United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EPA 450/3-91-028
December 1991

Air

EPA

Enabling Document for New Source Performance Standards for Calciners and Dryers In Mineral Industries

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Emission Standards Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
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Section 1. Introduction

The Environmental Protection Agency (EPA) has promulgated standards of performance (NSPS) for new, modified, and reconstructed calciners and dryers in 17 mineral industries. This enabling document presents pertinent information regarding the NSPS for this source category.

This document is intended to assist the EPA enforcement and other personnel who will be implementing and responding to comments and questions concerning this regulation. Comments on this document may be sent to Linda Chaput, Chief, Standards Preparation Section (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

Section 2 presents a summary of the applicability, exemptions, control requirements, performance testing requirements, monitoring, recordkeeping, and reporting requirements contained in the regulation (40 CFR 60.730-60.737). This section presents a brief synopsis designed to be useful in a quick determination of whether or not a facility is subject to the rule.

Section 3 presents a brief discussion of the process description for each of the 17 mineral industries covered by the regulation.

Section 4 includes a discussion of the General Provisions (Subpart A of 40 CFR Part 60) that are relevant to this regulation: Sections 60.8 Performance tests; 60.11 Compliance with standards and maintenance requirements; 60.13 Monitoring requirements; 60.14 Modification; and 60.15 Reconstruction.

Section 5 presents the Standard Industrial Classification (SIC) codes for the affected industries and a list of sources that were identified during the development of this rulemaking. It should be noted, however, that this list may not be complete, and may not reflect current operations at many facilities due to a 5-year time lag between proposal and promulgation. The list is provided as a guideline of the sources that might be affected by the NSPS.

Section 6 contains a copy of the regulation for calciners and dryers in mineral industries as it appeared in the Federal Register.

Appendix A presents a list of people at OAQPS who can be contacted regarding the technical as well as the regulatory aspects of the promulgated standard.

Section 2. Summary of Standards

Applicability

Affected industry: Any mineral processing plant that processes or produces any of the following minerals, their concentrates or any mixture of which the majority (> 50 percent) is any of the following minerals or a combination of these minerals: alumina, ball clay, bentonite, diatomite, feldspar, fire clay, fuller's earth, gypsum, industrial sand, kaolin, lightweight aggregate, magnesium compounds, perlite, roofing granules, talc, titanium dioxide, and vermiculite.

Affected facility: Each calciner and each dryer used in any of the 17 mineral processing industries.

Exemptions

- Feed and product conveyors, vertical shaft kilns in the magnesium compounds industry; the chlorination-oxidation process in the titanium dioxide industry; coating kilns, mixers, and aerators in the roofing granules industry; and tunnel kilns, tunnel dryers, apron dryers, and grinding equipment that also dries the process material used in any of the 17 mineral industries.

- For the brick and related clay products industry, only the calcining and drying of raw materials prior to firing of the brick are covered.

- An affected facility that is subject to the provisions of Subpart LL of 40 CFR Part 60, Metallic Mineral Processing Plants, is not subject to the provisions of this regulation.

Standards

- Limit stack emissions of particulate matter (PM) to 0.040 grain per dry standard cubic foot (gr/dscf) for calciners and for calciners and dryers installed in series.

- Limit stack emissions of PM to 0.025 gr/dscf for dryers.

- Limit visible emissions from affected facilities using dry control devices to 10 percent opacity.

Compliance testing

- Use Method 5 to determine the particulate matter concentration. The sampling time and volume for each test run is at least 2 hours and 1.70 dscm.

- Use Method 9 and the procedures in Section 60.11 to determine opacity from stack emissions.

- During the initial performance test of a wet scrubber, use the monitoring devices described in 40 CFR 60.734(d) to determine the average change in pressure of the gas stream across the scrubber and the average flowrate of the scrubber liquid during each of the particulate matter runs. The arithmetic averages of the three runs are to be used as the baseline average values for the purposes of 40 CFR 60.735(c).

Monitoring requirements

- When a dry control device (baghouse or ESP) is used to comply with the calciner or dryer mass emission standard, a Continuous Opacity Monitoring System (COMS) is required to be installed, operated, and maintained to measure and record the opacity of emissions discharged from the control device on all calciners and dryers, <u>except as follows</u>:

- In lieu of installing a COMS, the following units that use a dry control device may have a certified visible emissions observer measure and record three 6-minute averages of the opacity of visible emissions to the atmosphere each day of operation: ball clay vibrating grate dryer, bentonite rotary dryer, diatomite flash dryer, diatomite rotary calciner, feldspar rotary dryer, fire clay rotary dryer, industrial sand fluid bed dryer, kaolin rotary calciner, perlite rotary dryer, roofing granules fluid bed dryer, roofing granules rotary dryer, talc rotary calciner, titanium dioxide spray dryer, titanium dioxide fluid bed dryer, vermiculite fluid bed dryer, or a vermiculite rotary dryer.

- The following units are <u>exempt</u> from all monitoring: ball clay rotary dryer, diatomite rotary dryer, feldspar fluid bed dryer, fuller's earth rotary dryer, gypsum rotary dryer, gypsum flash calciner, gypsum kettle calciner, industrial sand rotary dryer, kaolin rotary dryer, kaolin multiple hearth furnace, perlite expansion furnace, talc flash dryer, talc rotary dryer, titanium dioxide direct or indirect rotary dryer, or vermiculite expansion furnace.

- If a wet scrubber is used to comply with the mass emission standard for any affected facility, monitoring devices are installed, calibrated, and maintained to continuously measure and record the pressure loss of the gas stream through the scrubber and scrubbing liquid flow rate to the scrubber. The pressure loss monitoring device must be certified by the manufacturer to be accurate within 5 percent of water column gauge pressure at the level of operation. The liquid flow rate monitoring device must be certified by the manufacturer to be accurate within 5 percent of design scrubbing liquid flow rate.

Recordkeeping and reporting requirements

The recordkeeping and reporting requirements of the NSPS are contained in Table 2-1.

TABLE 2-1. RECORDKEEPING AND REPORTING REQUIREMENTS

Requirement	Reg.	Gen. Prov.
Up-to-date, readily accessible records of data collected during initial performance test and during all subsequent performance tests.		60.8(a)
Records of startup, shutdown, or malfunction.		60.7(b)
Records of pressure loss of the gas stream across the scrubber and scrubbing liquid flow rate.	60.735(b)	
Continuous record of COMS results.	60.734(a)	
Records of daily visible emission observations.	60.734(b)	
2-year retention of records.	60.735(a)	
Reports of performance test data and results.		60.8(a)
Semiannual reports of excess emissions or exceedances of control device operating parameters.	60.735(c)	

Compliance dates

The compliance dates and timing requirements to be followed for determining compliance with the NSPS are shown in Table 2-2.

TABLE 2-2. COMPLIANCE TIMES FOR THE NSPS

	Activity	Postmarked Date
1.	Notification of date of commencement of construction or recon. [Sec. 60.7(a)(1)]	No later than 30 days after date of commencement
2.	Notification of date of anticipated initial startup [Sec. 60.7(a)(2)]	No more than 60 days nor less than 30 days prior to anticipated startup*
3.	Notification of date of actual initial startup [Sec. 60.7(a)(3)]	Within 15 days after actual startup*
4.	Notification of any physical change to an existing facility which may increase the emission rate [Sec. 60.7(a)(4)]	60 days or as soon as practicable before the change is commenced
5.	Notification of date of commencement of demonstration of COMS performance [Sec. 60.7(a)(5)]	Not less than 30 days prior to commencement
6.	Initial performance test and written report of results [Sec. 60.8(a)]	Within 60 days after achieving maximum production rate but not later than 180 days after initial startup*
7.	Notification of any performance test [Sec. 60.8(d)]	30 days prior notification required*
8.	Notification that COMS data results will be used to determine compliance with opacity standard in lieu of Method 9	Not less than 30 days prior to date of performance test

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*For those sources that were constructed, reconstructed, or modified between the date of proposal and the date of promulgation, notification of the actual date of initial startup must be postmarked no later than 30 days following the date of promulgation, the initial performance test must be conducted within 60 days following promulgation if the maximum production rate at which the affected facility will be operated has been achieved, or within 180 days following promulgation if the maximum production capacity has not been achieved.

Section 3. Process Description

The source category of mineral dryers and calciners includes process equipment used to dry and calcine metallic and nonmetallic minerals in 17 selected mineral processing industries. Drying is defined as the removal of uncombined (free) water from the mineral material through direct or indirect heating. Calcining is the removal of combined (chemically bound) water and/or gases from the mineral material through direct or indirect heating. Calcining also refers to the heating, at high temperatures, of certain clay materials to create a ceramic change in the raw material.

In addition to the typical dryer and calciner process units, other process equipment is included whose primary purpose is not to remove water, although water is removed as a secondary consideration. These special cases include expansion furnaces in the perlite and vermiculite industries and rotary kilns in the lightweight aggregate industry.

Description of Processing Equipment

The industries included in this source category utilize a wide variety of processing equipment for the drying, calcining, and expansion of raw materials. A schematic of each type of dryer and calciner included in the source category can be found in Chapter 3 of the background information document (EPA-450/3-85-025a; October 1985).

Dryers. The dryer types used in the mineral industries include direct rotary, indirect rotary, fluid bed, flash, spray, and vibrating-grate. The types used in each industry are shown in Table 3-1. Dryers use either a convection (direct) or a conduction (indirect) method of drying. In the convection method, a heating medium, usually air or the products of combustion, is in direct contact with the wet material. In the conduction method, heat is transmitted indirectly by contact of the wet material with a heated surface. The thermal efficiency of direct-fired dryers is higher than the thermal efficiency of indirect dryers. The process material flow in direct rotary dryers may be concurrent or countercurrent to the gas flow.

