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Pollution Caused by Waste From the Titanium Dioxide Industry: Directive 89/428

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Introduction

In 1989, the Council of the European Communities (Council) adopted a directive designed to reduce and eventually eliminate waste from the titanium dioxide industry.[1] Directive 89/428 prohibits the dumping of titanium wastes into waterways, and limits other disposal methods according to the production process used.[2] Through harmonizing the waste reduction programs of individual member states, the Council is attempting both to protect the environment from titanium dioxide waste, and to ameliorate competitive imbalances resulting from divergent member state programs.[3] This Note argues that these competing purposes cannot be accomplished concurrently. Moreover, implementation of the directive creates further imbalances in competitive conditions in the European Community (EC or Community) titanium dioxide industry.

Part I of this Note describes production methods for titanium dioxide and the environmental problems associated with the resulting wastes. Part II then discusses the Community's early efforts to control waste from titanium production. Part III examines the provisions of Directive 89/428. Finally, Part IV concludes that efforts to eliminate titanium waste will likely be only marginally successful because of the tension between economic interests and environmental protection.

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[1] Directive 89/428, Council Directive of 21 June 1989 on procedures for harmonizing the programmes for the reduction and eventual elimination of pollution caused by waste from the titanium dioxide industry, O.J. L201/56 (1989).

[2] *Id.* at arts. 3, 4, 6, 9.

[3] *Id.* at Preamble, art. 1; Proposal for a Council Directive on procedures for harmonizing the programmes for the reduction and eventual elimination of pollution caused by waste from the titanium dioxide industry, COM(83) 189 final, at 27, 32 (1983) [hereinafter COM(83) 189 final]. "This directive lays down . . . procedures for harmonizing the programmes for the reduction and eventual elimination of pollution from existing industrial establishments and is intended to improve the conditions of competition in the titanium dioxide industry." Directive 89/428, *supra* note 1, at art. 1.

I. PRODUCTION METHODS AND ASSOCIATED ENVIRONMENTAL PROBLEMS

Titanium dioxide, a white pigment, is used as a whitening agent in paper, plastics, paints, cosmetics, soap, toothpaste, and other household items.[4] The profitability of titanium dioxide production has greatly increased over the past few years because of rising demand and stagnant supply.[5] Today, profits from the sale of titanium dioxide remain high despite the large costs of managing the incidental production wastes.[6]

A. *Production Methods*

The sulfate process and chloride process are the two prevalent methods of obtaining titanium dioxide from raw titanium ore.[7] The sulfate process, which is used in nearly two-thirds of global production and nearly all European production, generates the greatest amount of environmentally harmful waste per unit of titanium dioxide produced.[8] This production method treats titanium ores with concentrated sulfuric acid.[9] The resultant titanium compound is selectively extracted and processed into pure titanium dioxide.[10] This process produces dilute sulfuric acid and large quantities of other harmful by-products, collectively referred to herein as titanium waste.[11]

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[4] Marsh, *Environmental Pooper at Acid House Party*, Fin. Times, Jan. 26, 1990, at 16, col. 1 [hereinafter *Environmental Party*]; Zanetti, *A Good Credo to Live By*, CHEM. ENG'G, Jan. 16, 1989, at 5 (NEXIS, Chemen).

[5] Lazorko, *TiO_2's Future is Keyed to New Technologies*, CHEM. ENG'G, Jan. 16, 1989, at 37 (NEXIS, Chemen). Demand for titanium dioxide is estimated at 3 million metric tons per year. Output is estimated at 2.8 million metric tons, annually.

[6] *Environmental Party*, *supra* note 4, at 16. Waste disposal and treatment represents 10–15 percent of titanium dioxide production costs. Short, *At-Sea Disposal: Many Questions Remain Unanswered*, CHEM. ENG'G, Sept. 5, 1983, at 30 (NEXIS, Chemen).

[7] COM(83) 189 final, *supra* note 3, at 6; *Environmental Party*, *supra* note 4, at 16.

[8] *Environmental Party*, *supra* note 4, at 16; Marsh, *The Ups and Downs of Two Routes*, Fin. Times, Jan. 26, 1990, at 16, col. 6 [hereinafter *Ups and Downs*]; COM(83) 189 final, *supra* note 3, at 6.

[9] *Ups and Downs*, *supra* note 8, at 16. Titanium ores include ilmenite and Canadian slag. COM(83) 189 final, *supra* note 3, at 6–7.

[10] COM(83) 189 final, *supra* note 3, at 6–7.

