

Supplementary Materials

Table A1. International patent clarification (IPC) related to water treatment technologies

IPC	Technolo	Description
C02F1/00	General	Treatment of water, wastewater, or sewage
C02F1/02	General	Heating
C02F1/04	General	Distillation or evaporation
C02F1/06	General	Flash evaporation
C02F1/08	General	Thin film evaporation
C02F1/10	General	Direct contact with a particulate solid
C02F1/12	General	Spray evaporation
C02F1/14	General	Solar energy
C02F1/16	General	Waste heat from other processes
C02F1/18	General	Transportable devices to obtain potable water
C02F1/20	General	Degassing, i.e., liberation of dissolved gases
C02F1/22	General	Freezing
C02F1/24	General	Flotation
C02F1/26	General	Extraction
C02F1/28	General	Sorption
C02F1/30	General	Irradiation
C02F1/32	General	Ultra-violet light
C02F1/34	General	Mechanical oscillations
C02F1/36	General	Ultrasonic vibrations
C02F1/38	General	Centrifugal separation
C02F1/40	General	Devices for separating or removing fatty or oily substances or similar floating material
C02F1/42	General	Ion-exchange
C02F1/44	General	Dialysis, osmosis or reverse osmosis
C02F1/46	General	Electrochemical methods
C02F1/46	General	Electrolysis
C02F1/46	General	Electrocoagulation
C02F1/46	General	Electroflotation
C02F1/46	General	Electrochemical disinfection
C02F1/46	General	Electrochemical separation
C02F1/48	General	Magnetic or electric fields
C02F1/50	General	Addition or application of a germicide or oligodynamic treatment
C02F1/52	General	Flocculation or precipitation of suspended impurities
C02F1/54	General	Organic material
C02F1/56	General	Macromolecular compounds
C02F1/58	General	Removing specified dissolved compounds
C02F1/60	General	Silicon compounds
C02F1/62	General	Heavy metal compounds
C02F1/64	General	Iron or manganese
C02F1/66	General	Neutralization; pH adjustment
C02F1/68	General	Addition of specified substances
C02F1/70	General	Reduction
C02F1/72	General	Oxidation
C02F1/74	General	Air
C02F1/76	General	Halogens or compounds of halogens
C02F1/78	General	Ozone

Table A1. International patent clarification (IPC) related to water treatment technologies (cont.)

IPC	Technology group	Description
C02F3/00	Biological	Biological treatment of water, wastewater, or sewage
C02F3/02	Biological	Aerobic processes
C02F3/04	Biological	Trickle filters
C02F3/06	Biological	Submerged filters
C02F3/08	Biological	Moving contact bodies
C02F3/10	Biological	Packings; fillings; grids
C02F3/12	Biological	Activated sludge processes
C02F3/14	Biological	Surface aeration
C02F3/16	Biological	Aerator with a vertical axis
C02F3/18	Biological	Aerator with a horizontal axis
C02F3/20	Biological	Diffusers
C02F3/22	Biological	Circulation pipes
C02F3/24	Biological	Free-fall aeration or spraying
C02F3/26	Biological	Pure oxygen or oxygen-rich gas
C02F3/28	Biological	Anaerobic digestion processes
C02F3/30	Biological	Aerobic and anaerobic processes
C02F3/32	Biological	Characterized by the animals or plants used, e.g., algae
C02F3/34	Biological	Characterized by the micro-organisms used
C02F5/00	Other	Softening water
C02F5/02	Other	Softening water by the precipitation of the hardness
C02F5/04	Other	Phosphates
C02F5/06	Other	Calcium compounds
C02F5/08	Other	Treatment of water with complexing chemicals
C02F5/10	Other	Organic substances
C02F5/12	Other	Containing nitrogen
C02F5/14	Other	Containing phosphorus
C02F7/00	Other	Aeration of stretches of water
C02F9/00	Multistage	Multistep treatment of water, wastewater or sewage
C02F9/02	Multistage	Separation step
C02F9/04	Multistage	At least one chemical treatment step
C02F9/06	Multistage	Electrochemical treatment
C02F9/08	Multistage	At least one physical treatment step
C02F9/10	Multistage	Thermal treatment
C02F9/12	Multistage	Irradiation or treatment with electric or magnetic fields
C02F9/14	Multistage	At least one biological treatment step
C02F11/00	Sludge	Treatment of sludge; Devices therefor
C02F11/02	Sludge	Biological treatment
C02F11/04	Sludge	Anaerobic treatment; Production of methane by such processes
C02F11/06	Sludge	Oxidation
C02F11/08	Sludge	Wet air oxidation
C02F11/10	Sludge	Pyrolysis
C02F11/12	Sludge	De-watering, drying, or thickening
C02F11/14	Sludge	Addition of chemical agents
C02F11/16	Sludge	Drying or composting beds
C02F11/18	Sludge	Thermal conditioning
C02F11/20	Sludge	Freezing

Table A1. International patent clarification (IPC) related to water treatment technologies (cont.)