Dryers may be operated in a batch mode or in a continuous mode. In several of the clay industries, batch operations are used to process several different materials through a given unit. Most dryers used in the mineral industries are operated in the continuous mode.

Rotary Dryers. A rotary dryer consists of a cylindrical shell, ranging in length from 4 to 10 times its diameter, into which wet charge is fed at one end and from which dried product is discharged at the other end. Direct rotary dryers are used in the mineral industries when the materials to be dried can be safely brought into contact with heated air or combustion gases and when volatile, flammable, or noxious components are absent or are present in only small amounts.

Direct rotary dryers in the mineral industries range in diameter from 1.2 to 3.1 meters (m) (4 to 10 feet [ft]). Dryer lengths vary from 6.1 to 19.8 m (20 to 65 ft). The production rates for mineral rotary dryers vary within each industry and range from 4.5 to 200 Mg/h (5 to 220 tons/h). The retention times in these dryers are 2 to 45 minutes. Natural gas, fuel oil, and coal are the predominant fuels used for direct rotary dryers.

Fluid Bed Dryers. In a fluid bed dryer, a vertically rising, hot stream of gas is introduced through a dispersion plate (gas distributor) at the base of a bed or column of particulate solids. The velocity of this air stream is such that the wet feed bed expands to allow the particles to move within the bed, i.e., the bed becomes fluidized. Feed rate, product discharge rate, and the volumetric gas flow and gas temperature are monitored on a fluid bed dryer to maintain steady-state conditions and obtain the desired product moisture

TABLE 3-1. TYPES OF DRYERS USED BY EACH INDUSTRY[a]

Industry	Rotary (direct)	Rotary (indirect)	Fluid bed	Vibrating grate	Flash	Spray
Ball clay		x		x[b]		
Bentonite	x		x			
Diatomite	x				x	
Feldspar	x		x			
Fire clay	x			x		
Fuller's earth	x		x			
Gypsum	x					
Industrial sand	x		x			
Kaolin	x					x
Perlite	x					
Roofing granules	x		x			
Talc	x				x	
Titanium dioxide	x	x	x		x	x
Vermiculite	x		x			

[a]Dryers are not used in the alumina, lightweight aggregate, and magnesium compounds industries.
[b]Indirect.

content. Wet feed material charged to the dryer above the bed is removed as dried product near the base of the vessel. Gas passing up through the bed is exhausted through the top of the dryer to a control device. A high pressure air blower is generally used to dilute high-temperature combustion gases from the furnace and fluidize the bed.

Flash Dryers. A flash (pneumatic) dryer is designed to dry material and convey it by a stream of hot gases from the feed point to some other point. The feed material must be reasonably free-flowing and capable of being entrained in the gas stream. Separation of the dried product from the conveying air usually takes place in a product cyclone followed by further separation in other cyclones or baghouses. Because of the short retention time (2 to 3 seconds) of material in a flash dryer, only materials with good drying characteristics are suitable for processing in these units. Feed materials typically contain 6 to 60 percent moisture on a weight basis. The ratio of solids to gas should not be less than 1:2 by weight.

Spray Dryers. Spray dryers are used to dry liquids, slurries, and pastes. A spray dryer consists of a source of hot gases, a drying chamber, a means of atomizing the feedstock, some provision for withdrawing the dried product and exhaust gases from the drying chamber, and equipment for the separation of the dried product from the exhaust gases.

For most operations, direct-fired combustion chamber air heaters are used, with natural gas and oil being the most common fuels. Inlet gas temperatures range from 93° to 760°C (200° to 1400°F) depending upon the heating method. The spray dryer may have concurrent, countercurrent, or mixed air and material flow. Countercurrent dryers yield high bulk density products and are the most common type used in the kaolin and titanium dioxide industries.

Product collection may be carried out in various ways. If a considerable amount of product separates out within the dryer chamber in the conical base, it may be removed continuously under its own weight through a rotary valve or screw conveyor. If most of the product remains entrained in the gas stream, separation of the dry material is carried out first in high-efficiency cyclones followed by baghouses.

Vibrating-grate Dryers. Fluidization is maintained by a combination of pneumatic and mechanical forces. The heated gas is introduced into a plenum and passes up through a perforated or slotted conveying deck, through the fluidized bed of solids, and into an exhaust hood. To ensure a uniform velocity distribution through the bed of solids, a combination pressure blower-exhaust fan system is used.

Vibrating-grate dryers are suitable for free-flowing solids containing mostly surface moisture. They are not effective on fibrous materials that form a mat, or on sticky solids that agglomerate or adhere to the deck. The motion imparted to the material particles may vary, but the objective is to move the material upward and forward so that it will travel along the conveyor path in a series of short hops. This mechanical action, combined with the upward velocity of the air flow through the grate, conveys and dries the raw material. Vibrating-grate dryers in the mineral industries are 0.3 to 1.5 m (1 to 5 ft) wide and 3.1 to 45.7 m (10 to 150 ft) long. They dry material at a rate of 14 to 23 Mg/h (15 to 25 tons/h) and have retention times of 2 to 30 minutes. Natural gas and No. 2 fuel oil are the predominant fuels.

Calciners. The types of calciners used in mineral industries are rotary, flash, and kettle calciners, and multiple hearth (Herreshoff) and expansion furnaces. The types used in each industry are shown in Table 3-2. Rotary calciners, which are the most common type, are operated in a continuous, direct-heat mode in most cases. Flash calciners are used in the alumina, gypsum, and kaolin industries. Kettle calciners are only used in the gypsum industry. Multiple hearth furnaces are used in the kaolin and magnesium compounds industries, and expansion furnaces are used in the perlite and vermiculite industries. Calciners are designed to remove the majority of combined moisture in the process material and are operated at higher temperatures than the dryers discussed earlier.

Rotary Calciners. Rotary calciners are similar in appearance to rotary dryers. Rotary calciners are used instead of rotary dryers when the process requires removal of both combined and uncombined moisture from the material. A rotary calciner consists of a cylindrical shell, ranging in length from 10 to 20 times its diameter, into which wet charge (wet-feed) or predried (dry-feed) material is fed at one end and calcined product is discharged at the other end. Rotary calciner shells are lined with refractory brick that insulates the steel shell and permits operation at high temperatures. Rotary calciners used in the mineral industries are 2.4 to 3.7 m (8 to 12 ft) in diameter and 30.5 to 61.0 m (100 to 200 ft) in length. The production rate is 0.9 to 66.4 Mg/h (1 to 73 tons/h) of material and the retention time ranges from 18 minutes to 14 hours.

Material movement through the kiln results from the combined effects of the kiln inclination and the rotation of the cylinder. Kiln inclination varies from 2 to 6 percent slope and the peripheral speed of rotation varies from 0.5 to 5 rpm.

Most rotary calciners have countercurrent air and material flow to achieve the most energy efficient reduction in moisture content. Natural gas, oil, or pulverized coal are the predominant fuels, with natural gas being used in the greatest number of rotary calcining units.

Flash Calciners. Flash calciners are similar to flash dryers in principle and operation except that they operate at higher temperatures than flash dryers. A flash calciner is a refractory-lined cylindrical vessel with a conical bottom.

TABLE 3-2. TYPES OF CALCINERS USED BY EACH INDUSTRY

Industry	Rotary	Flash	Multiple hearth furnace	Kettle	Expansion furnace
Alumina	x	x			
Diatomite	x				
Fire clay	x				
Fuller's earth	x				
Gypsum		x		x	
Kaolin	x	x	x		
Lightweight aggregate	x				
Magnesium compounds	x		x		
Perlite					x
Talc	x				
Titanium dioxide	x				
Vermiculite					x

[a]Calciners are not used in the ball clay, bentonite, feldspar, industrial sand, and roofing granules industries.

A flash calcining system used in the alumina industry consists of a two-stage cyclone, a preheater, a venturi-type flash dryer, the calciner, a multi-stage cyclone cooler, and a secondary fluid bed cooler. The material enters the calciner from the cyclone preheater at a temperature of 300° to 400° (570° to 750°F). The combustion air from the cooler enters the calciner at 815°C (1500°F), and a gas temperature of 1100° to 1450°C (2000° to 2640°F) is achieved in the calciner. Preheated, partly calcined material is discharged into the reactor parallel to the bottom, just above the fuel inlet. The calcined material is retained for a few seconds and is then separated from hot gases in the separation cyclone, prior to being discharged into the primary cooler.

Multiple Hearth (Herreshoff) Furnaces. A multiple hearth furnace consists of a number of annular-shaped hearths mounted one above the other. Rabble arms on each hearth are driven from a common center shaft. Multiple hearth furnaces handle granular material and provide a long countercurrent path between flue gases and process material. These furnaces are used in the magnesium compounds and kaolin industries.

Material is fed by a screw conveyor into the furnace at the center of the upper hearth. Rabble arms connected to a center drive shaft move the charge to the periphery of the hearth where it falls to the next lower hearth. The material is then moved to the center of this second hearth from which it falls to the next hearth, and the cycle continues down the furnace. The hollow center shaft is cooled internally by forced air circulation. Burners may be mounted at any of the hearths, and the circulated air is used for combustion.

Kettle Calciners. Kettle calciners have cylindrical metal shells, which are set in masonry brick and surrounded by a steel jacket. The inner wall of the masonry is lined with a refractory. Kettle calciners are equipped with a baffled annular space between the kettle and the refractory lining. Hot combustion gases from a firebox beneath or adjacent to the kettle pass through the annular space and through flues inside the kettle to provide indirect heating. Horizontal arms attached to a vertical shaft in the center of the kettle agitate the raw material to provide mixing and thus prevent over-heating of the material. Ambient air is passed through the kettle to remove the water liberated by calcination. The calcined material is discharged into "hot pits" located below the kettle.