[11] Depending on the production process or the ore used, titanium waste may include one or more of the following: dilute sulfuric acid (strong and weak acid waste), red sludge (copperas or ferrous sulfate), solid residue (chloride or sulfate salts), ore and pigment dust, and gaseous emissions. *See* Directive 89/428, *supra* note 1, at art. 2; COM(83) 189 final, *supra* note 3, at 4, 9; Short, *supra* note 6, at 30.

In the chloride process, natural rutile, a scarce, high quality titanium ore, is treated with chlorine to produce titanium tetrachloride.[12] Titanium tetrachloride is then mechanically separated from the other chlorides, distilled, and oxidized to produce titanium dioxide.[13] While the chloride process is fifteen times cleaner than the sulfate process, it is more expensive and requires high quality ores such as scarce natural rutile.[14]

B. *Titanium Waste Disposal*

While titanium dioxide itself is a useful, non-toxic compound, titanium waste is extremely acidic and its disposal methods create numerous environmental problems.[15] Most coastal production plants using the sulfate process dump large amounts of sulfuric acid into the North Sea or connecting waterways.[16] Although the alkaline sea water buffers and neutralizes the dilute acidic waste, dumping sulfuric acid causes a sudden drop in the pH value of the receiving water and reduces the oxygen content of the water, thereby decimating marine life.[17]

Sulfuric acid is also dumped into the soil and released into the air.[18] Landlocked titanium dioxide production plants neutralize the acidic waste by mixing it with chalk and using the resultant solid to build waste dumps.[19] In addition, these plants release dust and gas emissions of sulfur or chlorine compounds into the air.[20]

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[12] COM(83) 189 final, *supra* note 3, at 8; *Ups and Downs*, *supra* note 8, at 16. While rich in titanium dioxide, natural rutile is very scarce. In the alternative, concentrates obtained from ilmenite or synthetic rutile may be used as the starting ore. Ilmenite-based concentrates, however, are not suited for the chloride process because an iron-removal stage is required, which causes much the same problems incurred in the sulfate process. COM(83) 189 final, *supra* note 3, at 8.

[13] COM(83) 189 final, *supra* note 3, at 8.

[14] *Id.*; *Ups and Downs*, *supra* note 8, at 16; Short, *supra* note 6, at 30. The chloride process produces wastes similar to those produced in the sulfate process, but the sulfate process yields as much as fifteen times more waste. Short, *supra* note 6, at 30.

[15] Zanetti, *supra* note 4, at 5. *See also Ups and Downs*, *supra* note 8, at 16.

[16] *Environmental Party*, *supra* note 4, at 16. In 1988, titanium dioxide factories in Great Britain, France, and West Germany dumped approximately 4 million tons of titanium waste into the North Sea. Wastes are dumped into coastal and internal waters either directly or via barges and pipelines.

[17] COM(83) 189 final, *supra* note 3, at 9, 33; *Pollution: As Clean as Can Be*, ECONOMIST, Dec. 11, 1976, at 66.

[18] *Environmental Party*, *supra* note 4, at 16; COM(83) 189 final, *supra* note 3, at 29.

[19] *Environmental Party*, *supra* note 4, at 16.

[20] COM(83) 189 final, *supra* note 3, at 29.

II. HISTORICAL AND LEGISLATIVE BACKGROUND

In 1978, the Community officially acknowledged the serious environmental problems associated with the production of titanium dioxide by passing Directive 78/176.[21] This directive proposed to prevent and progressively reduce pollution attributable to the titanium dioxide industry.[22] The directive required member states to dispose of titanium waste without jeopardizing water, air, soil, plant life, animal life, or the beauty of the countryside.[23] Article 9 of the directive required member states to draft and submit programs, by June 1, 1980, to facilitate the prevention and reduction of titanium waste by July 1, 1987.[24] The programs had to include information on the state of the environment in each nation and the environmental protection measures in use at the time. Based on these submissions, the Commission of the European Communities (Commission) was required to submit a proposal to the Council, within six months, outlining a plan for harmonizing these programs in a future directive.[25]

Recognizing that technology levels varied among member states, the directive gave member states the authority to allow temporary dumping or discharge of waste.[26] This provision reflected the understanding that a rigid and immediate deadline for compliance with the directive would have placed an unreasonable burden on the titanium dioxide industry in less advanced member states and would have jeopardized the objectives of the directive.[27]

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[21] Directive 78/176, Council Directive of 20 February 1978 on waste from the titanium dioxide industry, O.J. L54/19, at Preamble (1978); CCH Explanation, *Waste from the Titanium Dioxide Industry*, 2 COMMON MKT. REP. (CCH) ¶ 3315,39 [hereinafter *Waste from the Titanium Dioxide Industry*].

