

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 421]

EFFLUENT LIMITATIONS GUIDELINES Nonferrous Metals Manufacturing Point Source Category

Notice is hereby given that effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources set forth in tentative form below are proposed by the Environmental Protection Agency (EPA) for the bauxite refining subcategory (Subpart A), the primary aluminum smelting subcategory (Subpart B), and the secondary aluminum smelting subcategory (Subpart C), of the aluminum segment of the nonferrous metals manufacturing category of point sources pursuant to sections 301, 304 (b) and (c), 306(b) and 307(c) of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, 1311, 1314 (b) and (c), 1316(b) and 1317(c); 86 Stat. 816 et seq.; P.L. 92-500) (the "Act").

(a) Legal authority. (1) Existing point sources. Section 301(b) of the Act requires the achievement by not later than July 1, 1977, of effluent limitations for point sources, other than publicly owned treatment works, which require the application of the best practicable control technology currently available as defined by the Administrator pursuant to section 304(b) of the Act. Section 301(b) also requires the achievement by not later than July 1, 1983, of effluent limitations for point sources, other than publicly owned treatment works, which require the application of best available technology economically achievable which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants, as determined in accordance with regulations issued by the Administrator pursuant to section 304(b) of the Act.

Section 304(b) of the Act requires the Administrator to publish regulations providing guidelines for effluent limitations setting forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the degree of effluent reduction attainable through the application of the best control measures and practices achievable including treatment techniques, process and procedure innovations, operating methods and other alternatives. The regulations proposed herein set forth effluent limitations guidelines, pursuant to section 304(b) of the Act, for the bauxite refining subcategory (Subpart A), the primary aluminum smelting subcategory (Subpart B), and the secondary aluminum smelting subcategory (Subpart C), of the nonferrous metals manufacturing category.

(2) New sources. Section 306 of the Act requires the achievement by new sources of a Federal standard of performance providing for the control of the discharge of pollutants which reflects the greatest degree of effluent reduction

which the Administrator determines to be achievable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants.

Section 306(b) (1) (B) of the Act requires the Administrator to propose regulations establishing Federal standards of performance for categories of new sources included in a list published pursuant to section 306(b) (1) (A) of the Act. The Administrator published in the FEDERAL REGISTER of January 16, 1973 (38 FR 1624), a list of 27 source categories, including the nonferrous metals category. The regulations proposed herein set forth the standards of performance applicable to new sources for the bauxite refining subcategory (Subpart A), the primary aluminum smelting subcategory (Subpart B), and the secondary aluminum smelting subcategory (Subpart C), of the nonferrous metals manufacturing category.

Section 307(c) of the Act requires the Administrator to promulgate pretreatment standards for new sources at the same time that standards of performance for new sources are promulgated pursuant to section 306. Sections 421.15, 421.25, and 421.35, proposed below provide pretreatment standards for new sources within the bauxite refining subcategory (Subpart A), the primary aluminum smelting subcategory (Subpart B), and the secondary aluminum smelting subcategory (Subpart C), of the nonferrous metals category.

Section 304(c) of the Act requires the Administrator to issue to the States and appropriate water pollution control agencies information on the processes, procedures or operating methods which result in the elimination or reduction of the discharge of pollutants to implement standards of performance under section 306 of the Act. The Development Documents referred to below provide, pursuant to section 304(c) of the Act, information on such processes, procedures or operating methods.

(b) Summary and Basis of Proposed Effluent Limitations Guidelines for Existing Sources and Standards of Performance and Pretreatment Standards for New Sources.

(1) General methodology. The effluent limitations guidelines and standards of performance proposed herein were developed in the following manner. The point source category was first studied for the purpose of determining whether separate limitations and standards are appropriate for different segments within the category. This analysis included a determination of whether differences in raw material used, product produced, manufacturing process employed, age, size, waste water constituents and other factors require development of separate limitations and standards for different segments of the point source category. The raw waste characteristics for each such segment were then identified. This included an analysis of (1) the source, flow and volume of water used in the

process employed and the sources of waste and waste waters in the operation; and (2) the constituents of all waste water. The constituents of the waste waters which should be subject to effluent limitations guidelines and standards of performance were identified.

The control and treatment technologies existing within each segment were identified. This included an identification of each distinct control and treatment technology, including both in-plant and end-of-process technologies, which are existent or capable of being designed for each segment. It also included an identification of, in terms of the amount of constituents and the chemical, physical, and biological characteristics of pollutants, the effluent level resulting from the application of each of the technologies. The problems, limitations and reliability of each treatment and control technology were also identified. In addition, the non-water quality environmental impact, such as the effects of the application of such technologies upon other pollution problems, including air, solid waste, noise and radiation were identified. The energy requirements of each control and treatment technology were determined as well as the cost of the application of such technologies.

The information, as outlined above, was then evaluated in order to determine what levels of technology constitute the "best practicable control technology currently available," the "best available technology economically achievable" and the "best available demonstrated control technology, processes, operating methods, or other alternatives." In identifying such technologies, various factors were considered. These included the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements) and other factors.

The data upon which the above analysis was performed included EPA permit applications, EPA sampling and inspections, consultant reports, and industry submissions.

The pretreatment standards proposed herein are intended to be complementary to the pretreatment standards proposed for existing sources under Part 128 of 40 CFR. The basis for such standards are set forth in the FEDERAL REGISTER of July 19, 1973, (38 FR 19236.) The provisions of Part 128 are equally applicable to sources which would constitute "new sources," under section 306 if they were to discharge pollutants directly to navigable waters, except for § 128.133. That section provides a pretreatment standard for "incompatible pollutants" which requires application of the "best practicable control technology currently available," subject to an adjustment for amounts of pollutants removed by the

publicly owned treatment works. Since the pretreatment standards proposed herein apply to new sources, §§ 421.15, 421.25 and 421.35 below amend § 128.133 to require application of the standard of performance for new sources rather than the "best practicable" standard applicable to existing sources under sections 301 and 304(b) of the Act.

(2) Summary of conclusions with respect to the bauxite refining subcategory (Subpart A), the primary aluminum smelting subcategory (Subpart B), and the secondary aluminum smelting subcategory (Subpart C) of the nonferrous metals manufacturing category.

The aluminum industry is a segment of the nonferrous metals manufacturing category of sources. Bauxite refining, primary aluminum smelting, and secondary aluminum smelting are recognized as discrete segments of the aluminum industry and each is characterized by distinctly different raw materials, manufacturing processes, products, and waste water characteristics. For this reason, three subcategories of the aluminum industry were established for the purpose of developing effluent limitations guidelines and standards of performance and three Development Documents were prepared. The regulations proposed herein apply to the aluminum segment of the nonferrous metals manufacturing category of sources as defined by the three subcategories, bauxite refining, primary aluminum smelting, and secondary aluminum smelting.

(1) General description. (1) Subpart A—Bauxite Refining Subcategory: Bauxite refining is the process of extracting alumina from aluminum ore (bauxite) by the Bayer process. The Bayer process dissolves the alumina in a caustic solution to form sodium aluminate. Upon dilution and cooling, the sodium aluminate is hydrolyzed to precipitate aluminum hydroxide. The precipitate is filtered and dried to form alumina, the principal raw material in the production of aluminum metal.

A significant feature of the bauxite refining process is that it produces approximately equal amounts of alumina and red mud wastes. Red mud is the term applied to the voluminous residue remaining after extraction of alumina from bauxite by the Bayer process. It varies in composition according to the ore from which it is derived. In the United States, various companies process bauxites, principally from Jamaica, Surinam, and Arkansas ores. The residue from processing Arkansas bauxite, which is treated by a modification of the Bayer process, is called brown mud or sinter mud.

(2) Subpart B—Primary Aluminum Smelting Subcategory: Primary aluminum smelting is the electrolytic reduction of purified alumina to aluminum metal. The Hall-Heroult reduction process is used by all domestic primary aluminum producers and has remained essentially unchanged since its inception. This process involves the dissolving of alumina in a solution or bath of molten cryolite and other fluoride salts. The bath is less

dense than molten aluminum, and is kept molten in a carbon crucible known as a "cell" or "pot". The carbon crucible serves as the cathode, and a carbon block, or blocks, serves as the anode. Electrolysis decomposes the alumina into aluminum and oxygen, and because of its greater density, the aluminum sinks to the bottom of the cell.

The oldest aluminum plants in the United States were built in the 1940's and, except for minor equipment modifications and changes in operating procedures, have been producing aluminum by this classical technology for thirty years. Recently, one producer has announced plans to build a pilot plant for the production of aluminum by the direct reduction of aluminum chloride. In addition to eliminating the use of fluoride, the process would likely require 30 percent less electrical energy than the Hall-Heroult process.

The heart of the production of aluminum is the reduction process. Depending upon the type of reduction cell used and the design of a particular facility, several other major operations such as anode baking or aluminum forming may be conducted at an integrated site. Reduction cells are of three basic types: prebaked cells, which use prebaked carbon anodes, and two types of Soderberg cells, which use large, single anodes continuously baked in place over the bath. Soderberg cells are either vertical stud or horizontal stud. In all cell types, the anode is composed of coke bound with pitch. The Soderberg anodes are baked by the heat released from the cell itself, while prebaked anodes are normally baked in a separate facility. If prebaked anodes are used, a separate facility is necessary to blend the anode components (pitch, coke, etc.) and bake the anodes around copper conductors. The organic emissions from the baking process must be controlled at the baking facility. If Soderberg anodes are used, the baking process occurs in the reduction cell and the anodes are baked in place. Although the need for a separate baking facility is eliminated, the in-place baking volatilizes the pitch components which may subsequently condense in emission control systems and cause operating problems. While the overall pollution potential of a primary aluminum facility is not significantly affected by the anode configuration, the choice of the associated air pollution control systems is closely related to the anode type.

In addition to the anode plant and reduction cell facility or potroom, a primary aluminum smelter has a casthouse. In this facility the molten aluminum metal is formed into basic shapes such as billets or ingots by cooling in molds. The cooling process may be a source of water pollution if water is used to cool the molds. A degassing or fluxing operation also is conducted in the casthouse. Wet scrubbing of the fluxing gas produces additional waste water from the casthouse.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: Secondary aluminum smelting is the process of remelting

and purifying aluminum-bearing scrap to produce an alloy of marketable specifications. Generally, the secondary aluminum industry gathers scrap from a number of sources and then uses the aluminum contained in the scrap to produce a variety of products. The secondary aluminum smelters comprise the largest portion of secondary aluminum industry and consume about 70 percent of all aluminum scrap generated in the United States.

