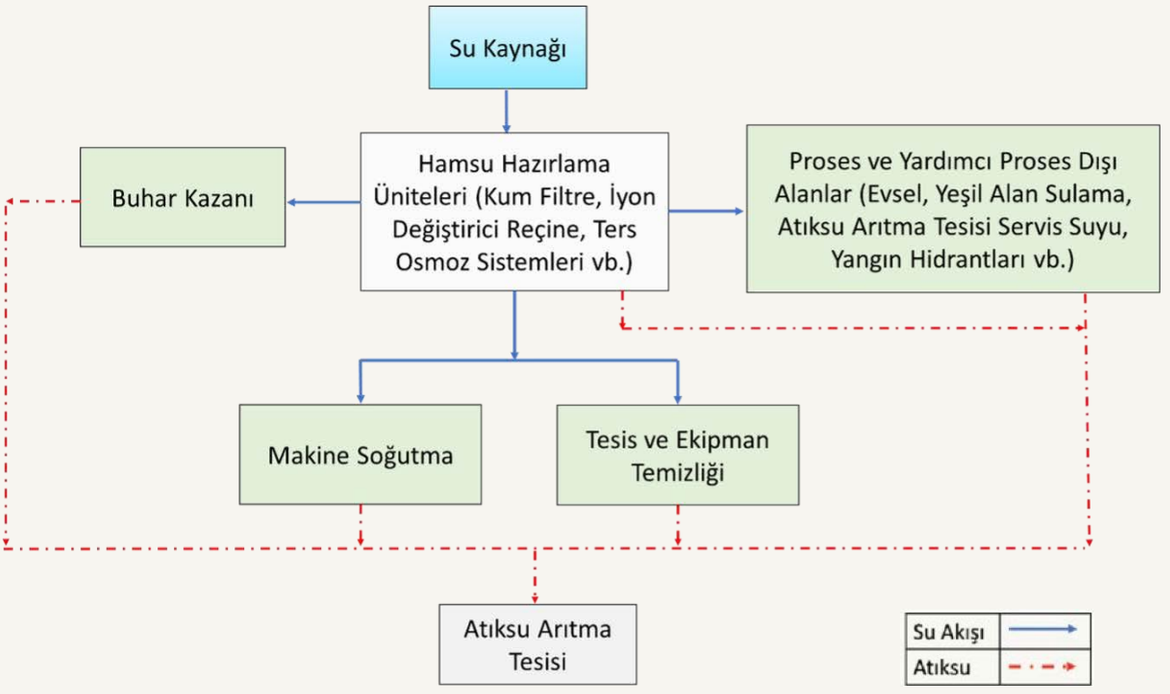
"Main metal industry" And "Fabrication metal products manufacturing (machine And equipment not including)"

"Main metal industry" And "Fabrication metal products manufacturing (machine And equipment (excluding)" sectors under directory documents prepared lower production arms This It is as follows:

24.10	Ana demir ve çelik ürünleri ile ferro alaşımların imalatı
24.20	Çelikten tüpler, borular, içi boş profiller ve benzeri bağlantı parçalarının imalatı
24.31	Barların soğuk çekilmesi
24.32	Dar şeritlerin soğuk haddelenmesi
24.34	Tellerin soğuk çekilmesi
24.41	Değerli metal üretimi
24.42	Alüminyum üretimi
24.51	Demir döküm
24.52	Çelik dökümü
24.53	Hafif metallerin dökümü
24.54	Diğer demir dışı metallerin dökümü
25.12	Metalden kapı ve pencere imalatı
25.21	Merkezi ısıtma radyatörleri (elektrikli radyatörler hariç) ve sıcak su kazanları (boylerleri) imalatı
25.30	Buhar jeneratörü imalatı, merkezi ısıtma sıcak su kazanları (boylerleri) hariç
25.50	Metallerin dövülmesi, preslenmesi, baskılanması ve yuvarlanması; toz metalürjisi
25.61	Metallerin işlenmesi ve kaplanması
25.62	Metallerin makinede işlenmesi ve şekil verilmesi
25.71	Çatal-bıçak takımları ve diğer kesici aletlerin imalatı
25.73	El aletleri, takım tezgahı uçları, testere ağızları vb. imalatı
25.92	Metalden hafif paketleme malzemeleri imalatı
25.93	Tel ürünleri, zincir ve yayların imalatı
25.94	Bağlantı malzemelerinin ve vida makinesi ürünlerinin imalatı
25.99	Başka yerde sınıflandırılmamış diğer fabrikasyon metal ürünlerin imalatı