[22] Directive 78/176, *supra* note 21, at art. 1.

[23] *Id.* at art. 2; *Waste from the Titanium Dioxide Industry*, *supra* note 21, at ¶ 3315,39. In order to achieve this goal, member states should promote the prevention, recycling, and processing of waste, the extraction of raw materials from waste, and any other processes that would enable reuse of waste. Directive 78/176, *supra* note 21, at art. 3.

[24] Directive 78/176, *supra* note 21, at art. 9(1)–(3).

[25] *Id.* at art. 9(3). *But see* Directive 83/29, Council Directive of 24 January 1983 amending Directive 78/176/EEC on waste from the titanium dioxide industry, O.J. L32/28 (1983). Directive 83/29 extended the deadline for the Commission to submit a proposal to the Council until March 15, 1983.

[26] Directive 78/176, *supra* note 21, at art. 4. Member states can authorize dumping under a strict monitoring system only if a more appropriate method does not exist, and the dumping does not have an adverse effect on leisure activities, fish and shellfish breeding, and other legitimate uses of the environment. *Id.* at art. 5.

[27] *See* COM(83) 189 final, *supra* note 3, at 31–32. An extension for compliance with

Unfortunately, Directive 78/176 proved ineffective in controlling titanium waste because member states took advantage of their discretionary powers and failed to enact the required measures to control titanium wastes.[28] Belgium, for example, was brought before the Court of Justice of the European Communities (Court of Justice) for failing to fulfill its obligations under the Treaty of Rome (EEC Treaty)[29] by not implementing Directive 78/176 within the requisite twelve months.[30] Other member states submitted incomplete programs, forcing the Commission to request further details.[31] Furthermore, the lack of a uniform format for the submitted programs prevented the Commission from properly assessing the replies. The Commission consequently obtained an extension until March 1983 for submitting its proposal for harmonization.[32] At that time the Commission issued a proposed directive, which the Council finally adopted on June 21, 1989, as Directive 89/428.

III. DIRECTIVE 89/428

Although Directive 89/428 is primarily concerned with protection of the aquatic environment,[33] it also regulates the disposal of titanium wastes based on the type of production process and the medium into which the waste is discharged.[34] Article 2 defines the types of titanium waste covered by the directive, categorizing waste according to its content of sulfuric acid, its pH value, and its physical state.[35] Finally, Directive 89/428 requires member states to ensure that the local titanium dioxide industry prevents or recycles waste where technically and economically feasible, and

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Directive 78/176, *supra* note 21, was included because less advanced member states could not complete the necessary procedures as quickly as those states that had already begun reducing titanium dioxide pollution.

[28] *See Agreement Reached with Belgium to End Waste Acid Discharges into North Sea by 1990*, 10 Int'l Env't Rep. (BNA) No. 4, at 174 (Apr. 8, 1987); Case 68/81, Commission of the European Communities v. Kingdom of Belgium, [1982] E.C.R. 153, 156 (1982).

[29] Treaty Establishing the European Economic Community, Mar. 25, 1957, 298 U.N.T.S. 11, at art. 169 [hereinafter EEC Treaty].

[30] *See* Case 68/81, [1982] E.C.R. at 156.

[31] COM(83) 189 final, *supra* note 3, at 3–4.

[32] Directive 83/29, *supra* note 25, at art. 2.

[33] Directive 89/428, *supra* note 1, at Preamble, art. 1. *See also* COM(83) 189 final, *supra* note 3, at 33.

[34] Directive 89/428, *supra* note 1, at arts. 2, 4, 6, 9.

[35] *Id.* at art. 2. Sulfuric acid is a high concentrate acid byproduct of the sulfate process. Physical state refers to whether the residue is a solid, liquid, or gas.

that waste be recycled, or disposed of without endangering human health or the environment.[36]

Directive 89/428 seeks to protect the environment by prohibiting the dumping of titanium waste into all waterways and by setting emission standards for gaseous discharges.[37] Specifically, the directive restricts discharges of weak acid waste and neutralized waste into waterways; atmospheric discharges of ore, pigment, and coke dusts; and discharges of chlorine gas and gaseous sulfur dioxide or sulfur trioxide.[38] Generally, the directive has prohibited the dumping of all titanium dioxide waste as of December 31, 1989.[39] Because of the technical and economic difficulties incident to implementation of this prohibition, the actual standards of the directive are somewhat flexible.[40] For example, the directive has banned the discharge into waterways of the most dangerous wastes as of December 31, 1989, but allows the discharge of weak acid waste and neutralized waste until December 31, 1992.[41]

Directive 89/428 grants numerous exemptions and deferments.[42] For example, in place of the directive's emissions limitations on less harmful titanium waste, member states may use quality objectives to determine limitations on water pollution.[43]

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[36] *Id.* at art. 11.