The scrap raw material used by secondary smelters can be divided into two categories, solids and residues. The solids are principally metal and include borings and turnings, new clippings and forgings, old castings and sheet, and aluminum containing iron. Residues include (1) dross and skimmings from melting operations at foundries, fabricators and the primary aluminum industry, and (2) slag formed during secondary smelting operations. Secondary aluminum smelters reprocess the scrap so that it can be used for consumer goods. In so doing, they are recycling a moderately priced metal which otherwise would become a solid waste.

Secondary aluminum smelters have been in operation since 1904 with major growth and expansion periods in the 1920's and late 1940's and 1950's. Their numbers have decreased over the last decade. Most of the 85 plants currently producing secondary aluminum metal are located near heavily industrialized areas which give them proximity to a supply of scrap and to their customers. There is no real need for them to be near plentiful supplies of electrical power and water as in the case of primary aluminum smelters.

(1) Categorization. (1) Subpart A—Bauxite Refining Subcategory: Bauxite refining is a single subcategory for the purpose of establishing effluent limitations guidelines and standards of performance. The consideration of the factors such as the age and size of the plant, processes employed, wastes generated, geographical location, raw materials used, and air pollution control techniques support this conclusion.

(2) Subpart B—Primary Aluminum Smelting Subcategory: Primary aluminum smelting is a single subcategory for the purpose of establishing effluent limitations guidelines and standards of performance. The consideration of the factors such as the age and size of the plant, anode type, raw materials used, and air pollution control techniques employed support this conclusion. However, the guidelines take into account the requirement for wet air pollution control devices used by some existing primary aluminum producers.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: Secondary aluminum smelting is a single subcategory for the purpose of establishing effluent limitations guidelines and standards of performance. However, three principal waste streams resulting from three distinct water uses within a secondary aluminum smelter have been identified and are subject to individual effluent limita-

tions and standards of performance. These are: (i) Waste water from metal cooling, (ii) waste water from fume scrubbing, and (iii) waste water from residue processing. Plants using water for cooling only will be subject to one series of effluent limitations; plants using water for both cooling and fume scrubbing will be subject to two series of effluent limitations, etc. The consideration of such factors as raw materials used, age and size of the plant, products produced, and manufacturing processes employed support the conclusion that effluent limitations should be based on the specific water uses within a plant.

(iii) Waste Characteristics. (1) Subpart A—Bauxite Refining Subcategory: The waste waters from bauxite refining contain various soluble and insoluble materials resulting from the following principal sources: (1) Red mud residue from the alumina extraction process, (2) spent liquor from salting out evaporators, (3) condensates from evaporation operations, (4) barometric condenser cooling water, (5) miscellaneous cooling water streams, and (6) storm-water run-off.

The most significant waste streams from the bauxite refining operation, in terms of volume of waste water generated, are the red mud and barometric condenser cooling water streams.

(2) Subpart B—Primary Aluminum Smelting Subcategory: Most of the waste waters from primary aluminum smelting result from air pollution control devices which employ wet scrubbers to control air emissions. Wet scrubbing can be employed in one or more of three general areas: the anode plant, the potline, and the casthouse. The waste waters from each of these areas will be discussed individually: (1) The anode plant, where the anode materials, pitch (coal tar) and petroleum coke, are received, comminuted, screened, blended, and in some plants, pressed and baked, is a source of dust. The handling of pitch and anthracite (hard coal) for cathode linings also produces carbonaceous dust. In some plants such dusts are collected in dry cyclones and bag filter houses. However, many plants use wet scrubbing systems for air emissions control. The resulting liquor contains acids, hydrocarbon tars and oils, and sulfur oxides from the baking operation as well as carbonaceous particulate material from materials handling. Such a stream is not suitable for processing through a recovery system to the electrolytic cells, and is usually added to other effluent streams, treated to promote settling, and diverted to ponds for subsequent mixing with other plant effluent streams before discharge; (2) The potlines, or rows of reduction cells, frequently have wet scrubbers to collect fumes and dust from the electrolytic process. These wet-scrubbing systems are the source of most of the waste water constituents from primary aluminum plants. Carbon dioxide, carbon monoxide, and hydrogen fluoride are generated in the overall cell reaction. In addition, gaseous and particulate emissions con-

taining alumina, cryolite, and fluorides of calcium and aluminum contribute to the scrubber liquor loading. In those plants using Soderberg anode systems in which the anode paste mix is baked in place at the reduction cell, volatile hydrocarbons and oxides of sulfur also are collected in the scrubber liquor; (3) A third area which may employ wet scrubbing is the casthouse. Molten aluminum from the cells is degassed or fluxed by bubbling with chlorine mixed with nitrogen and, sometimes, carbon monoxide. This batch operation is carried out in gas-fired, holding-alloying furnaces and is adjusted according to specifications of the particular order being cast. As the off-gas from the furnace is scrubbed, an acidic liquor bearing dissolved chlorine, chloride and suspended alumina is developed. The quantities vary with the extent of fluxing and time in the cycle.

In addition to the three plant areas considered above, general housekeeping and the manner of collection and disposal of rain run-off affects the total plant effluent. The run-off from used cathode storage or disposal areas is the source of most of the cyanide in plant effluent. While cyanide is found in some primary aluminum plant effluents, it normally is not present in high concentrations. In addition, liquid and solid spills contain pollutants.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: The waste water from secondary aluminum smelting results from three principal sources: metal cooling, fume scrubbing, and residue processing. Metal cooling waste waters result from spraying the molds to solidify the aluminum and allow its ejection from the mold. In some cases, the molds contain internal cooling lines through which noncontact water is passed. Air cooling of the molds may be used to eliminate cooling water completely. The production of shot requires water from the rapid quenching of the molten aluminum. The molten metal is poured into a vibrating porous container which allows the metal to pass through as droplets. The drops of molten metal fall into a water bath and are quickly solidified. From the water bath they are conveyed to a dry screening operation.

Fume scrubbing waste waters result from a process of removing magnesium from the melt. The aluminum scrap normally charged into the furnace contains a higher percentage of magnesium than is desired for the alloy produced. Therefore, it is necessary to remove a portion of the magnesium from the melt. Magnesium removal, commonly known in the industry as demagging, is normally accomplished either by passing chlorine through the melt, with the formation of magnesium chloride ($MgCl_2$), or by mixing aluminum fluoride (AlF_3) with the melt, with the formation of magnesium fluoride (MgF_2). Heavy fuming results from the demagging of a melt and these fumes often are controlled by passing them through a wet-scrubbing system. The water used for scrubbing thus gains pollutants and becomes a waste

water stream. Waste water from AlF_3 demagging gas scrubbers normally can be recirculated because of the relative insolubility of fluorides. Waste water from the scrubbing of chlorine demagging fumes, however, can be recycled only to a very limited degree because the chloride salts are highly soluble and would soon build up to make the water unusable. Thus, the discharge of the effluent from chlorine demagging is the principal source of waste water from fume scrubbing.

Residue processing by wet methods is another source of waste water from secondary aluminum smelters. The residues used by the secondary aluminum industry include drosses, skimmings, and slag and are generally composed of 10 to 30 percent aluminum, with attached aluminum oxide, fluxing salts (mostly $NaCl$ and KCl), dirt, and various other chlorides, fluorides, and oxides. Separation of the metal from the nonmetals is done by milling and screening and may be done either wet or dry. When done dry, dust collection is necessary to reduce air emissions and can be done either wet or dry. Milling of dross and skimmings will produce a dust that, when scrubbed wet, will contain insoluble solids in suspension such as aluminum oxide and hydrated alumina, and soluble salts from the flux cover residues such as sodium chloride and potassium chloride. Drosses also contain aluminum nitride which hydrolyzes in water to yield ammonia. When slags are milled, the waste water contains more dissolved sodium and potassium chloride and fluoride salts from the cryolite than from drosses or skimmings. Some of the oxides of heavy metals are solubilized in the slag and are leachable from the dust. With wet milling the dust problem is minimized but the operation produces a waste water stream that has a similar composition to the scrubber waters but contains higher concentrations of contaminants. The aluminum and alumina fines are settled rapidly and assist in the settling of other waste water constituents.

(iv) Significant Pollutants. (1) Subpart A—Bauxite Refining Subcategory: The significant pollutants in the waste waters from bauxite refining include alkalinity, pH, total dissolved solids, and suspended solids. Alkalinity is significant because of the alkaline characteristics of the waste water from the Bayer process. The pH of the discharge, in addition to identifying alkalinity, serves to monitor slug discharges of acid cleaning solutions. Total dissolved solids and suspended solids and suspended solids are significant for this subcategory because of the potential for high concentrations of sodium salts and insoluble impurities in the red mud wastes, respectively.

(2) Subpart B—Primary Aluminum Smelting Subcategory: The significant pollutants in the waste waters from this subcategory include fluoride, suspended solids, oil and grease, cyanide, and pH. Fluoride is the major waste water constituent associated with the primary aluminum smelting subcategory and re-

sults from the wet scrubbing of reduction cell emissions. The reclamation of spent cathodes also may be a source of fluoride. Suspended solids result from wet scrubbing operations in the anode plant and potlines and from miscellaneous sources such as casthouse cooling circuits. Oil and grease may be present in anode plant scrubber effluent, potline scrubber effluent, and casthouse effluent. Cyanide may result from the leaching of spent cathode storage piles. Each of these waste water constituents may be present in the effluent from a primary aluminum smelter in significant quantities and each is amenable to conventional waste water treatment techniques.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: The significant constituents of cooling waste water include suspended solids, lead, manganese, and oil and grease. Each of these waste water constituents may be present in sufficient quantities to warrant their control and treatment.

The significant waste water constituents from fume scrubbing (magnesium removal operations) are pH, suspended solids, oil and grease, and chemical oxygen demand. Each of these waste water constituents may be present in sufficient quantities to warrant their control and treatment.

The significant waste water constituents from residue processing are pH, suspended solids, aluminum, copper, fluoride, ammonia, and chemical oxygen demand. Each of these waste water constituents may be present in sufficient quantities to warrant their control and treatment.