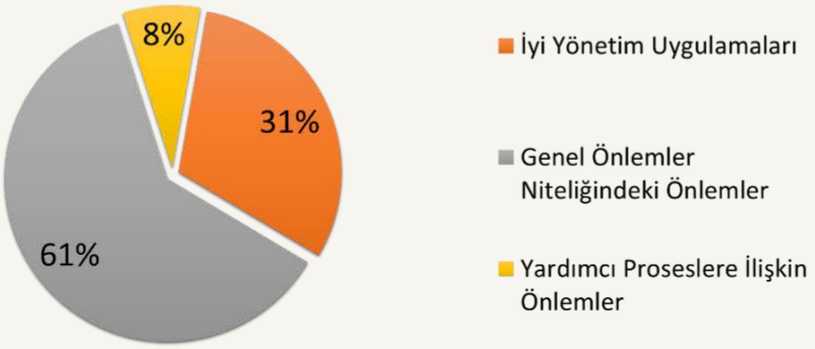
2.1 Hand The tools, Set The counter Manufacturing of Saw Tips, Saw Blades, etc. (NACE 25.73)

El Aletleri, Takım Tezgahı Uçları, Testere Ağızları vb. İmalatı Sektörü Su Akım Şeması



	Minimum	Maksimum
Proje Kapsamında Ziyaret Edilen Tesislerin Spesifik Su Tüketimi (L/kg ürün)	0,01	
Referans Spesifik Su Tüketimi (L/kg ürün)	6	42

Su Verimliliği Uygulamalarının Yüzdelik Dağılımı



In the manufacturing sector of hand tools, machine tool tips, saw blades, etc., product design is the first stage of mold production. The central part that forms the main body of the product mold with the desired features and dimensions is produced on machines such as milling, lathe, erosion. While the core part and sections are being processed, the cores, pushers, column pins that will perform the mechanical operation of the mold are to the mechanism parallel aspect is prepared. All This transactions at the end of pattern, It is subjected to polishing and heat treatment. Finally, the mold is mechanically structured to open and close with the combination of all these industrial parts. The desired final product is created thanks to the molds.

Hand tools, set workbench ends, saw their mouths etc. in manufacturing machine cooling in the process water use is located. Production in their processes to be used as follows soft This In order to be produced used sand filter, ion changer rosin, opposite osmosis like crude This preparation units for filter washing, resin regeneration and membrane cleaning processes at significant rates This consumption is taking place. Moreover steam cauldron like helper in units also water consumption is taking place.

In the manufacturing sector of hand tools, machine tool tips, saw blades etc. the reference specific water consumption is in the range of 6 - 42 L/kg. The specific water consumption of the production branch analyzed within the scope of the study consumption 0.01 It is L/kg. Good management applications, general measures in the nature of It is possible to achieve 52-63% water recovery in the sector by implementing measures and measures related to auxiliary processes.

25.73 Hand The tools, Set The counter The ends, Saw Their mouths The priority water efficiency application techniques recommended under the NACE code are presented in the table below .