> Member States shall take the measures necessary to ensure that all waste from the titanium dioxide industry, and in particular waste subject to prohibition on discharge or dumping into water or on discharge into the atmosphere is . . . avoided or re-used where technically and economically feasible, [or] re-used or disposed of without endangering human health or harming the environment. The same shall apply to waste arising from the re-use or treatment of the abovementioned waste.

Id.

[37] *Id.* at Preamble, art. 3.

[38] *Id.* at arts. 2, 6, 7, 9.

[39] *Id.* at art. 3. "The dumping of any solid waste, strong acid waste, treatment waste, weak acid waste, or neutralized waste, as referred to in Article 2 shall be prohibited with effect from 31 December 1989." *Id.* Dumping of titanium waste is defined as disposal into inland surface waters, internal coastal waters, territorial waters, or the high seas, from any platform, aircraft or ship, of any solid waste, strong acid waste, treatment waste, weak acid waste, or neutralized waste. *Id.* at art. 2(1)(c).

[40] COM(83) 189 final, *supra* note 3, at 31–32. *See also* Directive 89/428, *supra* note 1, at arts. 4–8.

[41] Directive 89/428, *supra* note 1, at arts. 4, 6. The most dangerous types of wastes are solid and strong acid wastes. *EC Council Adopts Directive on Discharge of Waste from Titanium Dioxide Industry*, 11 Int'l Env't Rep. (BNA) No. 12, at 648 (Dec. 14, 1988).

[42] Directive 89/428, *supra* note 1, at arts. 4–8.

[43] *Id.* at art. 8(1). "As regards the requirements of Article 6, Member States may choose to make use of quality objectives applied in such a way that the effects in terms of

This allows states greater latitude in applying standards because they do not have to impose the same emissions limits on each titanium dioxide plant, but can regulate emissions based on the actual effect of the pollution on the quality of an affected area. Member states that exercise this option must demonstrate to the Commission that their measures protect the environment as effectively as would the requirements of the directive.[44]

A member state can postpone the most serious reduction measures until December 31, 1992 if severe techno-economic difficulties—as defined by each member state—force them to do so.[45] Postponements are subject to the condition that the member state submitted a program designed to effectively reduce titanium wastes by December 31, 1989.[46] The Commission may grant states with severe techno-economic difficulties an additional six-month extension beyond the 1992 compliance deadline if member states are still unable to fulfill the requirements of the directive.[47] Member states can also submit programs to the Commission to defer the reduction of weak acid waste and neutralized waste from the sulfuric process until December 31, 1994.[48] This extension is contingent upon member states reaching certain lower levels of weak acid and neutralized waste reduction by earlier dates. These provisions are intended to accommodate the unevenly developed environmental protection capabilities of the titanium dioxide industries in the individual member states, and to increase the likelihood of overall compliance with the directive by allowing companies to make realistic adjustments.[49]

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protecting the environment and avoiding distortions of competition are equivalent to that of the limit values." *Id.* Less harmful wastes are defined as treatment waste, weak acid waste, or neutralized waste. *Id.* at art. 2(1)(c).

[44] *Id.* at art. 8(2).

> If a Member State chooses to make use of quality objectives, it shall present to the Commission a programme, demonstrating that the measures achieve an effect which, in terms of protecting the environment and avoiding distortion of competition, is equivalent to that of the limit values by the dates when these limit values are applied in accordance with Article 6.

Id. This applies to weak acid waste, treatment waste, and neutralized waste. *Id.* at art. 6.

[45] *Id.* at art. 5. The most serious reduction measures are the ban on the dumping of all titanium waste, the ban on the disposal of solid waste and strong acid waste associated with both processes, and the ban on disposal of treatment waste from the sulfate process.

[46] *Id.* at art. 5(1). The Commission may grant a six-month extension for the submission of the programs at the request of any member state that experiences difficulties with its authorizing procedures. *Id.* at art. 5(2).