Kettle calciners used in the gypsum industry are 3.0 m (10 ft) in diameter and 4.3 m (14 ft) in height. They have production rates of 4.5 to 12 Mg/h (5 to 13 tons/h) and a retention time of 60 to 180 minutes. Natural gas and distillate oil are the predominant fuel types used in most units.

Expansion Furnaces. Expansion furnaces are used to process ores that "expand" up to 20 times their original volume when exposed to high temperatures. Factors that affect the properties of the final product include the amount of entrapped water, the degree to which the crude ore particles approximate a cubic shape, size gradations, rate of heat application during expansion, and the method of injecting the crude ore into the expansion zone of the furnace. Expansion furnaces are used in the perlite and vermiculite industries.

Two types of expansion furnaces are used in industries. The stationary vertical furnace is the most common. The stationary vertical expansion furnace consists of a steel tube insulated with refractory or by means of a shell that provide an air space around the furnace. Ore is introduced into the furnace just above the flame located at the base of the furnace cylinder. Expansion of the material occurs instantaneously as the ore is blown up the furnace by the combustion gases. The temperature at the point of expansion ranges from 700^{o} to $1090^{o}C$ (1300^{o} to $2000^{o}F$), depending on the size of the crude ore to be expanded and its initial moisture content. Most furnaces process 0.9 to 1.8 Mg/h (1 to 2 tons/h) of material, and natural gas and fuel oil are used to fire most expansion furnaces.

The horizontal rotary expansion furnace has a preheating shell around the direct-fired expansion cylinder. After preheating, the feed is introduced into the rotating inner shell where it is exposed to the direct heat of the burner flame. An induced draft fan draws the particles out of the furnace and up to the product collection equipment.

The product from both furnace types is pneumatically conveyed to a product collection cyclone system. The primary cyclone removes the majority of the expanded particles, while the secondary cyclone collects smaller material. Material from the primary cyclone may then fall through a cooler/classifier unit that reduces product temperature before bagging.

Process Diagrams. Figures 3-1 through 3-18 are process flow diagrams of the 17 mineral industries covered by this NSPS. Two diagrams depict the two different titanium dioxide processes. These diagrams show where the drying and/or calcining processes occur in these industries.

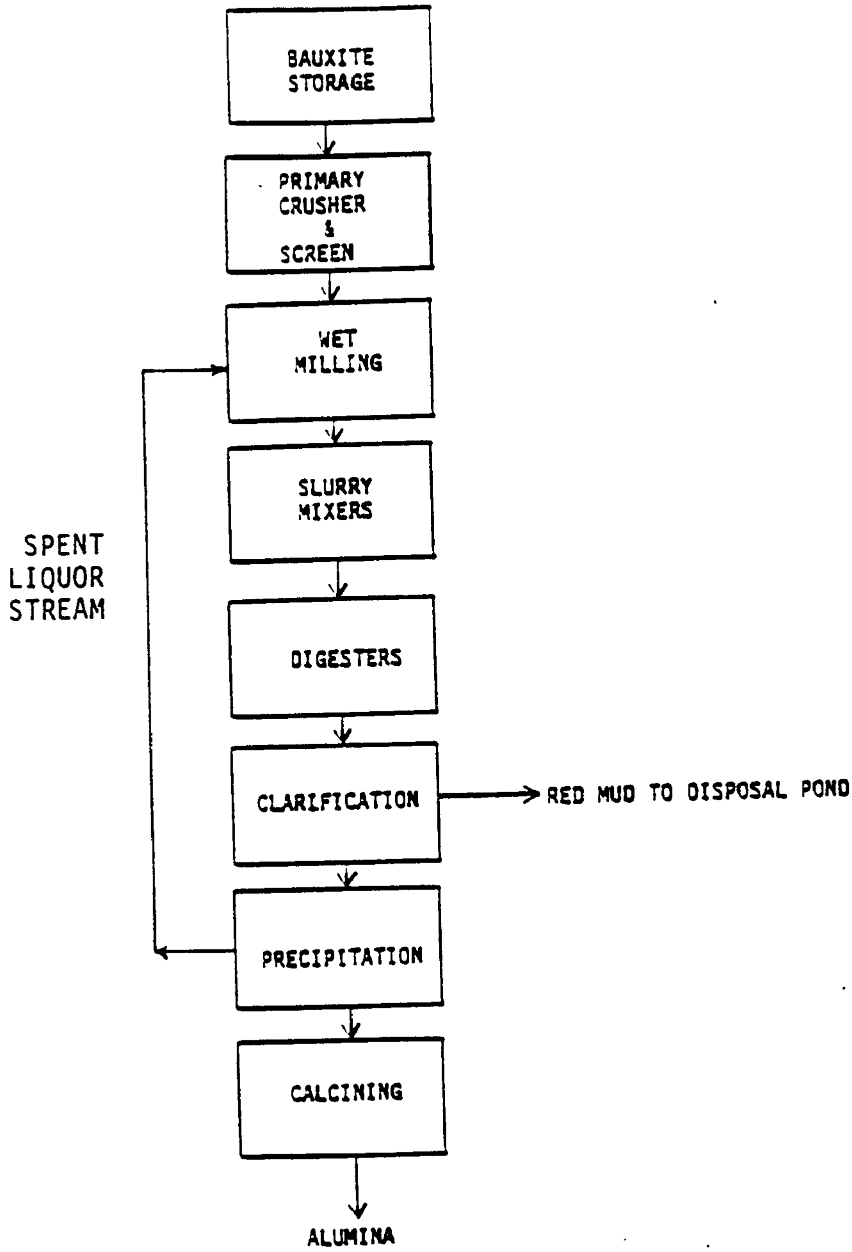


Figure 3-1. Simplified process flow diagram for alumina production.

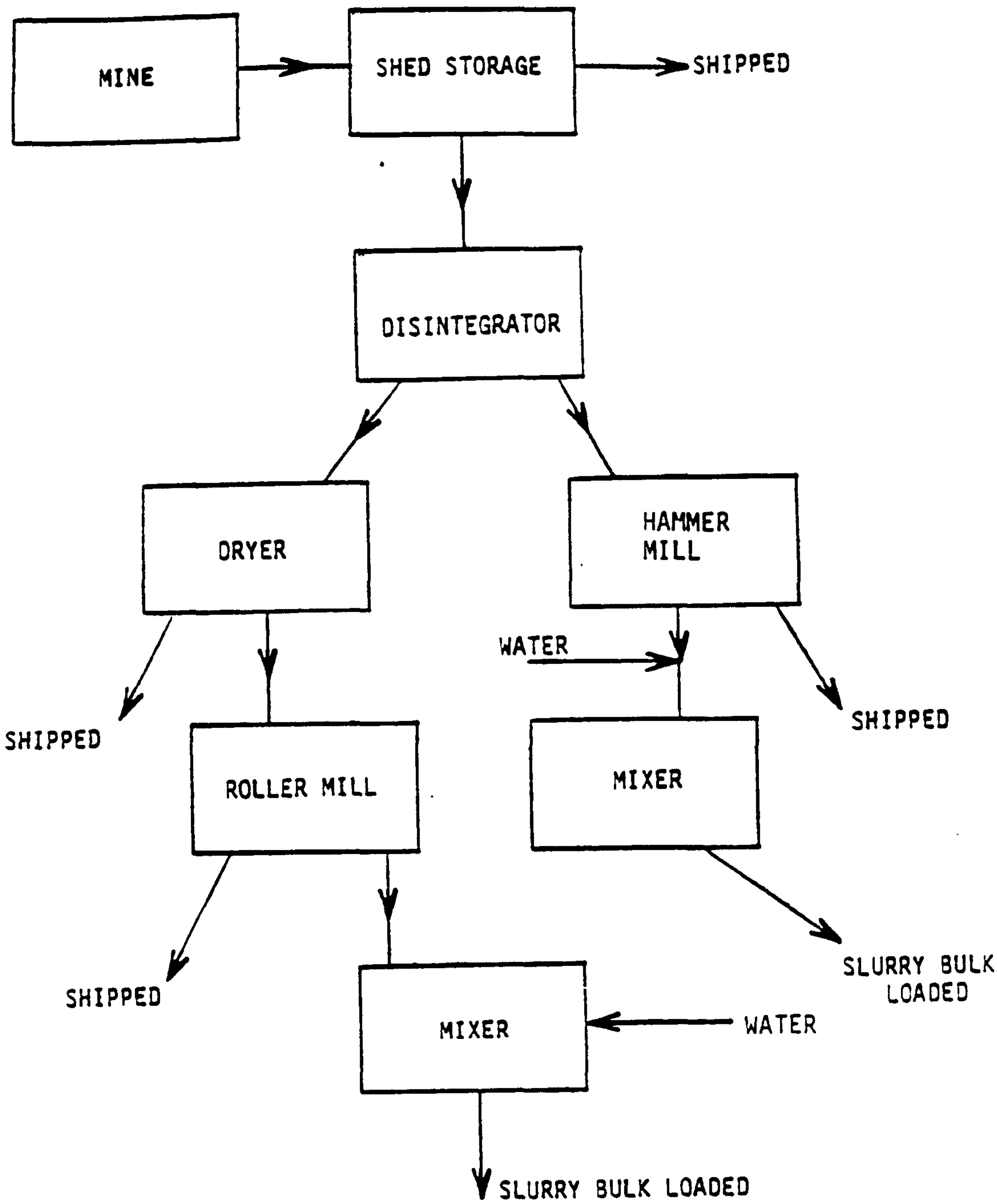


Figure 3-2. Ball clay process flow diagram.