(v) Control and Treatment Technology. (1) Subpart A—Bauxite Refining Subcategory: The only feasible technology for the control of the red and brown mud wastes produced by bauxite refineries is impoundment (controlled land disposals). The muds are impounded in large diked lakes, ranging in size from 40 hectares (100 acres), to 800 hectares (2,000 acres). The impoundment areas or mud lakes are constructed in either of two basic ways. The dikes may be erected to their full height initially, so that the complete lake is available from the beginning, and additional dike construction is not required during the life of the lake; or, a low dike may be constructed initially and continually rebuilt to greater heights as the lake fills with the mud.

In all mud lake construction, care must be taken to insure that the bottom is impervious. Soil tests may be made to evaluate the bottom, and clay may be used to line the bottom if an undesirable porosity is indicated. Depending on the structural characteristics of the underlying soil, the dike also may be keyed in, by excavating a trench down its center line before its construction.

Dike heights will depend upon soil characteristics and upon mud characteristics. Heights of 6-9 meters (20-30 feet) are usual with good underlying soil conditions and a mud which readily solidifies. Arkansas dikes can be as high as 18 meters (60 feet). Typically, a refinery

initially constructs a mud lake of 20-40 hectares (50-100 acres) surrounded by a dike on four sides. After this lake is filled, a new one is constructed adjacent to it. By using one side as a common dike, only three new sides need be constructed, thus reducing the capital investment.

Mud lakes are not single-purpose operations, nor is their cost entirely assignable to pollution control. Although they are primarily receptacles for the waste mud residues, they can serve as cooling ponds and water reservoirs. They can also be receptacles for other minor waste streams from the plant, which may include boiler and cooling tower blowdowns, and treated sanitary waste effluents. If soda (sodium) concentrations are not excessively high, they may serve to some extent as an additional mud washing stage. The basic requirement for the disposal of the red mud residue from alumina plants has a direct effect on plant space requirements, plant site arrangement and the initial design of the plant water system.

The mud lake is the central item in any total impoundment waste control program. It will be used for the alkaline mud stream and, possibly, for one or more of the other waste streams. Ancillary waste streams may also utilize the mud lake, or they may utilize other similar clear water or stormwater reservoirs instead. The alternatives for the recycling of the other streams are, in general, flexible enough so that optional solutions are possible. This will include the recycling of barometric condenser cooling water. In some refineries, conventional cooling towers are used in a barometric condenser cooling water circuit. In others, the red mud lake or clearwater lake will be used, with the barometric condenser water combined with the process water.

A critical item in the total impoundment process is the management of the general aqueous wastes from the refinery. A well-designed system will include concrete curbs around all process areas where spills or leaks of process solutions are possible, with the drains all connected to a collection system. The ultimate disposition of such a system generally will be the red mud lake or one of the other lakes in the total recycle circuit. The failure to install curbs or repair cracks and crevices in concrete floors may permit the escape of alkaline process solutions.

(2) Subpart B—Primary Aluminum Smelting Subcategory: The existing technologies for controlling the waste water volume in the primary smelting of aluminum include dry fume scrubbing, and recycle of water to wet scrubbers after precipitation of fluorides. The treatment methods for reducing pollutant concentrations include cryolite precipitation, precipitation by lime or alum, adsorption on activated alumina or hydroxylapatite, and reverse osmosis. Control technology refers to any practice applied to reduce the volume of waste water discharged. In the primary aluminum industry the most significant reduction

in discharge volume is obtained by converting wet fume scrubbers to dry fume scrubbers or by treating and recycling the water from wet scrubbers.

The dry scrubbing of pot gas is a system of air pollution control used by primary aluminum smelters for the removal of pollutants from the gases evolved from the electrolytic cell (pot) by contacting the gases with dry alumina to effect the adsorption of pollutants and subsequent collecting particulates by fabric filtration. The system is applicable to gases collected immediately above the pot, i.e., pot gas, having relatively higher concentrations of constituents than does pot room ventilation air. The dry scrubbing system is not applicable to pot room ventilation air.

The outstanding features of the dry system are the adsorption of emitted gases on alumina which is subsequently fed to pots to produce aluminum product, the associated return of fluorine compounds to the pots, and the generally high levels of collection efficiency for both gaseous fluorine compounds and particulates, e.g., greater than 99 percent. The process uses no water and, hence, eliminates the discharge of process waste water pollutants. The associated solid waste handling and disposal problems also are eliminated.

The elements of the dry scrubbing process include hoods and ducts to collect and deliver the gases from the pots to an operating unit, usually located in a courtyard between potline buildings, possibly a cyclone type device to separate coarse particulates, a reactor section in which the gases are contacted with the alumina, and a fabric filtration stage, from which the gases are released to the atmosphere, usually through a stack. Associated equipment includes fans, alumina delivery, storage and removal devices, and baghouse auxiliary equipment.

Three commercial variations of the dry process exist. In one type of dry scrubber, the contacting of gas and alumina is accomplished in a fluidized bed, with the fabric filters, or a baghouse at the top of the same chamber. In another design, the air at relatively high velocity is blown upward through a venturi throat, into which alumina is injected downward. The result is extremely turbulent mixing of the solid and gas in the throat and in the column above the throat. The gases and eluted solids are drawn from the column and then to the baghouse stage. In the third design, the collected gases are drawn at high velocity through a horizontal duct with the alumina being injected downward into the moving gases. Again, turbulent mixing and intimate contact of gases and solids occur, with the gases subsequently drawn through a baghouse. The three variations of the dry scrubbing process have been demonstrated on a commercial scale and one system has been operating for three years. To date, proven applications have been on prebake anode and vertical stud Soderberg anode cells.

The water from wet scrubbers can be treated in various ways to remove im-

purities so that the partially purified water can be continuously recycled to the wet scrubber. In the case of primary potline and secondary potroom wet scrubbers, the fluoride dissolved in the water can be precipitated and settled. This treatment simultaneously reduces the suspended solids and oil and grease content. In general, the method used to remove the soluble fluoride values from the waste water is precipitation either as cryolite or as calcium fluoride. In the first case, sodium aluminate (or NaOH and hydrated alumina) is added; and in the second, a lime slurry (or in one case CaCl₂) is used. After precipitation, the thickening of the slurry is accomplished in clarifiers or thickeners.

The treatment of wet scrubber liquors to recover cryolite is a significant practice because it removes a sufficient quantity of fluoride to permit recycle of the treated liquor to the scrubbers, and in the process recovers the fluoride in a form which usually can be returned to the aluminum reduction cells. The value of the cryolite recovered represents a credit to the treatment process. Total recycle cannot be achieved by this treatment because of the presence of sulfates in the liquor. Sulfur impurities in the raw materials, principally in the petroleum coke and pitch used in anode preparation, are converted to sulfur oxides during electrolysis and are collected in the scrubber water as sulfates. If total recycle of the liquor is attempted, the solubility of sodium sulfate would eventually be exceeded. Therefore, a small bleed is maintained from the scrubber liquor circuit to keep the sulfate concentration sufficiently low to prevent the precipitation of sodium sulfate. This bleed stream is relatively low in volume but high in fluoride content and represents the major portion of the fluoride effluent from the entire plant. The recycle system uses the clarified overflow from the thickener tanks as the scrubbing medium.

Degassing is an operation in which dissolved hydrogen and other impurities are removed from molten aluminum just before it is cast into product form. Classical degassing is the bubbling of chlorine gas through the melt to react with and remove the hydrogen as hydrogen chloride gas and the other impurities as chloride salts. Emissions to the air ordinarily have been controlled by alkaline wet scrubbing. The raw waste water stream produced may vary from acid to alkaline, depending on operating conditions, and contains significant amounts of dissolved salts, principally sodium chloride.

There are a variety of degassing procedures which eliminate the use of water during the degassing of molten aluminum. These include: (i) Degassing with mixtures of chlorine and other gases, (ii) degassing with inert gases (nitrogen or argon), and (iii) degassing by filtration. The necessity for degassing varies with product specifications. Products which must be especially pure and free from pin holes caused by gas bubbles (e.g., aluminum foil) require stringent

control of metal quality. Certain alloys or melting stock therefore require the elimination of impurities to achieve the specified properties of strength, ductility, electrical conductivity, etc. Each of the degassing procedures noted above is in commercial use in one or more producing plants. Therefore, it is concluded that there are currently available alternative process methods which eliminate cast house waste water from degassing operations.

Numerous treatment techniques are available to primary aluminum smelters to reduce the concentration of pollutants in waste waters before discharge. The treatment of recycled fluoride waste streams is effected by the reaction of the waste stream with calcium chloride or lime to precipitate calcium fluoride. Adequate detention time will also reduce the concentration of suspended solids and oil and grease in the effluent. The treatment of dilute, once-through, fluoride waste streams can be effected by several processes. Although these processes are not in general use by the industry, they are adequately demonstrated in other industrial or municipal applications and are considered practicable treatment technologies. They include: (i) Aluminum sulfate (alum) treatment, (ii) activated alumina adsorption, (iii) hydroxylapatite filtration, and (iv) reverse osmosis. The waste water from anode bake furnace scrubbers may be treated with lime and settled. After settling, oil and grease materials are skimmed from the pond surface.

For water pollution control, a dry scrubbing system is obviously the best, when it can be used. Plants committed to potroom air cleaning, i.e., secondary air scrubbing, cannot use a dry scrubbing system because of the inefficiency of dry systems at low concentrations of emissions. In addition, the use of dry scrubbing on the anode bake plant effluent is not practiced at the present time, although at least one plant achieves the equivalent of a dry system by controlled firing.