NACE Kodu	NACE Kodu Açıklaması	Önceliklendirilmiş Sektörel Su Verimliliği Teknikleri
25.73	El aletleri, takım tezgahı uçları, testere ağızları vb. imalatı	**Good Management Applications**
		1. Using an integrated wastewater management and treatment strategy to reduce wastewater volume and pollutant load
		2. Environment management system Establishment
		3. This flow schemes And This for mass their equivalence
		4. Providing technical training to personnel for the reduction and optimization of water use to be given
		General Measures In the nature of Measures
		1. Shedding and leaks Minimization
		2. Shower/toilet etc. This use at points This savings will provide automatic equipment and hardware (sensors, smart hand washing systems , etc.) to be used
		3. Drinking of water production on the lines from the use of to be avoided
		4. To prevent water and energy waste, production procedures should be documented and used by employees. environment for toxic either in dangerous chemicals of being transported
		5. Construction of closed storage and impermeable waste/scrap areas to prevent
		6. Aquatic in the environment risk constituent substances (oils, emulsions, (such as binders) storage, preservation and prevention of mixing with wastewater after use
		7. Clean This currents dirty This with its currents of mixing Prevention
		8. Suitable in processes closed loop This cycles of Separate collection and purification of grey water in the facility and high water quality
		9. not requiring in the fields (green area irrigation, place, ground washing etc.) use
		10. Implementing time optimization in production and arranging all processes to be completed in the shortest time possible.
		Helper To the processes Related Measures
		1. Use of a closed loop cooling system to reduce water usage

This in the sector total 15 piece technical has been suggested.

Hand The tools, Set The counter The ends, Saw Their mouths etc. Manufacturing NACE To your code Oriented;

(i) Good Management Applications,
(ii) General Measures And
(iii) Measures related to auxiliary processes are given under separate headings. is given.

2.1.1 Good Management Applications

- ***Environment management system Establishment***

Environmental Management Systems (EMS) include the organizational structure, responsibilities, procedures and resources required to develop, implement and monitor environmental policies of industrial organizations. Establishing an environmental management system improves the decision-making processes of institutions regarding raw materials, water-wastewater infrastructure, planned production process and different treatment techniques. Environmental management is the process of meeting resource supply and waste discharge demands with the highest economic efficiency, without compromising product quality and with the least possible impact on the environment. little with effect How that you can manage Organized is continuing.

The most widely used Environmental Management Standard is ISO 14001. Alternatives include Eco Management And Control The Program The directive (EMAS) (761/2001) is available. Businesses It has been developed for the evaluation, improvement and reporting of environmental performance. It is one of the leading applications within the scope of eco-efficiency (cleaner production) in EU legislation and participation is provided on a voluntary basis (TUBITAK MAM, 2016; TOB, 2021). Environmental Management System to establish And application benefits are as follows:

- Business performance by improving economic benefits in hand It can be done (Christopher, 1998).
- International Standards The organization (ISO) standards by being adopted spherical legal and regulatory to the requirements more more rapport is provided (Christopher, 1998).
- While the risks of penalties related to environmental liabilities are minimized, the amount of waste, resource consumption and operating costs are reduced (Delmas, 2009).
- Using internationally accepted environmental standards, operating in different locations around the world showing Businesses for suddenly more record And certificate your need from the middle (Hutchens) is lifting Jr., 2017).
- Especially in recent years, the improvement of internal control processes of companies has been appreciated by consumers. It is also considered important. The implementation of environmental management systems provides a competitive advantage against companies that do not adopt the standard. It also contributes to the institutions' better position in international areas/markets (Potoski & Prakash, 2005).