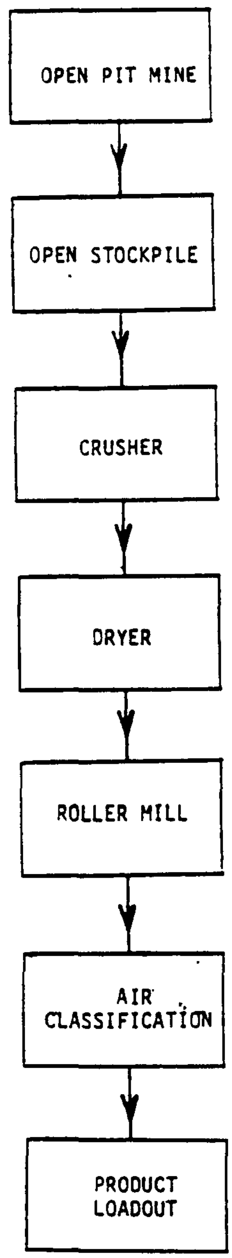


Figure 3-3. Bentonite processing.

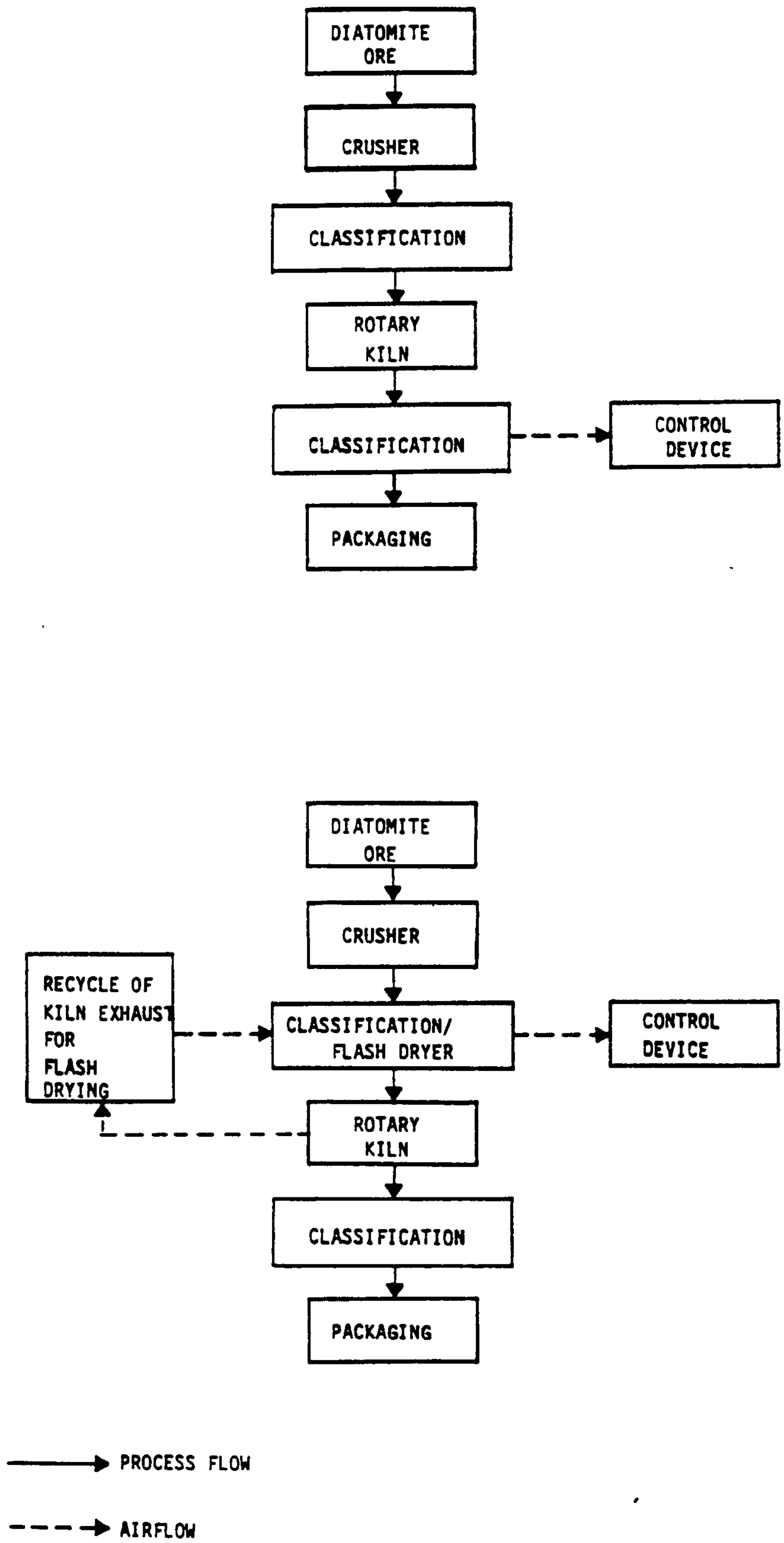


Figure 3-4. Alternate process flow diagrams for diatomite production.

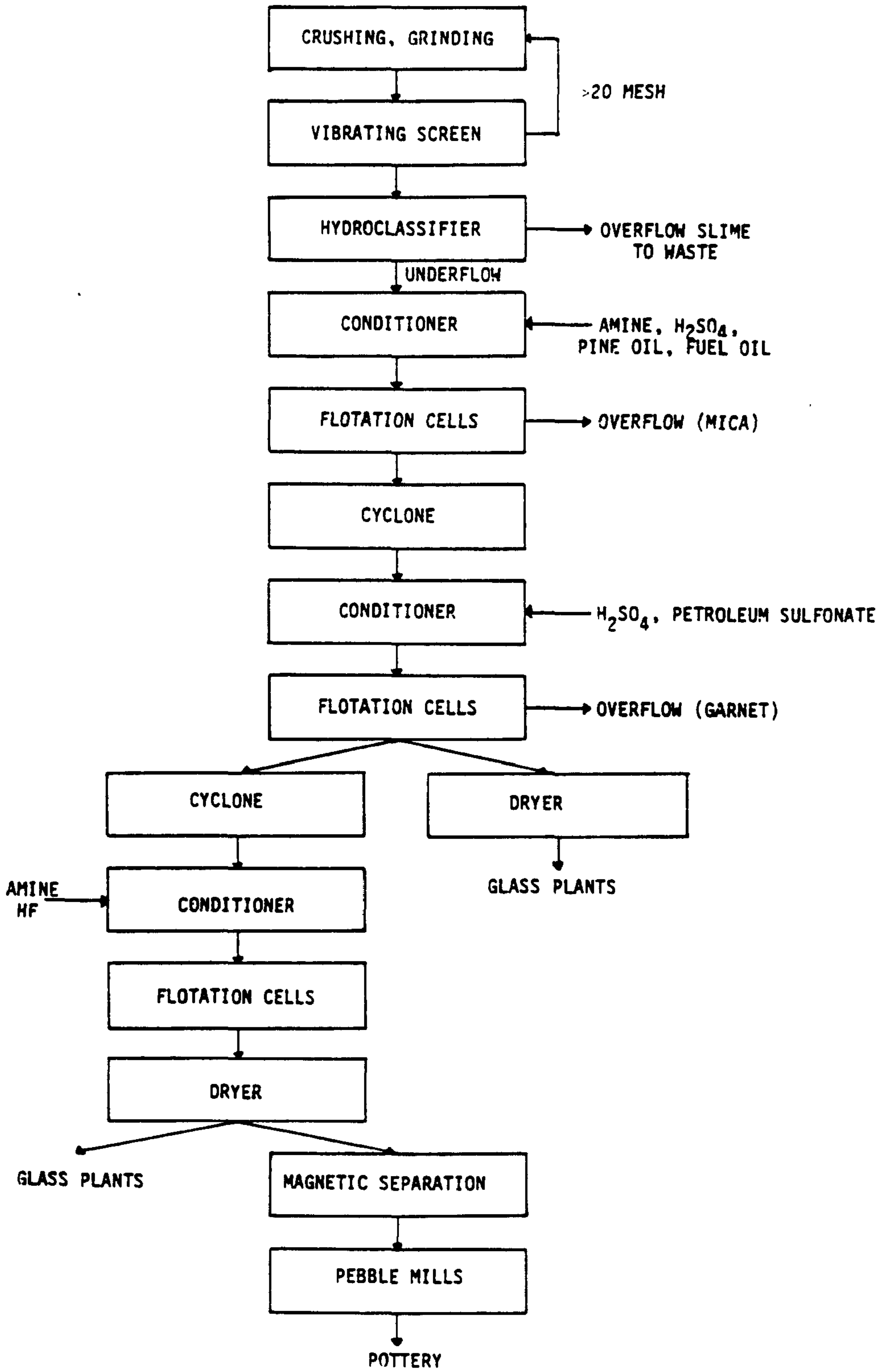
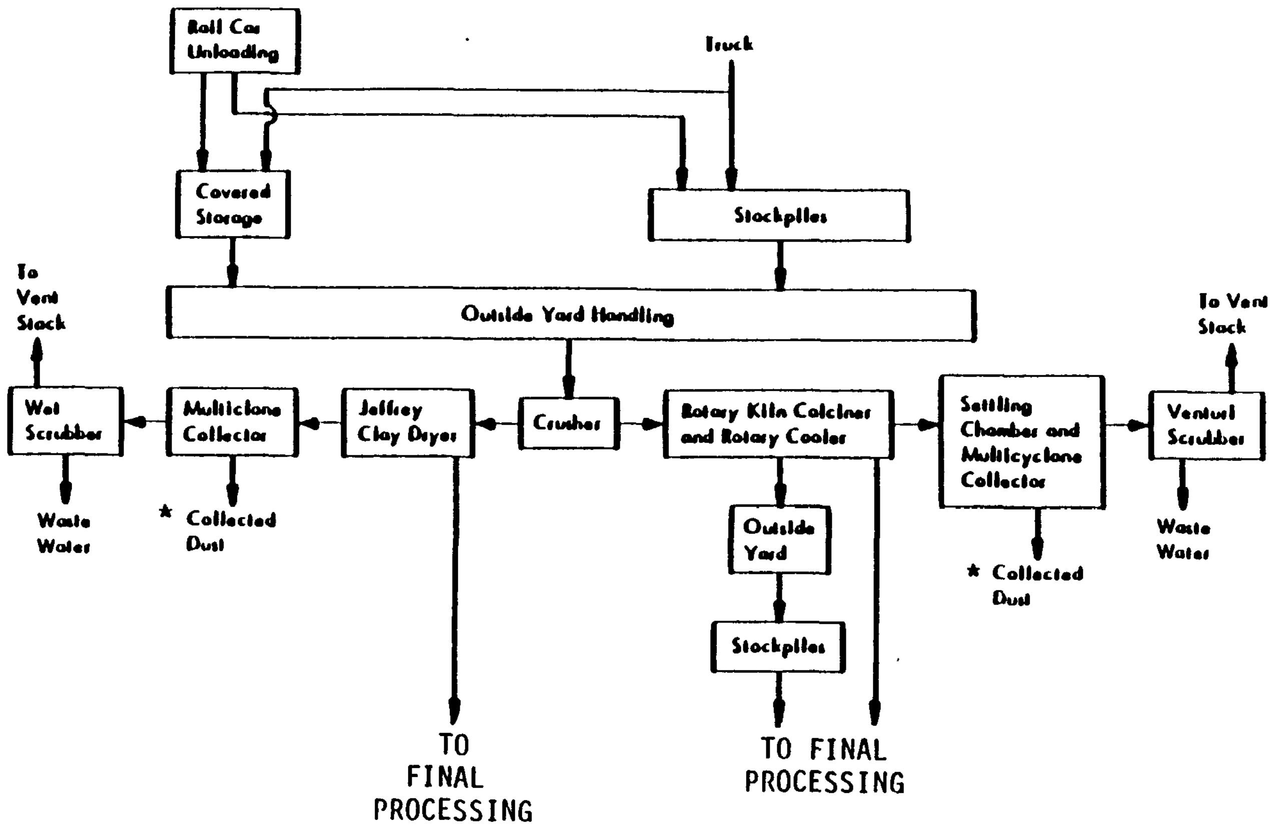