There are notable differences between the two wet scrubber systems, once-through and recycle. The recycle system is considerably more effective in the reduction of fluorides, suspended solids and oils and greases. Fluoride quantities are about 5-10 kg/kg (10-20 lb/ton) of aluminum when a once-through system is used and 0.5 to 1 kg/kg (1-2 lb/ton) of aluminum when a recycle system is used.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: The amount of waste water generated from metal cooling can be controlled by recirculation and cooling. A waste water discharge can be eliminated by adopting either total consumption through regulated water flow or air cooling. However, these two alternatives are not suited to smelters producing deoxidizer shot. A recirculation system may consist of a cooling tower, a cooling pit, an auxiliary holding tank, associated plumbing, and necessary pumps. The size and cost of these

facilities would depend on the production capacity of the smelter. It is possible to reduce flow rates in metal cooling such that the cooling water is totally evaporated by the hot ingots. Specially designed nozzles may be used to give a water mist spray that reduces the steam-to-metal interface and to reduce water consumption. Consumptive cooling may require longer conveyors to assure that the ingots have cooled sufficiently to be handled. Air streams also may be used to cool the ingots. Air cooling is accomplished by conveying the hot ingots through an air tunnel fitted with entrance and exhaust blowers. The conveyors are approximately twice the length of water cooling conveyors. Maintenance is higher on the air-cooled system because of the longer conveyor, the added heat load on the lubricants, and the additional blower motors. In some cases a water mist is added to the air to improve the cooling rate but this water is completely evaporated. The waste water from both once-through and recirculating cooling operations requires treatment to remove the oil and grease and suspended solids before discharge. Since it is more efficient to treat waste water with high levels of pollutants than with low levels, the treatment of the recirculated water is preferable. Specialized skimming devices are available for the removal of oil and grease from water. Grease traps can reduce the levels of oil and grease so that such specialized equipment is not overloaded. The removal of suspended solids from cooling waste water requires settling. The components of the suspended solids are primarily aluminum hydroxide or hydrated oxide which are excellent coagulants. The recirculation of cooling water will build the suspended solids level to concentrations great enough to effect rapid settling between cooling operation cycles. Sludge removal, if required, may be done periodically. The supernatant water may be pumped into a holding tank during sludge removal and then reused. Sludge from the settling tank may be disposed of in an impervious lagoon or an acceptable landfill.

The fumes formed during chemical magnesium removal must be controlled to reduce air emissions to acceptable levels. Numerous wet scrubbing techniques have been employed for this purpose. The discharge from these wet fume scrubbing devices contains most of the volatile metal salts entrained in the gas flow. When chlorine is used for magnesium removal, aluminum chloride and magnesium chloride are the principal waste water constituents. When aluminum fluoride is used for magnesium removal, the principal volatile products may be silicon tetrafluoride and hydrogen fluoride, which are formed from the high temperature hydrolysis of the slightly volatile fluoride salts reacting with moisture in the air. In both types of magnesium removal processes, the air pollutants are transferred into water pollutants. The control of air emissions during magnesium removal can be done either dry or wet. Dry emission control

techniques must contend with rather corrosive gases for both types of magnesium removal. Anhydrous chloride salts hydrolyze to produce hydrogen chloride gas which, in turn, reacts with water vapor to form hydrochloric acid. Hydrogen fluoride and hydrofluoric acid are formed only at high temperatures; however, once formed, they remain present in the gases being scrubbed.

Three processes exist for fume control without major use of water either in the process or in fume control. These are the Derham process, the Alcoa process, and the Teller process. The Derham process includes equipment and techniques for magnesium removal with chlorine from secondary aluminum melts with minimum fume generation and without major use of water in either the process or in fume control. The principal concept is the entrapment of magnesium chloride, the reaction product of magnesium removal with chlorine, in a liquid flux cover, with the flux subsequently being used in the melting operations. The principal components consist of a separate bath of the metal to be treated with its special flux cover, and means to circulate the molten metal to and from that separate bath.

The treatment bath may be integrated with, or separate from, the smelting furnace depending on whether the particular installation is a new or existing facility. The molten metal circulation from the main furnace hearth to the Derham unit is accomplished by pumping (usually with an air-drive siphon) rather than by less direct methods such as mechanical stirring or nitrogen-gas sparging or agitation.

The molten metal brought to the treatment unit is treated in the usual manner with gaseous chlorine to achieve magnesium removal. Molten magnesium chloride is the reaction product. By maintaining a relatively thick cover on the bath in the treatment unit, the emissions of aluminum chloride to the atmosphere usually produced by demagging are nearly completely arrested. As the flux cover becomes saturated with magnesium chloride, it is removed and may be used as a flux in the main melting furnace. The flux is usually cast into cakes. After grinding it may be used as a covering flux at the charging well of the melting furnace. Any gaseous effluents from the treatment unit are blended with the combustion gas effluent and released to the stack. Emission control requirements vary and may be satisfied by the approach of blending the gases. In situations requiring particulate control with baghouses, the chloride emissions, although hygroscopic, are usually dilute enough not to interfere with baghouse operation.

The Alcoa process is a fumeless technique for magnesium removal. It recovers molten magnesium chloride as a product. The unit is installed between the holding furnace and a casting machine and removes magnesium continuously as the metal flows through. The operation uses no flux salts and attains the high chlorine efficiencies through ex-

tended gas residence times achieved by employing gas-liquid contractors. For very dirty scrap a short period of pre-chlorination in the furnace is necessary to improve fluxing. The system has been operated on a commercial scale.

The coated baghouse (Teller) process is a modification of a baghouse operation. Baghouses normally have not been effective in the removal of fumes from demagging operations because blinding occurs during collection of the submicron particulates. These particles enter the interstices of the weave and create a barrier to gas flow. When blinding occurs, the pressure drop rises rapidly and gas flow diminishes. One system has been installed at a secondary aluminum smelter. Basically, the system differs from a normal baghouse in that the bags are precoated with a solid and are designed to absorb effluent gases as well as particulates. Upon saturation, the coating and the collected dust are removed by vibration. A fresh coating then is applied. The collected particulate and spent coating are disposed of in an acceptable landfill. The system is suited for collection of emissions from operations using aluminum fluoride for demagging. A prototype has been installed in such a facility where its performance is being evaluated. The evaluation program also is to establish its effectiveness for the collection of emissions from operations using chlorine for demagging.

Wet scrubbing techniques to remove demagging fumes from the air transfer pollutants to the water. The treatment applied to the waste water prior to its discharge or re-use depends upon the method used for magnesium removal. The water from fume scrubbing operations using chlorine for magnesium removal is highly acidic due to the hydrolysis of aluminum chloride and magnesium chloride. Neutralization to pH of 6-7 will precipitate most of the aluminum and magnesium as hydroxide. The coprecipitation of heavy metal hydroxides also occurs. The effectiveness of neutralization is diminished if too much alkali is added since resolubilization of aluminum hydroxide occurs at about pH 9. Solids removal by settling follows neutralization. The supernatant may be recycled to the scrubber system.

The water from fume scrubbing operations using aluminum fluoride for magnesium removal may be neutralized and recycled continuously. The continuous recycle system scrubs the emissions with a venturi-type scrubber followed by a packed tower and demisting chamber. The waste water is collected in a settling tank where it is treated with 5 percent caustic to neutralize the hydrogen fluoride formed from hydrolysis. The sodium fluoride formed reacts with particulate aluminum fluoride carried with the emission to form insoluble cryolite. The magnesium fluoride, cryolite, and other insolubles are separated in setting tanks and the alkaline supernatant is recycled to the scrubbed system. There is no water discharge except for that removed with the sludge.

Waste water generated during wet milling of residues is treated in settling ponds in which the insoluble materials are removed. Depending on the nature of the residue being milled, the amounts of dissolved solids and insoluble solids in the raw waste water vary. When the residues are slags from secondary smelters, the waste water contains large amounts of dissolved salts. When the residues are drosses or skimmings from primary or foundry sources, the amount of dissolved salts in the waste water is greatly reduced; however, the insoluble solids fraction approaches 70 percent by volume. At most residue milling facilities, both types of residues are handled and both types of raw waste water are generated from the same milling operation. Waste water also is generated from the wet control of dust from a dry milling operation. Wet milling of primary aluminum residues and secondary aluminum slags by a countercurrent process may be the only practical method to recover salts. By using a countercurrent milling and washing approach, two advantages are realized. The final recovered metal is washed with clean water, thereby providing a low-salt feed to the reverberatory furnaces. Also, the waste water with the insolubles removed would be of a concentration suitable for economical salt recovery by evaporation and crystallization. Heat for evaporation could be supplied by the waste heat from the reverberatory furnaces. The process ultimately must dispose of the dirt, trace metals, and insolubles recovered from the chlorine which contain low levels of soluble salts. Such salt recovery installations are operating in England and Switzerland and the salts recovered are credits to the operation, since they are reusable as fluxing salts by the secondary aluminum industry. Such a system has not been operated in the United States, although preliminary research to do so is underway.

The alternative to wet residue milling and the resulting waste water treatment is dry milling of the residues. Impact mills, grinders, and screening operations are used to remove the metallic aluminum values from the nonmetallic values. The high levels of dust formed in these operations are vented to baghouses. The baghouse dust and the nonmetallic fines from the screening constitute the solid waste from the operation. These solids normally are stored on the plant site on the surface of the ground. The runoff should be controlled by containing dissolved salts in drainage ditches which feed to suitable impervious impoundment areas.

(vi) Best Practicable Control Technology Currently Available, Best Available Technology Economically Achievable, and Best Available Demonstrated Control Technology, Processes, Operating Methods, or Other Alternatives.

(1) Subpart A — Bauxite Refining Subcategory: The best practicable control technology currently available for the bauxite refining subcategory is the total impoundment of process waste waters with recycle as required to elimi-

nate the discharge of process waste water pollutants to navigable waters. The corresponding effluent limitation is no discharge of process waste water pollutants. The best available technology economically achievable and the best available demonstrated control technology also is total impoundment of process waste waters. The corresponding effluent limitation and standard of performance is no discharge of process waste water pollutants.

(2) Subpart B—Primary Aluminum Smelting Subcategory: The best practicable control technology currently available for the primary aluminum smelting subcategory is the treatment of wet scrubber water and other fluoride-containing effluents to precipitate the fluoride, followed by settling of the precipitate and recycling of the clarified liquor to the wet scrubbers as a means of controlling the volume of waste water discharged. Two precipitation methods are currently available: Cryolite precipitation, and precipitation with lime. This technology achieves an attendant reduction in the discharge of suspended solids and oil and grease. Alternate technologies for achieving effluent limitations based on the application of the best practicable control technology currently available are dry fume scrubbing and total impoundment (controlled land disposal).

The application of the best practicable control technology currently available results in a relatively low-volume, high-concentration bleed stream. The best available technology economically achievable is the lime treatment of such a bleed stream to further reduce the discharge of fluoride, suspended solids and oil and grease. Alternate technologies for achieving the effluent limitations based on the application of the best available technology economically achievable include dry fume scrubbing and total impoundment (controlled land disposal).