IPC	Technology group	Description
C02F101/00	Other	Nature of the contaminant
C02F101/10	Other	Inorganic compounds
C02F101/12	Other	Halogens or halogen-containing compounds
C02F101/14	Other	Fluorine or fluorine-containing compounds
C02F101/16	Other	Nitrogen compounds, e.g., ammonia
C02F101/18	Other	Cyanides
C02F101/20	Other	Heavy metals or heavy metal compounds
C02F101/22	Other	Chromium or chromium compounds, e.g., chromates
C02F101/30	Other	Organic compounds
C02F101/32	Other	Hydrocarbons, e.g., oil
C02F101/34	Other	Containing oxygen
C02F101/36	Other	Containing halogen
C02F101/38	Other	Containing nitrogen
C02F103/00	Other	Nature of the water, wastewater, sewage or sludge to be treated
C02F103/02	Other	Non-contaminated water, e.g., for industrial water supply
C02F103/04	Other	Obtaining pure or ultra-pure water
C02F103/06	Other	Contaminated groundwater or leachate
C02F103/08	Other	Seawater, e.g., for desalination
C02F103/10	Other	From quarries or from mining activities
C02F103/12	Other	From silicate or ceramic industries
C02F103/14	Other	Paint wastes
C02F103/16	Other	From metallurgical processes
C02F103/18	Other	From the wet purification of gaseous effluents
C02F103/20	Other	From animal husbandry
C02F103/22	Other	From the processing of animals, e.g., poultry, fish, or parts thereof
C02F103/24	Other	From tanneries
C02F103/26	Other	From the processing of plants or parts thereof
C02F103/28	Other	From the paper or cellulose industry
C02F103/30	Other	From the textile industry
C02F103/32	Other	From the food or foodstuff industry, e.g., brewery wastewater
C02F103/34	Other	From the chemical industry not provided for in groups
C02F103/36	Other	From the manufacture of organic compounds
C02F103/38	Other	Polymers
C02F103/40	Other	From the manufacture or use of photosensitive materials
C02F103/42	Other	From bathing facilities, e.g., swimming pools
C02F103/44	Other	From vehicle washing facilities

Table A2. Patent data collection periods in PATENTSCOPE database by country

Country or Patent office	Data collection period	Country or Patent office	Data collection period
PCT	20.10.1978 - 04.08.2017	Japan	09.01.1993 - 07.07.2017
Argentina	12.02.1965 - 27.04.2017	Jordan	31.12.1899 - 16.03.2016
Australia	15.01.1900 - 28.07.2017	Kenya	12.05.1996 - 01.02.2011
Bahrain	10.03.1957 - 29.09.2005	Mexico	02.12.1991 - 20.06.2017
Brazil	26.04.1972 - 05.07.2017	Morocco	07.07.1977 - 31.12.2016
Canada	12.08.1869 - 15.07.2017	Nicaragua	23.12.1982 - 07.02.2014
Chile	20.04.2000 - 28.05.2016	Panama	10.03.1990 - 30.10.2013
China	10.07.1986 - 05.07.2017	Peru	22.02.1989 - 30.06.2017
Colombia	14.02.1995 - 01.07.2016	Portugal	24.06.1967 - 01.07.2016
Costa Rica	14.07.1988 - 30.07.2016	Republic of Korea	04.02.1979 - 16.06.2017
Cuba	13.03.1968 - 05.07.2017	Russian Federation	15.02.1995 - 28.06.2017
Denmark	26.03.1895 - 18.07.2017	Russian Federation (USSR data)	01.03.1919 - 28.12.2016
Dominican Rep.	11.05.1964 - 01.07.2017	Saudi Arabia	24.12.1995 - 12.10.2015
Ecuador	02.10.1990 - 01.05.2015	Singapore	29.11.1995 - 30.06.2017
Egypt	02.01.2002 - 31.10.2014	South Africa	27.01.1983 - 30.07.2015
El Salvador	11.03.1970 - 08.06.2017	Spain	15.03.1827 - 22.07.2017
Estonia	18.10.1994 - 18.07.2017	Tunisia	01.01.1999 - 04.01.2017
Eurasian Patent Office	02.07.1996 - 01.04.2017	United Arab Emirates	02.07.2002 - 03.01.2013
France	03.07.1859 - 22.07.2017	United Kingdom	05.07.1782 - 27.07.2017
Germany	03.07.1877 - 30.06.2017	United States of America	01.08.1790 - 02.08.2017
Germany (DDR data)	15.06.1951 - 23.04.1999	Uruguay	17.08.1990 - 01.04.2017
Guatemala	31.12.1961 - 07.07.2017	Viet Nam	26.05.1997 - 27.04.2010
Honduras	30.01.2004 - 28.04.2015	ARIPO	04.07.1985 - 29.07.2008
Israel	02.01.1900 - 31.03.2017	European Patent Office (EPO)	21.12.1978 - 27.07.2017

Source: PATENTSCOPE (https://patentscope.wipo.int/search/en/help/data_coverage.jsf)