Figure 3-5. Feldspar flotation process.



* Collected dust is mostly returned to process.

Figure 3-6. Partial flow diagram for fire clay plant (handling and processing of raw materials prior to use in refractory manufacturing plant).[67]

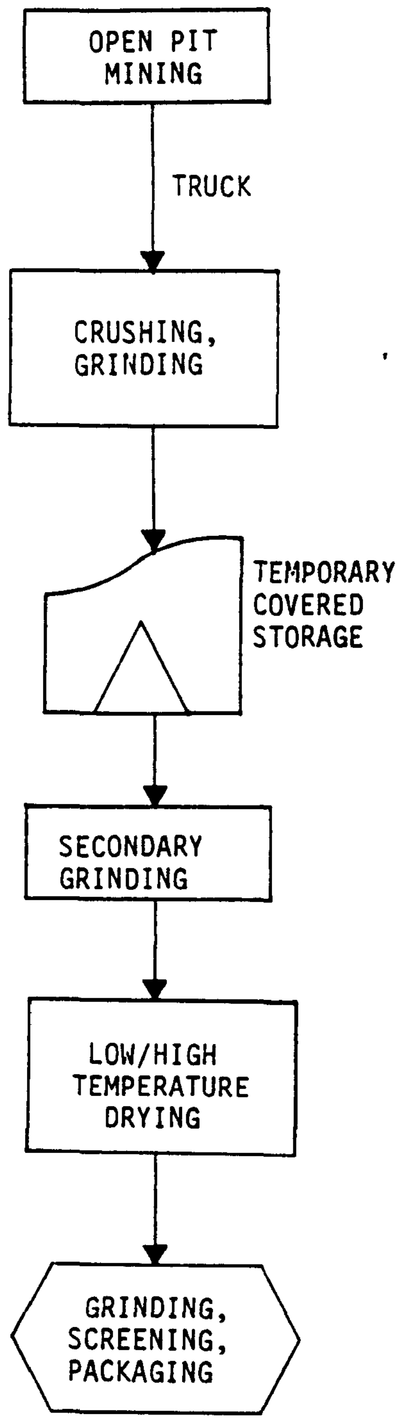


Figure 3-7. General flow diagram for fuller's earth production.

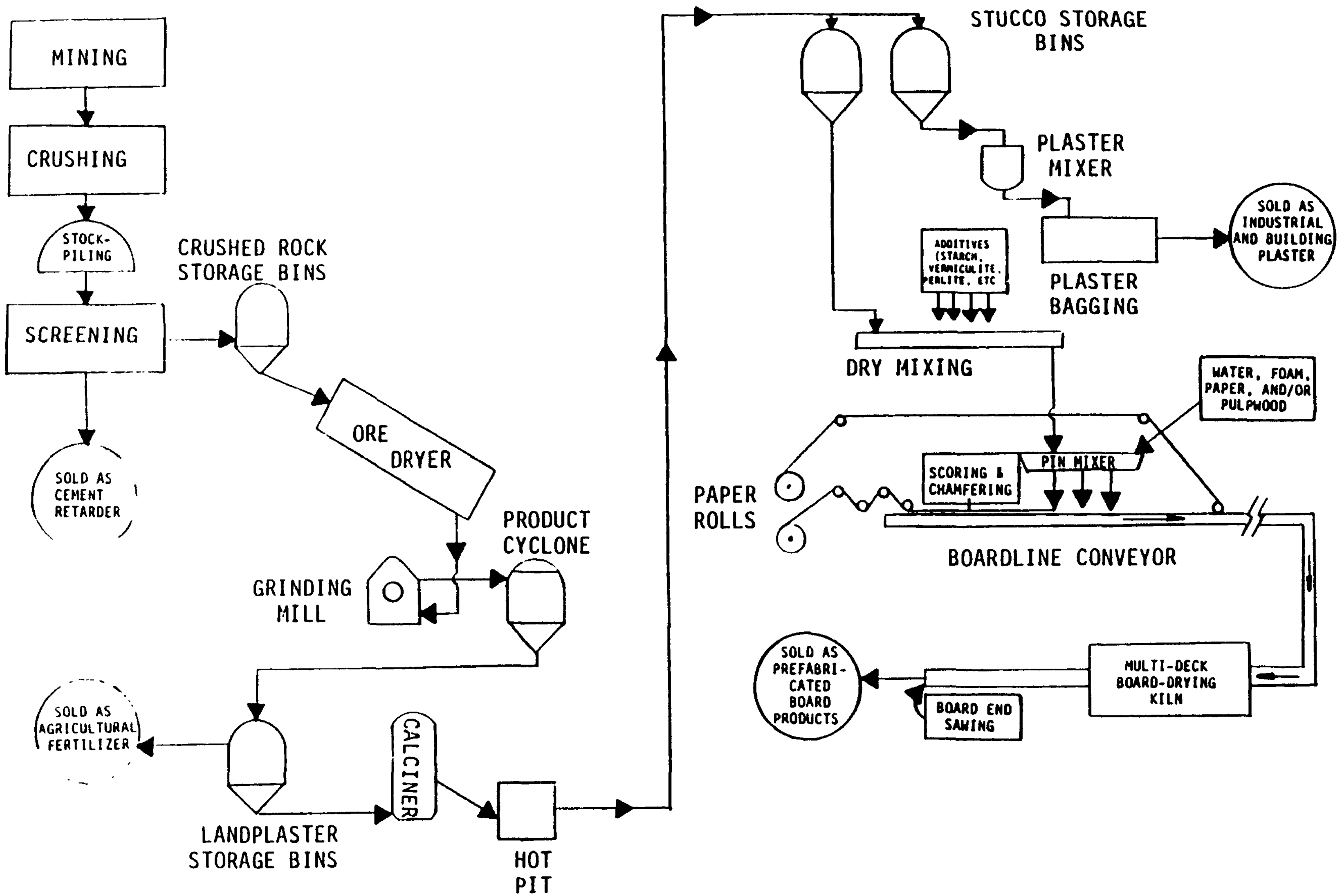


Figure 3-8. Process flow diagram for gypsum production.