The best available demonstrated control technology for new sources in the primary aluminum smelting subcategory is the use of dry fume scrubbing techniques on the potroom air and the treatment of waste water from anode plant wet scrubbers and the casthouse. Since the primary smelting of the aluminum requires no process water directly, the principal area where the use of water can be minimized in the design of a new plant is the application of dry fume scrubbing systems for air pollution control. Dry fume scrubbing systems exhibit high collection efficiencies. The fluoride values contained in the fumes can be recovered in a form amenable to recycle to the smelting process. Alternate technologies for potroom air cleaning which may be employed in certain circumstances are wet scrubbing with total impoundment of the scrubber water or with recycle of the scrubber water and lime treatment of the bleed stream.

The treatment of the waste water from the anode plant and other fluoride-containing waste streams consists of lime precipitation followed by solids removal and recycle of the clarified liquor

to the scrubbing system. Alternate technologies for fluoride removal are identical to the best available technology economically achievable.

The treatment of waste water from the casthouse consists of impoundment of the bleed stream from the cooling water circuit or treatment of the cooling water for solids and oil and grease removal. Alternate technologies for the control of casthouse waste water include air-cooled, solid-state rectifiers, which eliminate the discharge of rectifier cooling water, and a number of alternative methods for molten metal degassing which eliminate the discharge of casthouse scrubber waste water.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: The control and treatment technologies applicable to secondary aluminum smelters are discussed below for waste water generated during (i) metal cooling, (ii) fume scrubbing during magnesium removal, and (iii) wet residue processing.

The best practicable control technology currently available for metal cooling in the secondary aluminum subcategory is the elimination of the discharge of process waste water through the use of the following: (i) Air cooling, or (ii) total consumption of cooling water, or (iii) recycle of cooling water for deoxidizer-shot cooling or ingot cooling. With re-use or recycle of water the need for sludge and oil removal will be dictated by individual plant procedures.

The air cooling method or the total evaporation cooling method (air cooling method with water mist added to assist the air cooling) requires: (i) The addition of ingot molds to the lengthened conveyor line, (ii) the installation of blowers, and (iii) in the case of total evaporation cooling, the addition of special nozzles, flow meters, and controls to existing water lines.

A recycle system for ingot cooling may require: (i) The addition of a cooling tower, holding tanks, and pumps to the existing water cooling facility, (ii) provisions for oil and grease removal, and (iii) provisions for sludge removal, dewatering, and disposal. The effluent limitation associated with the application of the best practicable control technology currently available for metal cooling waste waters is no discharge of process waste water pollutants. The best available technology economically achievable and the best available demonstrated control technology are equivalent to the best practicable control technology currently available for metal cooling.

The best practicable control technology currently available for control of the discharge of pollutants contained in fume scrubber waste water from magnesium removal are the following: (i) When chlorination is used for magnesium removal, adjustment of the scrubber effluent pH to between 6.5 and 8.5 followed by settling for solids removal or, the prior adjustment of the pH of the scrubber liquor so that the resultant effluent from the scrubber is at a pH of 6.5 to 8.5 followed by settling for

solids removal, and (ii) when aluminum fluoride is used for magnesium removal, adjustment of the scrubber effluent pH to between 6.5 and 8.5 followed by settling for solids removal. After neutralization and settling, the supernatant is recycled continuously and the solid fluorides are removed continuously to eliminate the discharge of process waste water pollutants. The fume scrubber water from magnesium removal with chlorine, upon pH adjustment, cannot be recycled continuously because of the excessive buildup of sodium chloride. However, partial recycle of the clarified treated effluent to reduce the volume of waste water discharged is considered practicable.

The best available technology economically achievable for the control of waste water from fume scrubbing during magnesium removal is the use of in-process and end-of-process controls and treatment to achieve no discharge of process waste water pollutants. This can be done using one of the following approaches: (i) The use of currently available processes for fumeless chlorine magnesium removal, (ii) the use of aluminum fluoride for magnesium removal and continuous recycling of scrubbing water from emission and effluent control systems, and (iii) the use of aluminum fluoride for magnesium removal and a coated baghouse system for air pollution control.

The best available demonstrated control technology, processes, operating methods, or other alternatives, for fume scrubbing waste water is the use of aluminum fluoride for magnesium removal and continuous recycling of scrubber water from emission and effluent control systems, or the use of chlorine for magnesium removal with wet fume scrubbing and the application of the best practicable control technology currently available (pH adjustment and settling).

The best practicable control technology currently available for control of the discharge of pollutants contained in waste water from residue milling is a settling treatment of three to four stages with partial recycle of the sludge and the clear supernatant from the final stage to the mill. Adjustment of the intake water pH is necessary to reduce ammonia levels in the waste water during milling. When milling is done without pH adjustment of the intake water, ammonia remains in solution. To aid the settling of the milling wastes, a polyelectrolyte may be required to reduce the level of suspended solids. Recirculation of the sludge in the last settling pond to the mill will reduce the overall sludge content of the final pond.

The best available technology economically achievable and the best available demonstrated control technology for the control of waste water from residue milling is the equivalent of totally dry milling methods to eliminate the discharge of process waste water. An alternative to dry milling is the use of countercurrent wet milling techniques with evaporation to reclaim salts from

the process and to eliminate the discharge of process waste water pollutants.

(vii) Costs for the Control and Treatment of Waste Water. (1) Subpart A—Bauxite Refining Subcategory: Increases in operating costs to eliminate the discharge of process waste water pollutants are estimated to range from zero to \$0.28/kkg (0–\$0.25/ton) of alumina for six of eight U.S. refineries. One producer estimates that the costs incurred to eliminate the discharge of process waste water pollutants would be \$6.40 to \$7.74/kkg (\$5.76 to 6.97/ton). Based on operating costs of \$55/kkg of alumina (\$50/ton), this would be an increase of 11–14 percent in operating costs for two plants in the industry. Neither of these two plants currently has facilities for impounding process wastes. Every other plant in the subcategory currently practices some form of impoundment.

(2) Subpart B—Primary Aluminum Smelting Subcategory: The costs of reducing the discharge of pollutants from primary aluminum smelting is directly related to the cost of removing fluoride. It is apparent that the cost increases as the amount of fluoride in the effluent stream decreases. The most effective and also the most expensive option to control fluorides is the conversion of a wet scrubbing system on the potline to a dry scrubbing system. A dry scrubbing system, however, may not be feasible for use on potroom secondary air or for horizontal stud Soderberg potlines.

The relatively high capital required for the installation of a dry scrubbing system applies only to those plants which would be converting from a wet system. The initial installation of a wet scrubbing system, including the scrubber, fans, etc., costs about \$38/annual ton of aluminum. Thus, the difference in cost between the two systems for a new plant would only be about \$2/annual ton based on an average investment cost of \$40/annual ton for dry scrubbing.

The recycle mode of scrubbing water control on both potline (primary) gases and potroom (secondary) gases results in fluoride effluents less than 1 kg/kkg of aluminum (2 lb/ton). An average cost for this means of control is about \$10/annual ton capital and \$4.60/ton operating. This treatment scheme is the model for the best practicable control technology currently available. The use of once-through water in the wet scrubbing system of potlines with lime treatment before discharge results in effluent fluoride levels of about 5 kg/kkg of aluminum (10 lb/ton). Costs associated with this treatment process are \$7/annual ton capital and \$2.50/ton operating. This treatment scheme is not considered equivalent to the best practicable control technology currently available. The following conclusions can be made regarding the cost effectiveness of fluoride control:

(1) The most cost-effective means of control for new plants with prebake or vertical stud Soderberg anode configuration is the installation of a dry scrubbing system on the potline gaseous efflu-

ents. Tight hoods should be provided, and the operation conducted in such a manner as to minimize any potroom contamination.

(2) The most cost-effective means of removing fluoride for those plants with existing wet scrubber systems is the operation of a recycle loop to the scrubber with cryolite precipitation. The difference in cost between this system and the once-through system with lime treatment is relatively low, and the fluoride removal efficiency is considerably better in the recycle system.

The treatment techniques for fluoride removal will tend to remove suspended solids. In the dry system, any suspended solids will be caught in the collection system. Since wet systems for fluoride control involve a settling operation, the suspended solids also will tend to settle. Therefore, conclusions about the cost effectiveness of fluoride removal also apply to suspended solids control.

Oils and greases emitted from the anode consumption in the potline also tend to be removed with the suspended solids and fluoride. At least one plant lagoons scrubber water from the anode bake plant and indicates that the oil and grease content (as well as suspended solids) can be reduced by 60 percent in a pond with a residence time of 21 hours. This residence time is relatively long. However, concentrations of oils and greases are low (less than 10 mg/l with an incoming suspended solids concentration of 100 mg/l. Very likely, further reduction of oil and grease can be effected by longer residence times with proportionately higher costs. Another plant achieves good reduction in oil and grease (95 percent) by using a cooling tower and aerated lagoon treatment of the blowdown from the cooling tower at a cost of \$1.60/annual kkg capital and \$0.40/kkg operating. The choice of additional schemes for the treatment of scrubber water effluent depends primarily on whether a recycle system or once-through system is in use. In a recycle system, the additional control of fluorides, suspended solids, and oil and grease can be effected by the lime or CaCl₂ treatment of the filtrate stream from the cryolite recovery system and the bleed stream from the scrubber. The costs for this treatment are \$1.50/annual kkg capital and \$0.64/kkg operating. This cost includes a mixing tank for chemical addition, a thickener tank, pumps, piping services, etc. The costs are relatively low compared with other fluoride treatment processes because of the low volume of effluent to be treated, about 120 l/minute (30 gpm), and high concentration of fluoride, about 1,000 mg/l. It is expected that this treatment also will reduce suspended solids and/or grease. The addition of a treatment process to water effluent from the once-through potline and potroom scrubber after lime treatment is more costly than the treatment of recycle effluents. In once-through systems, large volumes of water with low concentrations of fluorides and other pollutants are treated. The conclusions about the cost effective-

ness of treatment of potline and potroom effluents are:

(1) The cost difference between a dry system and a recycle plus effluent control is negligible for new plants.

(2) For plants which already have a recycle scrubber operation on their potline or potroom gases, the addition of further treatment of the two effluent streams is both inexpensive and very effective.

(3) For plants using a once-through scrubber system, a conversion to the recycle mode yields the best cost-benefit. Although an activated alumina adsorption process added to the once-through scrubber water costs approximately the same, about ten times the amount of pollutants would be discharged in the water from the activated alumina system.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: The costs for the application of waste water control and treatment technologies for the secondary aluminum smelting subcategory are described for the following operations: (i) Metal cooling, (ii) fume scrubbing, and (iii) residue processing.