Above counted benefits, production process, management applications, source usage And It depends on many factors such as potential environmental impacts (TOB, 2021). Similar content to the environmental management system owner annual inventory reports preparation And production in their processes your inputs and outputs amount And qualification In terms of to be watched like applications with This in consumption 3-5% savings between can be provided (Ozturk, 2014). EMS development And APPLICATION stages of The total duration is estimated to be 8-12 months (ISO 14001 User Manual, 2015).

guidelines for industrial organisations to assess and report their water footprint defining international One standard the one which... ISO 14046 This Foot Trace The standard within the scope of studies is carrying out. Relating to the standard implementation with production for necessary the one which... sweet water use And environmental effects reduction is intended. Moreover, industry ISO 46001 Water Efficiency Management Systems Standard, which helps organizations save water and reduce operating costs, provides monitoring,

benchmarking and review studies. with organizations This efficiency policies to their development helper is happening.

- ***Wastewater the amount of And polluting the burden of to reduce for integrated wastewater management And purification strategy to be used***

  Wastewater management should be based on a holistic approach from wastewater generation to final disposal and should include its composition, collection, treatment including sludge disposal and reuse. functional elements covers. Industrial wastewater for suitable purification choice of technology ; land availability, desired refined This quality, national And local regulations like harmony integrated factors depends (Abbassi & Take it Base, 2008).

  Refined wastewater in the facility again usage just This their masses quality not only improves, same in time sweet into the water the one which... demand also is decreasing. This for this reason different reuse goals for suitable purification strategies Determination A lot is important.

  In integrated industrial wastewater treatment, different aspects such as wastewater collection system, treatment process and reuse target are evaluated together. (Naghedi et al., 2020). Industrial wastewater back gain for SWOT method (strong directions, weak directions, opportunities and threats), PESTEL method (political, economic, social, technological, environmental and legal factors), decision tree like methods expert opinions with by combining integrated wastewater management framework can be determined (Naghedi et al., 2020). Analytical Hierarchy Process (AHP) and Unified Consensus Solution (CoCoSo) techniques integrated to be done, industrial wastewater management processes for a lot of criteria based on priorities to determine for can be used (Adar etc., 2021).

  Integrated wastewater management strategies with the implementation of This in consumption, wastewater in the amount of and an average reduction of up to 25% in pollution loads of wastewater can be achieved. The potential payback period of the application varies between 1-10 years (TOB, 2021).

http://www.asw-eg.com/en/images/products/116567Water-Sewage-Treatment-System-With-Plant-And-Facility.jpg

Industrial Wastewater Purification The facility

- ***This of use reduction And optimization for to the staff technical trainings to be given***

  With this measure, water saving and water recovery can be achieved by increasing the training and awareness of the personnel, and water efficiency can be achieved by reducing water consumption and costs. In industrial facilities, due to the lack of necessary technical knowledge of the personnel, a high amount of This usage And wastewater formation with relating to problems emerge can come out. For example, it is important that cooling tower operators, who represent a significant proportion of water consumption in industrial operations, are properly trained and have technical knowledge. Determining water quality requirements in production processes, measuring water and wastewater quantities , etc. in applications in relating to of staff sufficient technical to information owner be It is necessary (TOB, 2021). This For this reason, This of use reduction, optimization And This savings Policies about staff education to be given importance supply is continuing. Of the staff This savings with relating to water usage amounts before and after water efficiency initiatives about organised reports Creation of And This reports employee with like sharing applications, as long as Participation And motivation supports. Employee Education with to be obtained technical, economic And environmental benefits middle or LONG in term conclusion (TUBITAK) MAM, 2016; TOB, 2021).

- ***This flow schemes And This for mass their equivalence preparation***

  Determining water usage and wastewater generation points in industrial facilities, establishing water-wastewater balances in production processes and auxiliary processes outside of production processes generally form the basis of many good management practices. throughout And production processes on the basis of process their profiles creation; unnecessary determination of water usage points and high water usage points, water recovery opportunities to be evaluated, process modifications And This their losses makes it easier to determine (TOB, 2021).

2.1.2 General Measures In the nature of Measures

- ***Shedding And leaks -most limb download***

  Spills and leaks in businesses can cause both raw material and water losses. In addition, if wet cleaning methods are used to clean spilled areas, water consumption, wastewater amounts and pollution loads of wastewater may increase (TOB, 2021). In order to reduce raw material and product losses, spillage and splash losses are reduced by using splash guards, wings, drip trays and sieves (IPPC BREF, 2019).