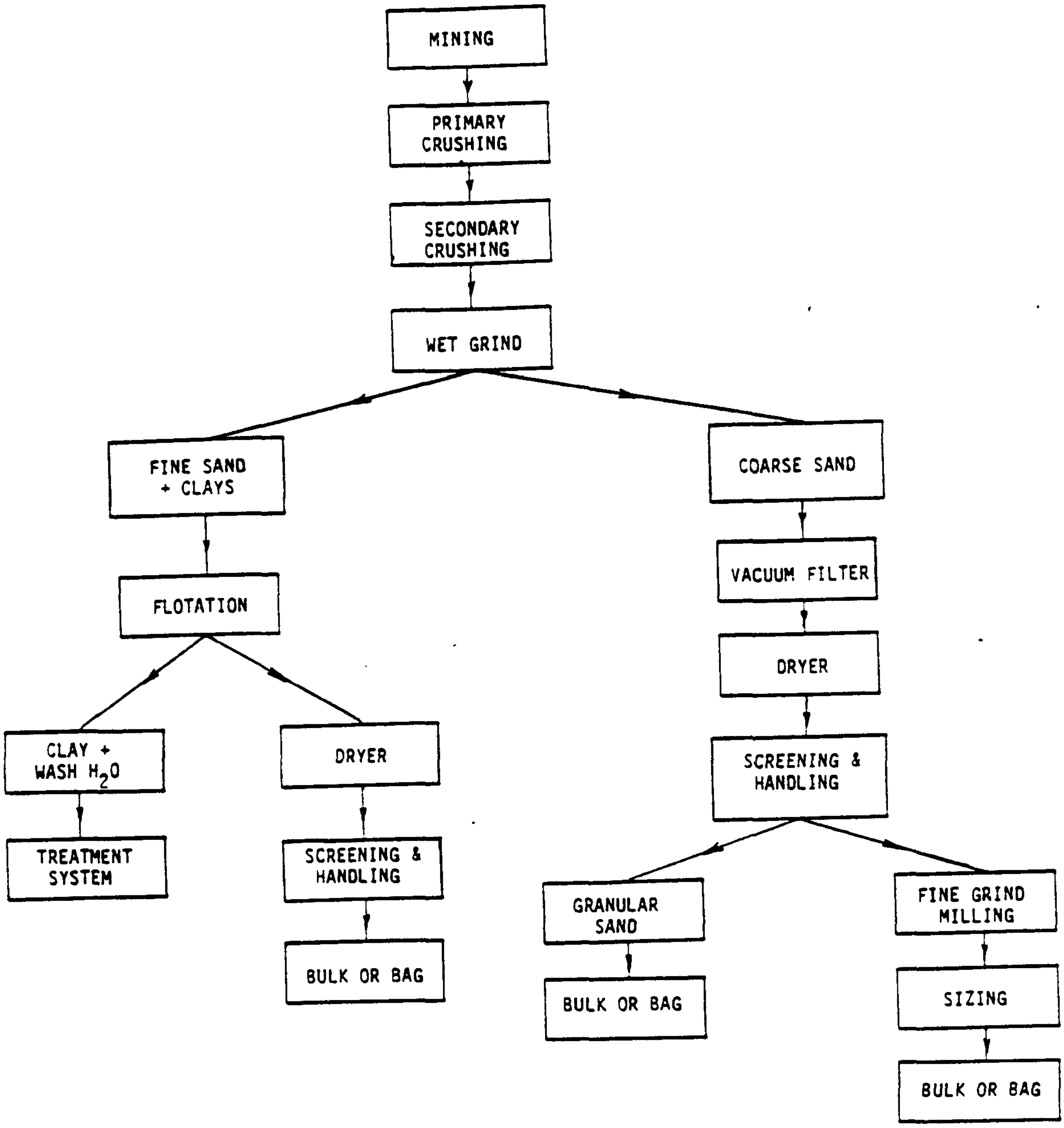


Figure 3-9. Process flow diagram for industrial sand production.

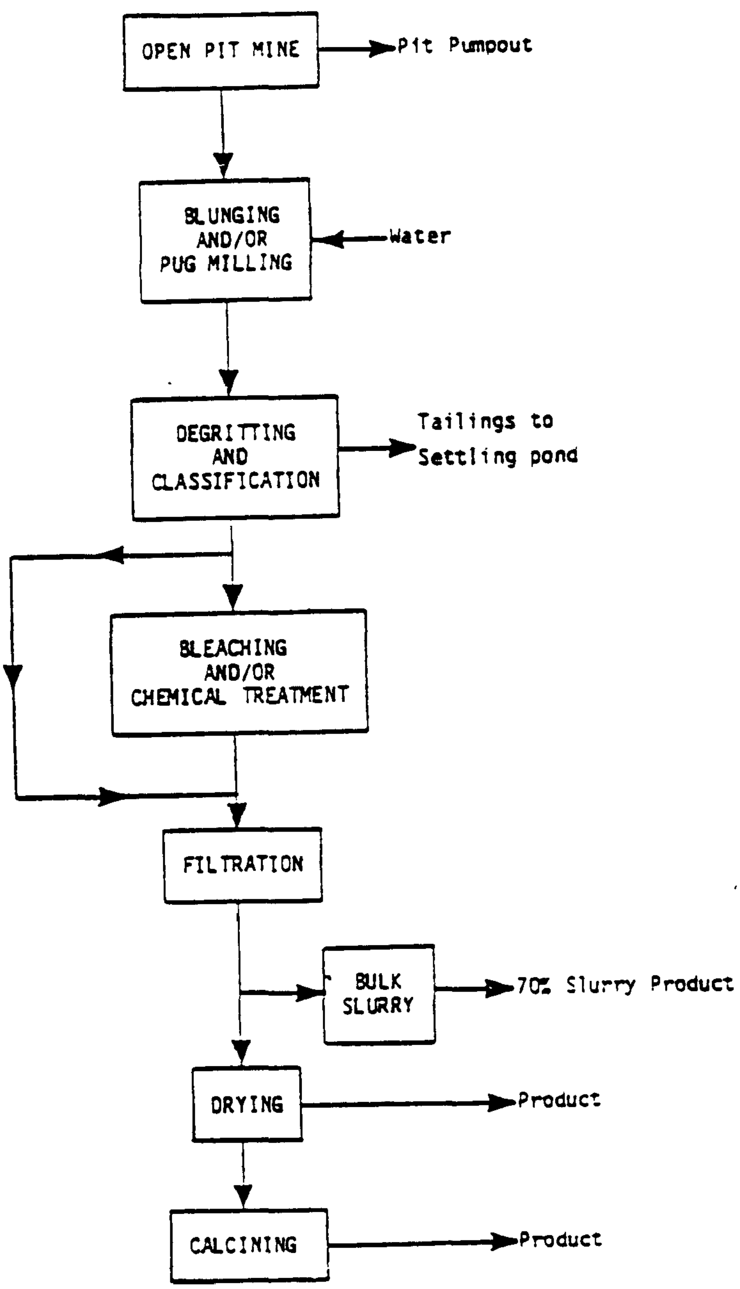


Figure 3-10. Typical wet mining and process for high grade kaolin products.

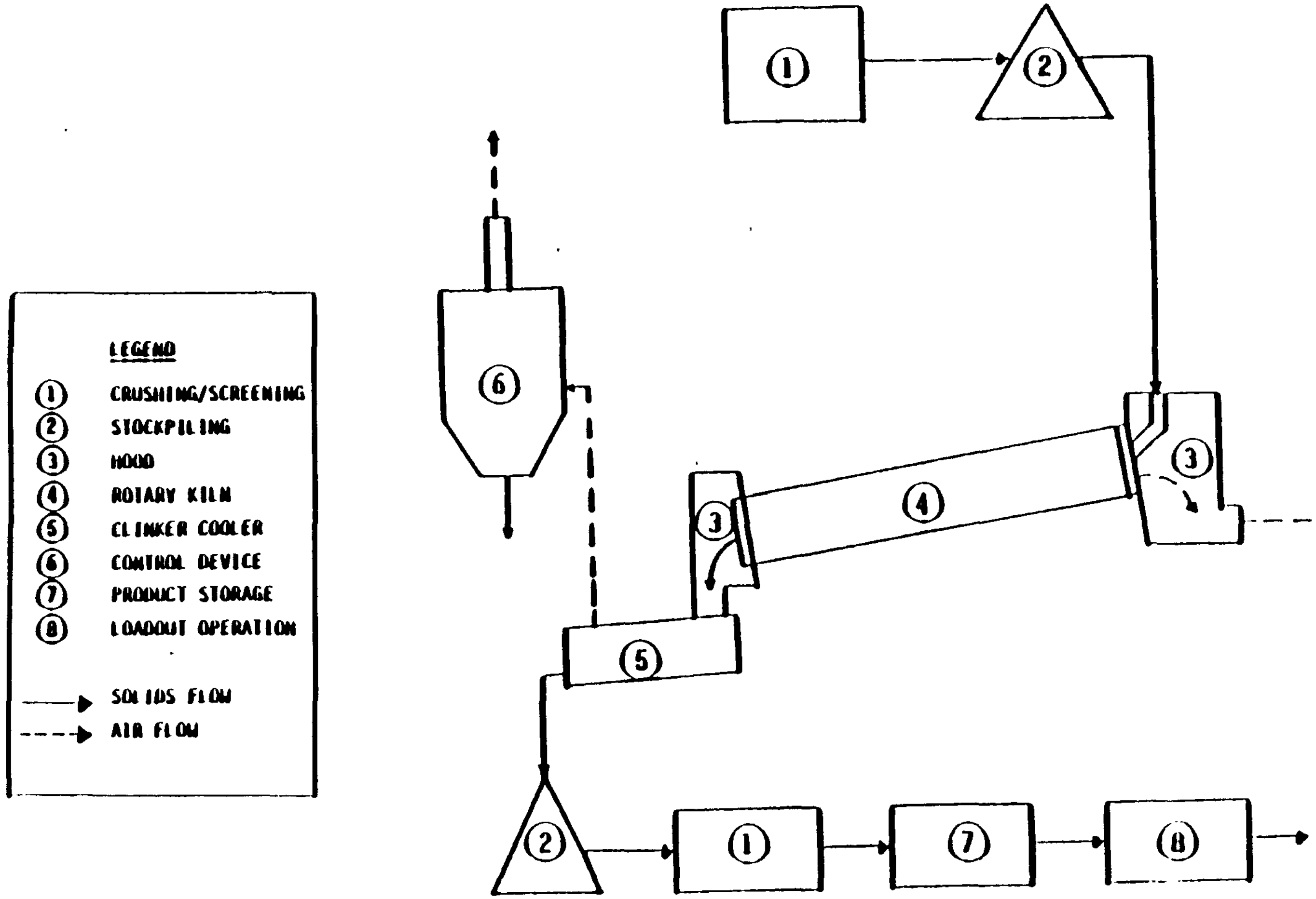


Figure 3- 11. Schematic of a typical LWA plant.