A capital cost of approximately \$0.43/annual kkg of aluminum is needed to convert an existing once-through water cooling system to a recirculation system. An operating cost of \$0.15 per kkg is required, exclusive of savings resulting from decreased water use. The conversion from a water-cooled ingot line to an air-cooled line would require an investment of \$9.20/kkg and an operating cost of \$2.25/kkg, also exclusive of the water savings credit. The evaporation of the blowdown from the cooling tower in a recirculating system would require a capital cost of \$0.30/kkg and an operating cost of \$0.05/kkg. The treatment of metal cooling waste water to remove oil and grease would require a capital cost of \$0.08/kkg and an operating cost of \$0.07/kkg. It is concluded that no discharge of process waste water pollutants from metal cooling can be achieved for an added cost of \$0.15 to \$1.00/kkg of aluminum produced.

A capital cost of approximately \$2.75/annual kkg of aluminum is required to install a pH adjustment-settling treatment capability to control the discharge of pollutants from chlorine fume scrubber systems. An operating cost of \$1.50/kkg is estimated for such an installation with somewhat lesser expenditures required for plants currently neutralizing the scrubber effluent. Those plants using aluminum fluoride for magnesium removal require, in addition to neutralization and settling, a means to recirculate the scrubber water and remove solids continuously. This requires a capital investment of \$9.90/annual kkg and an operating cost of \$2.45/kkg. The cost of eliminating the discharge of pollutants from fume emission control systems depends upon which of three available techniques is used. The Derham process for magnesium removal requires a capital expense of \$3.40/annual kkg of capacity and an operating cost of \$2.60/kkg. The Alcoa process requires a capital

cost of \$5.90/kg and an operating cost of \$2.90/kg, exclusive of a credit for the sale of magnesium chloride recovered. The use of aluminum fluoride for magnesium removal combined with the continuous recirculation of scrubber water requires a capital expenditure of \$14.00/annual kkg and an operating cost of \$5.40/kg. The use of a chemically treated baghouse system (Teller system) for the reduction of air emissions from magnesium removal by aluminum fluoride, requires an estimated capital cost of \$27.70/annual kkg of capacity and an operating cost of \$7.30/kg.

A capital cost of \$8.70 to \$15.30/annual kkg of molten aluminum and operating costs of \$3.30 to \$10.90/kg are required to treat waste waters from residue processing by settling. The variations in costs result from (i) the amount of water used in milling, and (ii) the solids content of the residue. The cost of eliminating the discharge of pollutants from the milling of residues is estimated to be \$130.00/annual kkg of aluminum capacity. This cost is for building a new facility to convert from wet to dry milling. The costs for recovery of salts from residue milling waste waters is dependent upon the type of residue processed. The estimated capital costs for evaporation of low-salt residue waste waters is \$16.00/annual kkg and the operating cost is \$24.00/kg. High-salt content residues may require a capital expenditure of as much as \$200.00/annual kkg and an operating cost of \$124.00/kg.

(viii) Nonwater Quality Aspects of Pollution Control. (1) Subpart A—Bauxite Refining Subcategory: The energy requirements for the total impoundment of red mud wastes result from pumping and heat exchange. The energy consumed in pumping red mud and other effluents to an impoundment area is considered comparable to that required for pumping to an outfall so the incremental energy usage is nominal. Similarly, the energy required to return the supernatant from a lake to the plant is comparable to that required for pumping freshwater from another source. Depending upon the overall plant design, management of the plant water circuit, and plant location, the evaporation of excess water may be necessary to avoid discharging process waste water pollutants. Thus, the use of fossil fuel in variable quantities may be necessary. However, the water to be evaporated always will be significantly less than the quantity routinely evaporated in the manufacturing process.

The volume of solid wastes, i.e. red mud, generated annually by the bauxite refining industry would occupy 12 million cubic yards. This is equivalent to 7600 acre-feet per year. Assuming a mud lake is filled to a depth of 25 feet, 300 acres would be required. This land requirement for the control of bauxite refining wastes is the only practical disposal alternative available. However, the use of land impoundment for the control of waste waters does not relieve the refiner from the responsibility to avoid con-

tamination of subsurface waters. Impoundment sites should be located and engineered to avoid direct hydraulic continuity with surface or subsurface waters, and any leachate or subsurface flow into the disposal area should be contained within the site unless treatment is provided. Where appropriate, the location of the disposal site should be permanently recorded in the office of legal jurisdiction.

(2) Subpart B—Primary Aluminum Smelting Subcategory: Because the energy requirements of control and treatment methods for primary aluminum smelters represent only a small fraction of the total energy consumed in the primary aluminum industry, it is concluded that energy requirements will not be the deciding factor in the choice of control and treatment technology. The total energy requirement for a cryolite recovery and recycle system which is equivalent to the best practicable control technology currently available is about 1 percent of the energy consumed by the smelting operation itself.

A number of the control and treatment technologies identified produce solid waste. Dry scrubbing does not produce a solid waste but, rather, allows the collected particulates and gases to be returned to the electrolytic cell. Wet scrubbing methods and subsequent waste water treatment produce sludges in amounts ranging from 60 to 123 kg/kg of aluminum. The calcium fluoride sludge should be disposed of in an acceptable landfill, which means a landfill at which complete long term protection is provided for the quality of surface and subsurface waters, from hazardous substances contained in the wastes deposited therein, and against hazard to the public health and the environment.

(3) Subpart C—Secondary Aluminum Smelting Subcategory: The nonwater quality environmental impact of the control and treatment of cooling waste waters consists of: (i) An incremental addition to the thermal load of the plant by thermal radiation from air cooling of ingots, (ii) added electrical energy requirements of about 11 kwhr per kkg would be needed for air cooling operations, and (iii) negligible impact on air quality from water evaporation either from consumptive water-mist cooling or from sludge drying. Sludges from a recirculating cooling water system should be disposed of in an acceptable landfill. The only significant nonwater quality environmental impact of the control and treatment of waste waters from fume scrubbing during magnesium removal is the potential effect on soil systems due to the reliance upon the land for ultimate disposition of final solid waste from the water treatment. The solid wastes are primarily inorganic and nonleachable. However, the solid waste from fluoride recovery can affect ground waters adversely if not adequately contained. Therefore, the solid wastes should be disposed of in an acceptable landfill to prevent contamination of subsurface waters. The residues resulting from ap-

plication of the Derham process may be too high in soluble salts for economic processing by residue milling techniques for metal recovery and, therefore, constitute a solid waste. The application of aluminum fluoride with continuous scrubber water recirculation will produce a solid waste. The application of chemically-treated baghouse systems for dry air pollution control also results in a solid waste since the bag coating and the collected dust and fumes may contain fluoride salts.

The application of settling techniques to treat the waste waters from residue milling produces a solid waste. Both dry milling and wet milling of residues generate large quantities of solid wastes, ranging from 2.3 to 9 kkg/kg of aluminum recovered, depending on the grade of residue. Generally the solid waste from dry milling contains the highly soluble chloride salts which are removed during wet milling. These salts may be leachable to groundwater. Dry milling also generates large quantities of air-borne dust. Appropriate collection systems normally are able to control the atmospheric emissions of the dust. The recovery of salts from wet milling operations will require additional consumption of thermal energy of 8.6×10^6 kg cal for the low-salt residue waste water and 176×10^9 kg cal for the high-salt residue waste water per kkg of aluminum recovered.

(ix) Economic Impact Analysis. The proposed effluent limitations guidelines are expected to have only minimal effects on the secondary aluminum subcategory with practically no impact on the primary subcategory. While, in general, similar conclusions have been reached concerning the bauxite refining subcategory, it should be recognized that two plants in this industry (representing about 24 percent of total industry supply) are likely to incur very significant costs in meeting the proposed guidelines.

Within the primary aluminum subcategory, the current trend toward dry scrubbers for air pollution control should minimize, if not eliminate, the problems of water pollution control. Accordingly, there should be only minimal cost in meeting the proposed effluent limitations for 1977 and 1983. No price increases are expected and no plant closings or employment impacts are anticipated. There should be no impacts on the balance of trade or industry growth as a result of water pollution control requirements.

Noticeable price increases are not expected within the secondary aluminum industry as a result of the proposed guidelines. With the exception of the wet dross processing sector (less than 4 percent of secondary capacity) cost increases are expected to be less than 1.1 percent of the sale value of aluminum. Excepting isolated cases of regional monopolies, competition within the industry should prevent these costs from being passed on as price increases. Plant closings are expected only in those plants using wet processes for dross and slag milling. In such plants the combined 1977 and 1983 proposed guidelines could lead to cost increases equal to 6 percent or

more of the sale value of aluminum (1.5¢/lb or more) and equivalent to 100 percent or more of profits. There are four known wet dress plants and two other plants with wet dress departments. These six operations represent approximately 160 employees and less than 1.0 percent of total aluminum production. None of these closures or curtailments should have noticeable community impacts and the impacts of the guidelines on the balance of trade and industry growth should be negligible.

The majority of the costs for meeting the proposed guidelines have already been incurred by seven of the nine plants in the bauxite refining subcategory. Cost increases for these seven plants are expected to range from zero to 1.6 percent of the sale value of alumina depending on the levels of control already in place. Cost increases for the remaining two plants (approximately 24 percent of industry supply) may range from \$6.72 to over \$9.36 per ton of alumina or an equivalent of 10 percent to 13 percent of the sale value of raw alumina. Due to the low cost increases for the other seven plants and the competitive structure of the industry, it is not likely that the cost to these two plants can be recovered through price increases. While the high percentage of industry capacity represented by these two plants make their closure seem unlikely, it should be recognized that the potential for closure does exist. Their estimated cost for meeting the guidelines are quite high, with investment costs being equal to about 18 percent of replacement cost of an alumina facility and annual cost being equivalent to 30 percent or more of the total profits normally realized on the manufacture of finished aluminum. These high costs in light of some distinct advantages to overseas bauxite refining may cause the owners to give serious consideration to closing these plants. Such actions could result in significant short term disruptions within the aluminum industry. In addition, an estimated 1220 jobs could be lost with potential secondary unemployment for an additional 2,400 people. The balance of trade would be affected by an estimated \$950 million dollars per year.