- ***Clean This currents dirty This with its currents of mixing Prevention***

  By determining the wastewater generation points in industrial facilities and characterizing the wastewater, wastewater with high pollution load and relatively clean wastewater can be collected in separate lines. (TUBITAK MAM, 2016; TOB, 2021). This Thanks to this suitable to quality owner wastewater flows by purification either in without purification again can be used. Wastewater currents Water pollution is reduced by separating the water , treatment performance is increased, energy consumption can be reduced by reducing treatment needs , and emissions are reduced by recycling wastewater and recovering valuable materials. In addition, separated hot wastewater from the currents heat back gain in It is possible (TUBITAK MAM, 2016; TOB, 2021) Wastewater currents separation Generally high investment costs requires is, Reducing costs where recovery of large amounts of wastewater and energy is possible can be provided (IPPC BREF, 2006).

- ***Drinking of water production on the lines from the use of to be avoided***

  Manufacturing of industry different lower in their sectors production to their purposes suitable aspect different This Water of the highest quality can be used. In industrial facilities, raw water, usually obtained from underground water sources, is used in production processes after being purified. However, in some cases, drinking water can be used directly, although it is costly in production processes, or raw water is disinfected with chlorinated compounds and then used in production processes. This water, which contains residual chlorine, is not used in production processes . found organic compounds (natural organic substances (DOM) with reaction can enter and form disinfectant by-products that are harmful to living metabolisms (Özdemir & Toroz, 2010; Oghur et al.; TOB, 2021). Balance chlorine compounds including drinking of the waters or in chlorinated compounds with disinfect made crude of waters from the use of possible should be avoided as much as possible . Crude of waters in disinfection with chlorine disinfection in its place ultraviolet Disinfection methods with high oxidation capacity such as (UV), ultrasound (US) or ozone can be used. With the application will be provided technical, economic And environmental of benefit can be increased Determining and using the required water quality parameters in each production process to avoid unnecessary This recruitment And purification costs of to be reduced helper It is possible. This with application water, energy, chemical costs of reduction It is possible (TUBITAK MAM, 2016).

- ***Suitable in processes closed loop This cycles of to be used***

  Refrigerants are generally chemical compounds with certain thermodynamic properties that cool the substances to be cooled by taking heat from them and affecting the performance of the cooling process (Kuprasertwong et al., 2021).

  Manufacturing industry in their processes And product cooling process your head suffered A lot in process refrigerant aspect This is used. This cooling process while it is being carried out This, cooling can be recycled through cooling tower or central cooling systems. If there is any unwanted microbial growth It happens whereas recirculation into the water chemical additional by being checked under can be taken (TUBITAK MAM, 2016).

  wastewater generated by reusing cooling water in processes such as cleaning amount is reduced. However, cooling of waters cooling And recirculation for need for energy be heard One side interaction aspect emerge is emerging.

  Cooling around heat exchangers usage with Heatback gain in is provided. Closed loop systems are generally used in facilities where water cooling systems are used. However, cooling system blowdowns are removed by being discharged directly into the wastewater treatment plant channel. This bluff waters suitable the one which... production in their processes again can be used.

- ***Aquatic in the environment risk constituent substances (oils, emulsions, binders like) Preventing its storage, preservation and mixing with wastewater after use as much as possible***

  Industrial in facilities oils, emulsions And binders like Aquatic environment for risk bearing
  chemicals wastewater to the currents of mixing blocking for dry cleaning techniques can be used and leaks can be prevented. In this way, water resources can be protected (TUBITAK MAM, 2016).