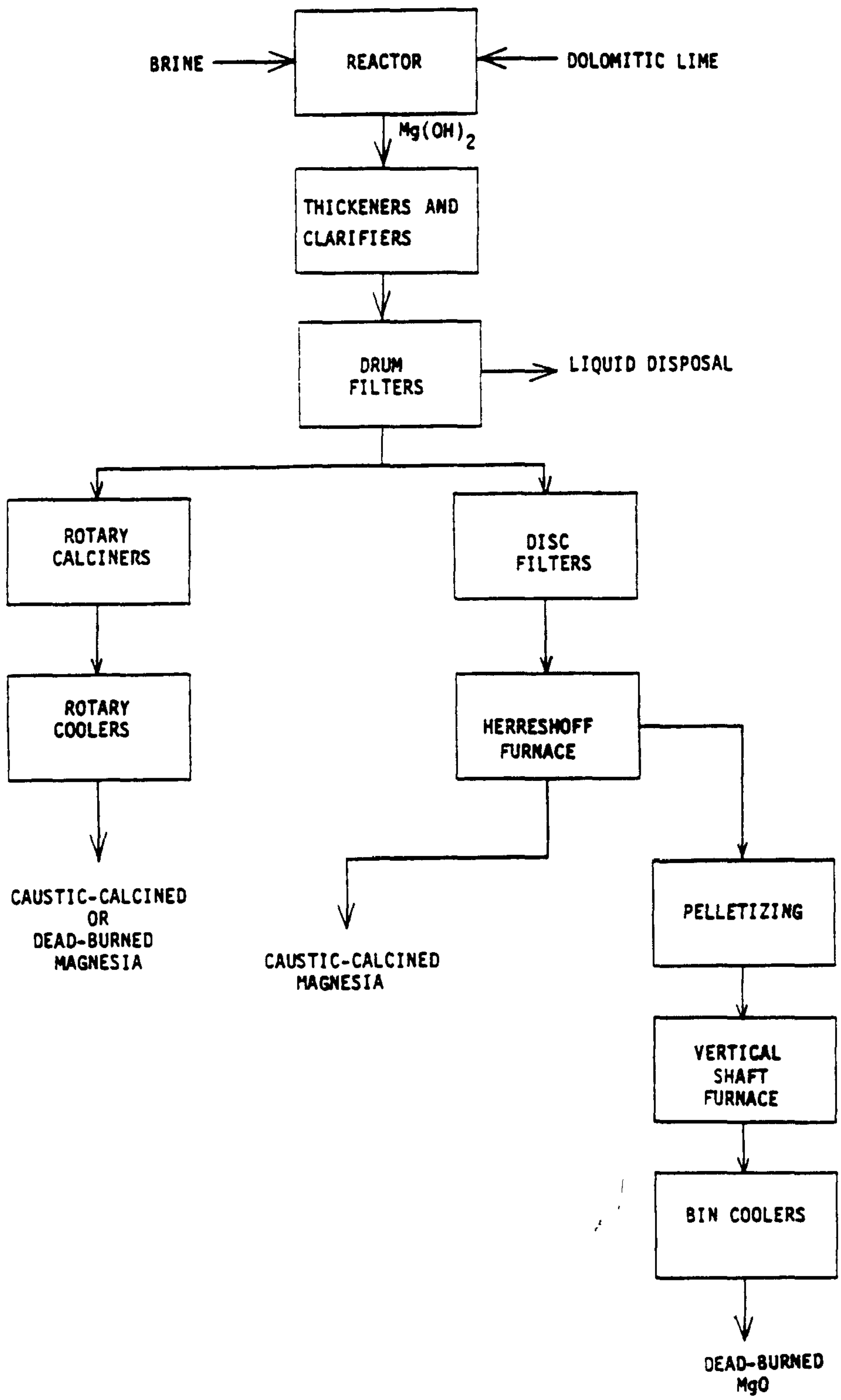


Figure 3-12. Typical process flow diagram for the production of magnesias from natural brine solutions.

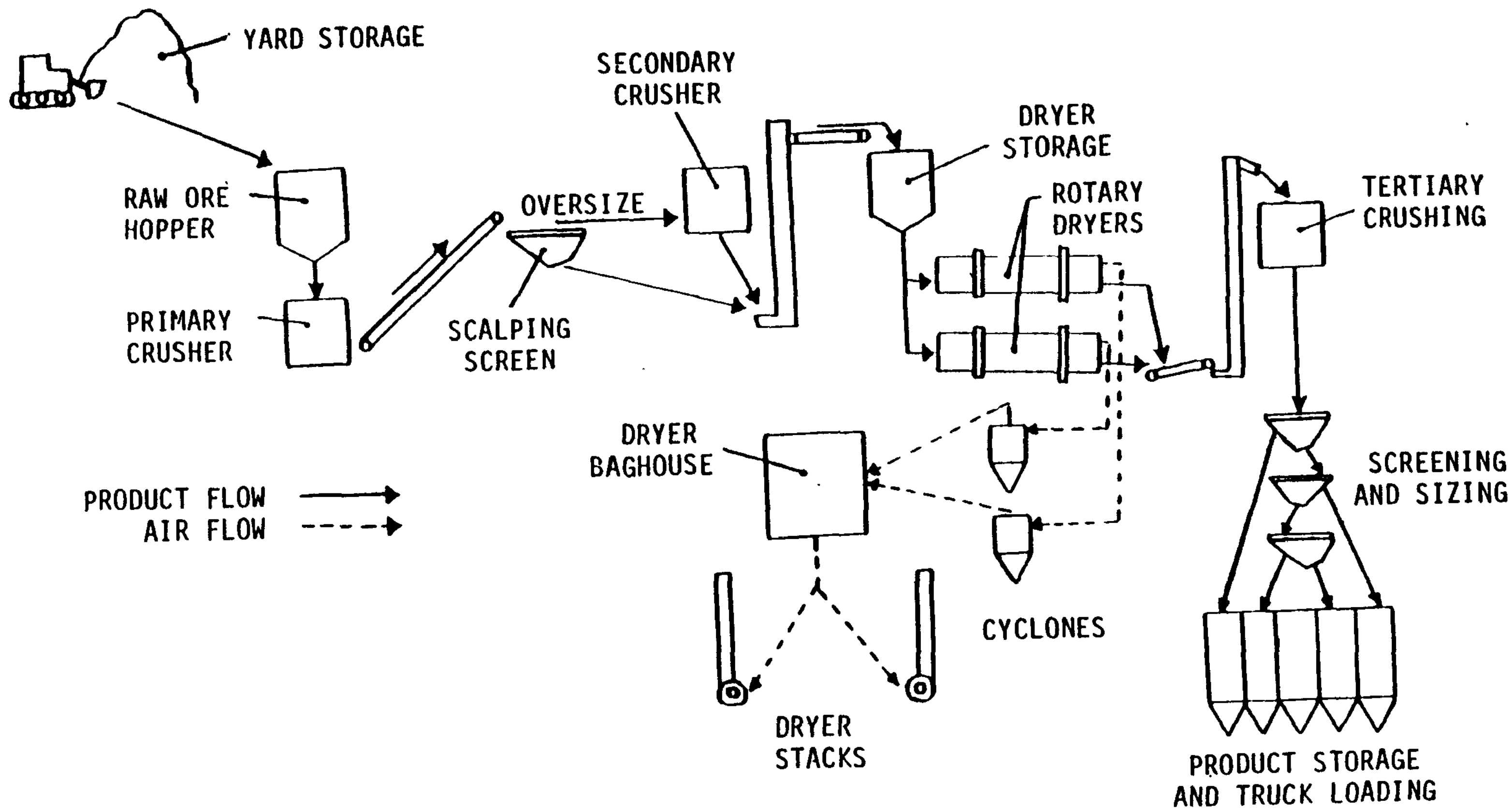


Figure 3-13. Flow diagram for perlite ore processing.