Reports entitled "Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Bauxite Refining Subcategory of the Aluminum Segment of the Nonferrous Metals Manufacturing Point Source Category," "Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Primary Aluminum Smelting Subcategory of the Aluminum Segment of the Nonferrous Metals Manufacturing Point Source Category," and "Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Secondary Aluminum Smelting Subcategory of the Aluminum Segment of the Nonferrous Metals Manufacturing Point Source Category"¹ describe the analysis undertaken in support

of the regulations being proposed herein and are available for inspection in the EPA Information Center, Room 227, West Tower, Waterside Mall, Washington, D.C., at all EPA regional offices, and at State water pollution control offices. A supplementary analysis prepared for EPA of the possible economic effects of the proposed regulations is also available for inspection at these locations. Copies of these documents are being sent to persons or institutions affected by the proposed regulations, or who have placed themselves on a mailing list for this purpose (see EPA's Advance Notice of Public Review Procedures, 38 FR 21202, August 6, 1973). An additional limited number of copies of all reports are available. Persons wishing to obtain a copy may write the EPA Information Center, Environmental Protection Agency, Washington, D.C. 20460, attention: Mr. Phillip B. Wisman.

(c) Summary of public participation. Prior to this publication, the agencies and groups listed below were consulted and given an opportunity to participate in the development of the effluent limitations guidelines and standards of performance for the aluminum subcategory. The following are the principal agencies and groups consulted: (1) Effluent Standards and Water Quality Information Advisory Committee (established under Section 515 of the Act), (2) All State and U.S. Territory Pollution Control Agencies, (3) Ohio River Valley Sanitation Commission, (4) New England Interstate Water Pollution Control Commission, (5) Delaware River Basin Commission, (6) Conservation Foundation, (7) Businessmen for the Public Interest, (8) Environmental Defense Fund, Inc., (9) Natural Resources Defense Council, Inc., (10) The American Society of Civil Engineers, (11) Water Pollution Control Federation, (12) National Wildlife Federation, (13) The American Society of Mechanical Engineers, (14) U.S. Department of Health, Education and Welfare, (15) U.S. Department of Commerce, (16) Water Resources Council, (17) U.S. Department of the Interior, (18) The Aluminum Association, and (19) Aluminum Recycling Association.

The following organizations responded with comments: General Counsel of the Department of Commerce, Texas Water Quality Board, Georgia Department of Natural Resources, Reynolds Metals Company, United States Department of the Interior, Office of the Assistant Secretary of Defense, Scientist's Institute for Public Information, Illinois Environmental Protection Agency, Kaiser Aluminum and Chemical Corporation, Arizona State Department of Health, Florida Department of Pollution Control, Aluminum Recycling Association, United States Water Resources Council, Ormet Corporation, Aluminum Company of America, Maine Department of Environmental Protection, New York State Department of Environmental Conservation, Nebraska Department of Environmental Control, Copper and Brass Fabricators Council, Hawaii Department of

Health, Colorado Department of Public Health, and California Water Resources Control Board.

The comments were highly variable, but the principal issues raised in the development of the proposed effluent limitations guidelines and standards of performance and the treatment of these issues herein are as follows:

(1) One commentator criticized the treatment of all bauxite refineries in a single subcategory and cited the combination of factors of ore type, net accumulation of rainfall, and soil conditions as circumstances which preclude the achievement of the proposed effluent limitation of no discharge of process waste water pollutants. Each of the eight domestic bauxite refiners was visited. Variations in raw materials (ore type) and geographic location (net accumulation of rainfall and soil conditions) were considered, among other factors, as possible bases for further subcategorization and rejected for the reasons outlined in the Development Document. One plant using the same ore type as the commentator currently achieves no discharge of process waste water pollutants. Six of eight domestic refiners currently practice impoundment of red mud wastes, a major step toward the goal of no discharge of process waste water pollutants.

(2) Several comments were received which questioned the achievement of "no discharge" by the application of the best practicable control technology currently available. The phrase "no discharge" has been modified to be "no discharge of process waste water pollutants."

(3) One commentator stated that cost information provided the EPA contractor was not considered in the development of the guidelines. The subject information has been included in the Development Document and conclusions about the projected costs for the bauxite refining industry to meet effluent limitations have been revised to include the producer's estimates.

(4) Comments were received that the use of controlled firing on anode baking furnaces is not technically feasible for all plants and that totally dry systems for air pollution control are not adequately demonstrated on all potential waste streams from primary aluminum smelters. Further analysis revealed that the standards of performance should be revised to reflect the possible requirement for wet air pollution control devices on the anode bake plant and small discharges of cooling water.

(5) One commentator cited a cost of \$120/annual ton for a dry scrubbing system at an operating primary smelter and disagreed with the figure of \$40/annual ton. The source(s) of the \$40/annual ton figure are cited in the Development Document. It should be noted that the proposed effluent limitations do not imply dry systems for existing sources and that the difference in cost between wet and dry systems for new sources is estimated to be \$2/annual ton of aluminum.

¹Filed as part of the original document.

(6) A comment questioned the ability of the proposed best practicable control technologies currently available for fume scrubbing and residue milling in the secondary aluminum smelting subcategory to achieve the effluent limitations specified. Further analysis revealed that the application of the best practicable control technology currently available would not effect a reduction in dissolved solids. The effluent characteristics and the associated effluent limitations were revised to reflect the additional data analysis.

(7) One comment indicated that the best available demonstrated control technology for secondary aluminum smelters could not achieve the proposed standard of performance of no discharge of process waste water pollutants. The standards of performance were revised to permit new sources to discharge process waste water pollutants from chlorine magnesium removal processes only, after the application of the best practicable control technology currently available.

Interested persons may participate in this rulemaking by submitting written comments in triplicate to the EPA Information Center, Environmental Protection Agency, Washington, D.C. 20460, Attention: Mr. Philip B. Wisman. Comments on all aspects of the proposed regulations are solicited. In the event comments are in the nature of criticisms as to the adequacy of data which is available, or which may be relied upon by the Agency, comments should identify and, if possible, provide any additional data which may be available and should indicate why such data is essential to the development of the regulations. In the event comments address the approach taken by the Agency in establishing an effluent limitation guideline or standard of performance, EPA solicits suggestions as to what alternative approach should be taken and why and how this alternative better satisfies the detailed requirements of sections 301, 304(b), 306 and 307 of the Act.

A copy of all public comments will be available for inspection and copying at the EPA Information Center, Room 227, West Tower, Waterside Mall, 401 M Street, SW., Washington D.C. A copy of preliminary draft contractor reports, the Development Documents and economic study referred to above and certain supplementary materials supporting the study of the industry concerned also will be maintained at this location for public review and copying. The EPA information regulation, 40 CFR Part 2, provides that a reasonable fee may be charged for copying.

All comments received on or before December 31, 1973 will be considered. Steps previously taken by the Environmental Protection Agency to facilitate public response within this time period are outlined in the advance notice concerning public review procedures published on August 6, 1973 (38 FR 21202).

Dated: November 19, 1973.

JOHN QUARLES,
Acting Administrator.

PART 421—EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES FOR THE NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

Subpart A—Bauxite Refining Subcategory

- Sec.
- 421.10 Applicability; description of bauxite refining subcategory.
- 421.11 Specialized definitions.
- 421.12 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.
- 421.13 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.
- 421.14 Standards of performance for new sources.
- 421.15 Pretreatment standards for new sources.

Subpart B—Primary Aluminum Smelting Subcategory

- 421.20 Applicability; description of primary aluminum smelting subcategory.
- 421.21 Specialized definitions.
- 421.22 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.
- 421.23 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.
- 421.24 Standards of performance for new sources.
- 421.25 Pretreatment standards for new sources.

Subpart C—Secondary Aluminum Smelting Subcategory

- 421.30 Applicability; description of secondary aluminum smelting subcategory.
- 421.31 Specialized definitions.
- 421.32 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.
- 421.33 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.
- 421.34 Standards of performance for new sources.
- 421.35 Pretreatment standards for new sources.

Subpart A—Bauxite Refining Subcategory

§ 421.10 Applicability; description of bauxite refining subcategory.

The provisions of this subpart are applicable to discharges resulting from the refining of bauxite to alumina by the Bayer process or by the combination process.

§ 421.11 Specialized definitions.

For the purpose of this subpart:

(a) The term "bauxite" shall mean ore containing alumina monohydrate or alumina trihydrate which serves as the principal raw material for the production of alumina by the Bayer process or by the combination process.

(b) The term "process waste water" shall mean any water which, during the refining process, comes into direct contact with any raw material, intermediate product, by-product or product used in or resulting from the manufacture of alumina from bauxite.

(c) The term "process waste water pollutants" shall mean the pollutants contained in the process waste water.

§ 421.12 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.

(a) Subject to the provisions of paragraph (b) of this section, the following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best practicable control technology currently available by a point source subject to the provisions of this subpart: There shall be no discharge of process waste water pollutants to navigable waters.

(b) During any calendar month in which the precipitation exceeds the evaporation in the area in which a process waste water impoundment is located as established by the U.S. National Weather Service (or as otherwise determined if no monthly evaporation data have been established by the National Weather Service for such area), there may be discharged from such impoundment either a volume of process waste water equal to the difference between the precipitation and the evaporation for that month or a volume of process waste water equal to the difference between the mean precipitation and mean evaporation for that month as established by the U.S. National Weather Service for the preceding 10 year period, whichever is greater.

§ 421.13 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.

(a) Subject to the provisions of paragraph (b) of this section, the following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best available technology economically achievable by a point source subject to the provisions of this subpart: there shall be no discharge of process waste water pollutants to navigable waters.

(b) During any calendar month in which the precipitation exceeds the evaporation in the area in which a process waste water impoundment is located as established by the U.S. National Weather Service (or as otherwise determined if no monthly evaporation data have been established by the National Weather Service for such area), there may be discharged from such impoundment either a volume of process waste water equal to the difference between the precipitation and the evaporation for that month or a volume of process waste water equal to the difference between the mean precipitation and mean evaporation for that

month as established by the U.S. National Weather Service for the preceding 10 year period, whichever is greater.

§ 421.14 Standards of performance for new sources.

(a) Subject to the provisions of paragraph (b) of this section, the following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged reflecting the greatest degree of effluent reduction achievable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants by a new point source subject to the provisions of this subpart: there shall be no discharge of process waste water pollutants to navigable waters.

(b) During any calendar month in which the precipitation exceeds the evaporation in the area in which a process waste water impoundment is located as established by the U.S. National Weather Service (or as otherwise determined if no monthly evaporation data have been established by the National Weather Service for such area), there may be discharged from such impoundment either a volume of process waste water equal to the difference between the precipitation and the evaporation for that month or a volume of process waste water equal to the difference between the mean precipitation and mean evaporation for that month as established by the U.S. National Weather Service for the preceding 10 year period, whichever is greater.