[47] *Id.* at art. 5(2).

[48] *Id.* at art. 7.

[49] *See* COM(83) 189 final, *supra* note 3, at 31–32. "[T]he timetable mentioned in various

IV. BALANCING COMPETITION AND ENVIRONMENTAL PROTECTION CONCERNS

The objectives of Directive 89/428 are twofold. First, the directive is concerned with environmental protection through elimination of pollution from titanium dioxide waste.[50] Second, the directive attempts to mitigate competitive imbalances in the Community's titanium dioxide industry by harmonizing divergent member state pollution reduction programs.[51] Acknowledging that the capabilities of member states varied considerably, the Council included provisions within Directive 89/428 that allow member states to delay enactment.[52] These flexibility features demonstrate the tension that arises between the goals of environmental protection on the one hand and competitive conditions on the other.[53]

Both these goals cannot be implemented concurrently, however, because the technical capabilities of titanium producers to protect the environment vary among the member states.[54] Allowing certain member states to delay compliance until 1993 creates inequitable competitive conditions, especially for industries in those member states whose governments implemented the directive immediately.[55] Member states that face more stringent regulations are less competitive in the Community and abroad because of higher production costs.[56] While a perfectly level competitive field is impossible because of historical differences in production capability, exemptions and deferments render further competitive distortions in the functioning of the single market.

The potential for abuse by some member states is also a factor. In the current situation, it is to the advantage of a member state to postpone enforcement until the final deadline so that its in-

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Articles of this proposal is designed to allow the industries to make the adjustments under realistic economic and technical conditions." *Id.* at 32.

[50] Directive 89/428, *supra* note 1, at Preamble.

[51] *Id.* at art. 1.

[52] *Id.* at arts. 5, 7–8.

[53] Examples of flexibility features include allowing member states to use quality objectives instead of the numerical limitations established by the directive, and allowing deferment of the ban on dumping. *Id.* at arts. 5, 8.

[54] *See Environmental Party, supra* note 4, at 16.

[55] *See id.* Member states already complying with Directive 89/428 include West Germany and Italy. Zanetti, *supra* note 4, at 5.

[56] *Environmental Party, supra* note 4, at 16. For example, Heinrich von Kleist-Retzow, chairperson of one German titanium dioxide plant, claims his company is at "an absolute disadvantage" because other producers can delay implementation of Directive 89/428.

dustries will have a competitive advantage. Thus, abuse is likely because it is the member state itself that determines whether severe techno-economic difficulties are sufficient to warrant an extension; no disinterested, objective authority enforces the directive.[57] In the future, it should be the Commission, rather than individual member states, that determines whether there are serious techno-economic difficulties warranting extensions.

The adverse effects of postponement on competition are already being felt by some member states. For example, Germany complains that its commitment to eliminating titanium dioxide waste has imposed heavy burdens on its titanium dioxide producers, who are now forced to dispose of the acid by recycling.[58] This has increased production costs by 25 percent—costs which anger German producers because other member states, like France and Britain, have allowed their producers to delay compliance until 1993. Germany and similarly situated member states seem to be paying a higher price for membership in the Community. But the cost of obtaining higher environmental protection standards may be to allow member states flexibility in implementation and enforcement. Otherwise, member states might never agree to regulations and directives that could place them in a weaker economic position.

CONCLUSION

The Community's decision to reduce and eventually eliminate wastes from the titanium dioxide industry reflects a growing concern for environmental protection. Directive 89/428 attempts to strike a balance between environmental protection and the harmonization of competitive conditions among member states. The allowance for exemptions and deferments is compatible with the competing economic and environmental goals of the directive: such exceptions enable member states to comply with the directive while remaining competitive. Already many member states have elected to postpone enforcement. Certainly, these delays will allow three more years of dumping titanium wastes into coastal waters and will cause further damage to the environment. But stricter standards without the option to postpone might have resulted in member states failing to enact the directive at all.

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[57] *See* Directive 89/428, *supra* note 1, at arts. 5, 7.

[58] *Environmental Party*, *supra* note 4, at 16.

It is currently impossible to predict the effectiveness of Directive 89/428 because so few member states have instituted its policies. The best that the Commission can do is prevent abuse of member state discretion—that is, where member states postpone compliance solely to provide local industries with a competitive advantage. In this and future environmental legislation, the determination of whether there are hardships sufficient to warrant exemptions should be a task for the Commission or other disinterested, objective party.

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