- ***Aquatic environment for toxic either in dangerous chemicals of being transported blocking for closed storage And impermeable waste/scrap field to be done***

  In industrial facilities, closed and impermeable waste/scrap storage areas can be built to prevent the transfer of toxic or hazardous chemicals to the aquatic environment. available environment arrangements in the scope of This APPLICATION Currently Within the scope of the field studies carried out, a separate collection channel can be built in the toxic or hazardous substance storage areas in industrial facilities, so that the leakage water in question can be collected separately and its mixing with natural water environments can be prevented.

- ***Shower/toilet etc. This use at points This savings will provide automatic hardware and equipment (sensors, clever hand washing systems etc.) to be used***

  Water is very important in many sectors of the manufacturing industry, both for production processes and for personnel to ensure the necessary hygiene standards. Water consumption in industrial facilities can be provided in various ways in production processes, and savings can be achieved in water consumption by using equipment such as sensor taps and smart hand washing systems in areas where personnel use water. Smart hand washing systems adjust the mixture of water, soap and air in the right proportions, while also providing resource efficiency in addition to water savings. provides.

- ***This And energy waste of to obstruct for production procedures documented made kept in a safe place and used by employees***

  Effective procedures for determining, evaluating potential problems and their sources and controlling production stages in order to ensure efficient production in a business. should be applied (Ayan, 2010). Production in the processes suitable procedures The determination and implementation of resources (such as raw materials, water, energy, chemicals, personnel and time) ensures more efficient use and ensures reliability and quality in production processes (Ayan, 2010). The existence of documented production procedures in production processes contributes to the evaluation of business performance and the development of the ability to develop immediate reflexes to solve problems (TUBITAK MAM, 2016; TOB, 2021). Effective implementation and monitoring of procedures created specifically for production processes is one of the most effective ways to ensure product quality, receive feedback and develop solution suggestions (Ayan, 2010). Documenting, effectively implementing and monitoring production procedures is a good management practice and is used in the structuring and continuity of the cleaner production approach and environmental management system. It is an effective tool. In addition to the potential benefits, the cost and economic gains of the application may vary from sector to sector or depending on the facility structure (TUBITAK MAM, 2016; TOB, 2021). Production procedures Creation of And to be watched Although it is not costly, the payback period can be short considering the savings and benefits it will provide (TUBITAK MAM, 2016; TOB, 2021).

- ***In production time optimization implementation And all transactions -most short in time to end arrangement***

  Planning the process from raw material to product in industrial production processes using the least amount of processes reduces labor costs, resource usage costs and environmental impacts. effects reduction And productivity Providing for effective One is the application. This In this context, the production processes are reviewed and the minimum number of process steps are used. again Revised to be done necessary It can be (TUBITAK MAM, 2016). Basis In cases where the desired product quality cannot be achieved due to some inadequacies, inefficiencies and design errors in the production processes, it may be necessary to renew the production processes. Therefore, in this case, the resource usage required in the production of a unit amount of product and the amount of waste, emissions and solid waste generated increase. Time optimization in production processes is an effective application (TUBITAK MAM, 2016).

- ***In the facility gray of waters separate gathered together purification And high This quality not requiring in the fields (green area irrigation, place, ground washing etc.) to be used***

  Wastewater generated in industrial facilities is not only industrial wastewater originating from production processes. not being showers, sinks, kitchens etc. from the fields originating from It also includes wastewater. Wastewater from showers, sinks, kitchens, etc. is called grey water. This grey water is purified with various purification processes to obtain high water quality. not requiring in the fields by using This savings can be provided.

2.1.3 Assistant To the processes Related Measures

Cooling to their systems related METs

- ***This of use reduction for closed loop cooling system to be used***

  Closed loop cooling systems, more busy This for use owner open loop to systems Compared to water consumption important To some extent is decreasing. Closed loop in systems, same This system recirculated within while being done, Generally volatile This amount much cooling water addition Cooling is required. systems Optimized by being made evaporation losses in can be reduced.

Source

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