§ 421.15 Pretreatment standards for new sources.

The pretreatment standards under section 307(c) of the Act, for a source within the bauxite refining subcategory, which is an industrial user of a publicly owned treatment works (and which would be a new source subject to section 306 of the Act, if it were to discharge pollutants to navigable waters), shall be the standard set forth in Part 128, 40 CFR, except that for the purposes of this section, § 128.133, 40 CFR shall be amended to read as follows: "In addition to the prohibitions set forth in § 128.131, the standard for incompatible pollutants introduced into a publicly owned treatment works by a major contributing industry shall be the standard of performance for new sources specified in § 421.14, 40 CFR, Part 421 provided that, if the publicly owned treatment works which receives the pollutants is committed, in its NPDES permit, to remove a specified percentage of any incompatible pollutant, the pretreatment standard applicable to users of such treatment works shall be correspondingly reduced for that pollutant."

Subpart B—Primary Aluminum Smelting Subcategory

§ 421.20 Applicability; description of primary aluminum smelting subcategory.

The provisions of this subpart are applicable to discharges resulting from the

production of aluminum from alumina by the Hall-Heroult process.

§ 421.21 Specialized definitions.

For the purpose of this subpart:

(a) The term "process waste water" shall mean any water which, during the manufacturing process, comes into direct contact with any raw material, anode material, cathode material, intermediate product, by-product, product, or material used in or resulting from the production of primary aluminum.

(b) The term "process waste water pollutants" shall mean pollutants contained in the process waste water.

(c) The term "product" shall mean hot aluminum metal.

(d) The term "oil and grease" shall mean that component of the waste water amenable to measurement by the method described in *Methods for Chemical Analyses of Water and Wastes*, Environmental Protection Agency, Analytical Quality Control Laboratory, page 217.

(e) The term "cyanide" shall mean those cyanides amenable to chlorination by the method described in *1972 Annual Book ASTM Standards*, 1972, Standard D2036-72, Method B, page 553.

(f) The term "kg" shall mean kilogram(s); The term "kkg" shall mean 1000 kilograms; the term "lb" shall mean pound(s).

§ 421.22 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.

The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best practicable control technology currently available by a point source subject to the provisions of this subpart:

<i>Effluent characteristic</i>	<i>Effluent limitation</i>
Fluoride -----	Maximum for any one day 2.0 kg/kkg of product (2.0 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 1.0 kg/kkg of product (1.0 lb/1,000 lb).
Suspended nonfilterable solids, total.	Maximum for any one day 3.0 kg/kkg of product (3.0 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 1.5 kg/kkg of product (1.5 lb/1,000 lb).
Oil & grease-----	Maximum for any one day 0.5 kg/kkg of product (0.5 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.25 kg/kkg of product (0.25 lb/1,000 lb).

<i>Effluent characteristic</i>	<i>Effluent limitation</i>
Cyanide -----	Maximum for any one day 0.01 kg/kkg of product (0.01 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.005 kg/kkg of product (0.005 lb/1,000 lb).
pH -----	Within the range 6.0 to 9.0.

§ 421.23 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.

The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best available technology economically achievable by a point source subject to the provisions of this subpart:

<i>Effluent characteristic</i>	<i>Effluent limitation</i>
Fluoride -----	Maximum for any one day 0.1 kg/kkg of product (0.1 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.05 kg/kkg of product (0.05 lb/1,000 lb).
Suspended nonfilterable solids, total.	Maximum for any one day 0.2 kg/kkg of product (0.2 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.1 kg/kkg of product (0.1 lb/1,000 lb).
Oil and grease----	Maximum for any one day 0.03 kg/kkg of product (0.03 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.015 kg/kkg of product (0.015 lb/1,000 lb).
Cyanide -----	Maximum for any one day 0.01 kg/kkg of product (0.01 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.005 kg/kkg of product (0.005 lb/1,000 lb).
pH -----	Within the range 6.0 to 9.0

§ 421.24 Standards of performance for new sources.

The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged reflecting the greatest degree of effluent reduction attainable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants by a new point source subject to the provisions of this subpart:

Effluent characteristic	Effluent limitation
Fluoride	Maximum for any one day 0.05 kg/kg of product (0.05 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.025 kg/kg of product (0.025 lb/1,000 lb).
Suspended non-filterable solids, total	Maximum for any one day 0.1 kg/kg of product (0.1 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.05 kg/kg of product (0.05 lb/1,000 lb).
Oil and grease	Maximum for any one day 0.03 kg/kg of product (0.03 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.015 kg/kg of product (0.015 lb/1,000 lb).
Cyanide	Maximum for any one day 0.01 kg/kg of product (0.01 lb/1,000 lb). Maximum average of daily values for any period of 30 consecutive days 0.005 kg/kg of product (0.005 lb/1,000 lb).
pH	Within the range 6.0 to 9.0.

§ 421.25 Pretreatment standards for new sources.

The pretreatment standards under section 307(c) of the Act, for a source within the primary aluminum smelting subcategory which is an industrial user of a publicly owned treatment works (and which would be a new source subject to section 306 of the Act, if it were to discharge pollutants to navigable waters), shall be the standard set forth in Part 128, 40 CFR, except that for the purposes of this section, § 128.133, 40 CFR shall be amended to read as follows: "In addition to the prohibitions set forth in § 128.131 the pretreatment standard for incompatible pollutants introduced into a publicly owned treatment works by a major contributing industry shall be the standard of performance for new sources specified in § 421.24, 40 CFR, Part 421, provided that, if the publicly owned treatment works which receives the pollutants is committed, in its NPDES permit, to remove a specified percentage of any incompatible pollutant, the pretreatment standard applicable to users of such treatment works shall be correspondingly reduced for that pollutant."

Subpart C—Secondary Aluminum Smelting Subcategory

§ 421.30 Applicability; description of secondary aluminum smelting subcategory.

The provisions of this subpart are applicable to discharges resulting from the recovery, processing, and remelting of aluminum scrap to produce metallic aluminum alloys.

§ 421.31 Specialized definitions.

For the purpose of this subpart:

(a) The term "process waste water"

shall include, but not be limited to, any water which is used in the metal cooling process, the magnesium removal process, or the residue milling process.

(b) The term "process waste water pollutants" shall mean pollutants contained in the process waste water.

(c) The term "product" shall mean hot aluminum recovered.

(d) The term "oil and grease" shall mean that measured by the analytical method prescribed in subparagraph (d) of § 421.21.

(e) The term "aluminum" shall mean that component of the waste water amenable to measurement by the method described in *Methods for Chemical Analysis of Water and Wastes*, 1971, Environmental Protection Agency, Analytical Quality Control Laboratory, page 98.

(f) The term "kg" shall mean kilograms(s); The term "kkg" shall mean 1000 kilograms; and the term "lb" shall mean pound(s).

§ 421.32 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.

(a) The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best practicable control technology currently available by a point source subject to the provisions of this subpart and which uses water for metal cooling: there shall be no discharge of process waste water pollutants to navigable waters.

(b) The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best practicable control technology currently available by a point source subject to the provisions of this subpart and which uses aluminum fluoride in its magnesium removal process ("demagging" process): there shall be no discharge of process waste water pollutants to navigable waters.

(c) The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best practicable control technology currently available by a point source subject to the provisions of this subpart and which uses chlorine in its magnesium removal process:

Effluent characteristic	Effluent limitation ¹	
	Grams per kilograms magnesium removed	Pounds per pounds magnesium removed
Suspended nonfilterable solids, total	175	0.175
Oil and grease	2.0	0.002
Oxygen demand, chemical	6.5	0.0065
pH	(2)	(2)

¹ Maximum average of daily values for any period of 30 consecutive days.

² Within the range 7.5 to 9.0.

(d) The following limitations constitute the quantity or quality of pollutants or pollutant properties which may

be discharged after application of the best practicable control technology currently available by a point source subject the provisions of this subpart and which processes residues by wet methods:

Effluent characteristic	Effluent limitation ¹	
	Kilograms per kilograms of product	Pounds per 1,000 pounds of product
Suspended nonfilterable solids, total	1.5	1.5
Fluoride	0.4	0.4
Ammonia nitrogen	0.04	0.04
Aluminum	1.0	1.0
Copper	0.003	0.003
Oxygen demand, chemical	1.0	1.0
pH	(2)	(2)

¹ Maximum average of daily values for any period of 30 consecutive days.

² Within the range 7.5 to 9.0.

§ 421.33 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.

The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged after application of the best available technology economically achievable by a point source subject to the provisions of this subpart: there shall be no discharge of process waste water pollutants to navigable waters.

§ 421.34 Standards of performance for new sources.

(a) The following limitations constitute the quantity or quality of pollutants or pollutant properties which may be discharged reflecting the greatest degree of effluent reduction achievable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants by a new point source subject to the provisions of this subpart: there shall be no discharge of process waste water pollutants to navigable waters.

(b) Application of the factors listed in section 306(b) of the Act may require variation from the standard of performance set forth in this section for any point source subject to such standard of performance and which uses chlorine in the magnesium removal process ("demagging" process). If variation is determined to be necessary for any such source, the discharge of process waste water pollutants shall be allowed from the magnesium removal process only, and such source shall be subject to effluent limitations no less stringent than those required by paragraph (c), § 421.32 of this part.

§ 421.35 Pretreatment standards for new sources.

The pretreatment standards under section 307(c) of the Act, for a source within the secondary aluminum smelting subcategory which is an industrial user of a publicly owned treatment works (and which would be a new source sub-

ject to section 306 of the Act, if it were to discharge pollutants to navigable waters), shall be the standard set forth in Part 128, 40 CFR, except that for the purposes of this section, § 128.133, 40 CFR shall be amended to read as follows: "In addition to the prohibitions set forth in § 128.131, the pretreatment

standard for incompatible pollutants introduced into a publicly owned treatment works by a major contributing industry shall be the standard of performance for new sources specified in § 421.34, 40 CFR, Part 421, provided that, if the publicly owned treatment works which receives the pollutants is committed, in its

NPDES permit, to remove a specified percentage of any incompatible pollutant, the pretreatment standard applicable to users of such treatment works shall be correspondingly reduced for that pollutant."

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