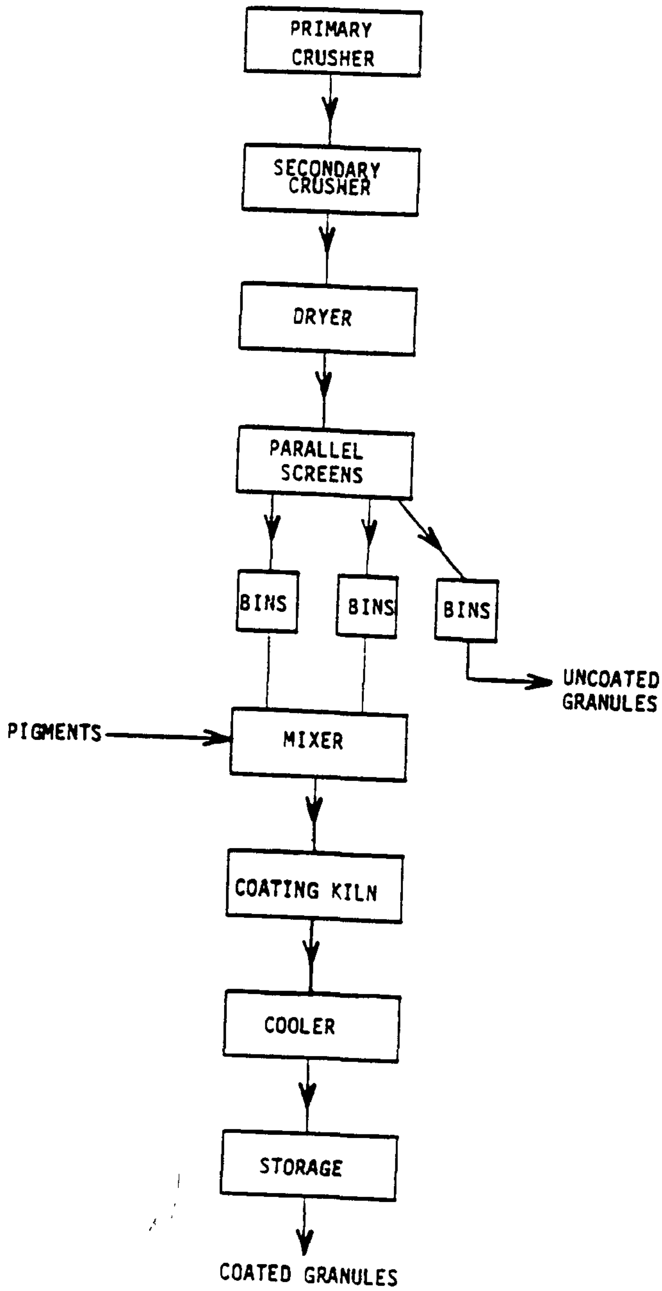


Figure 3-14. Roofing granules production.

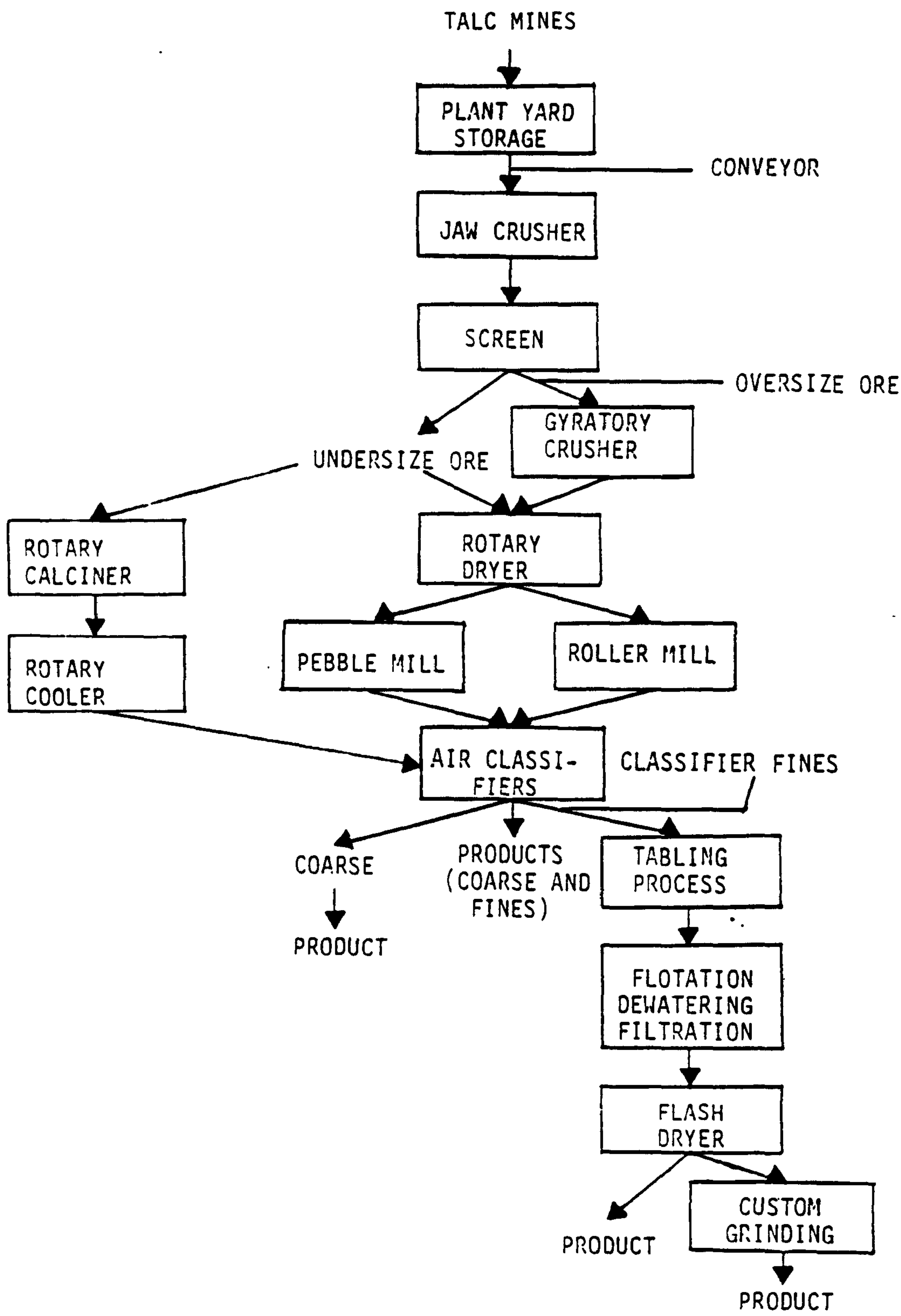


Figure 3-15. Process flow diagram for talc processing.

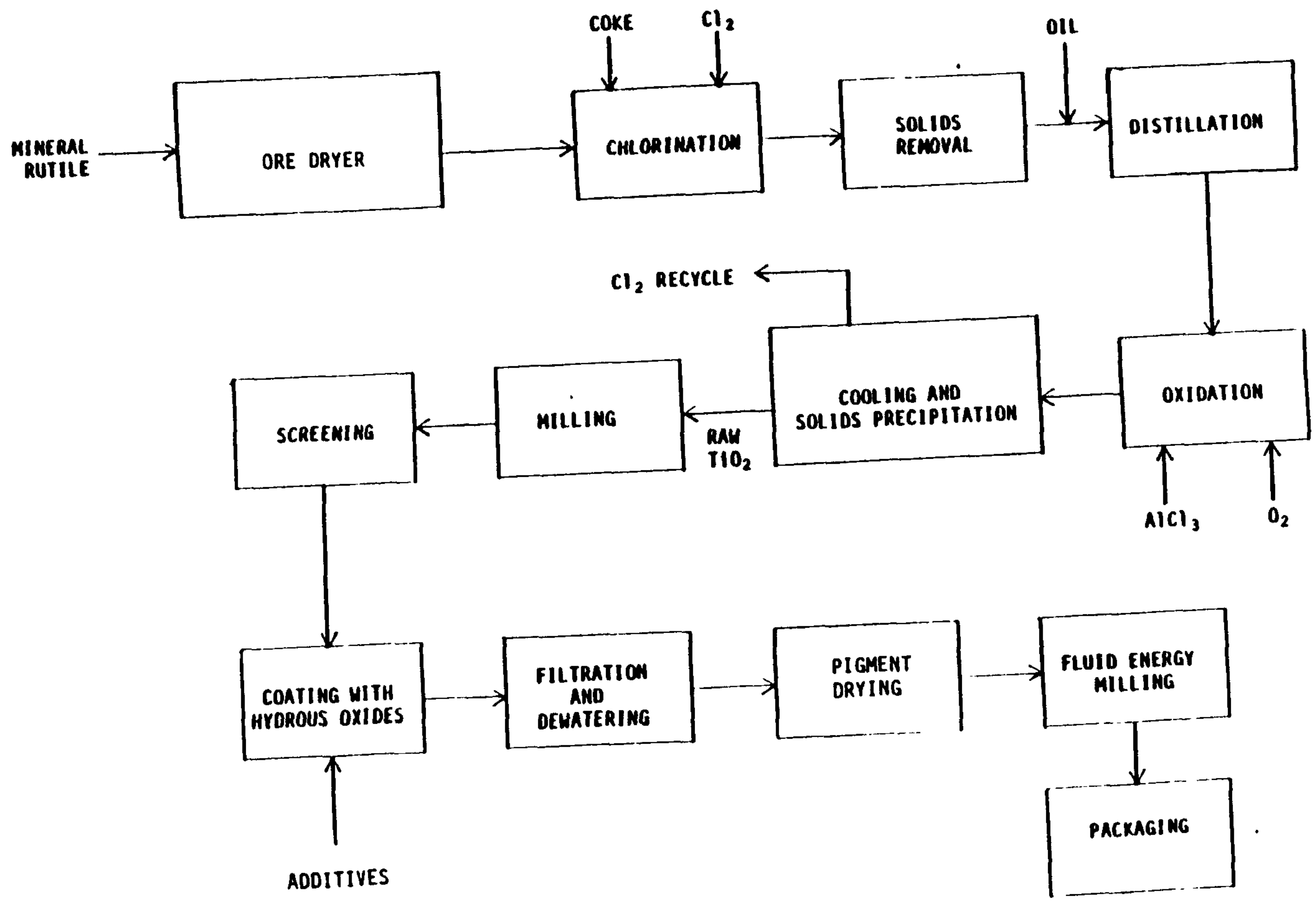


Figure 3-16. Simplified flow diagram of chloride process--TiO_2.

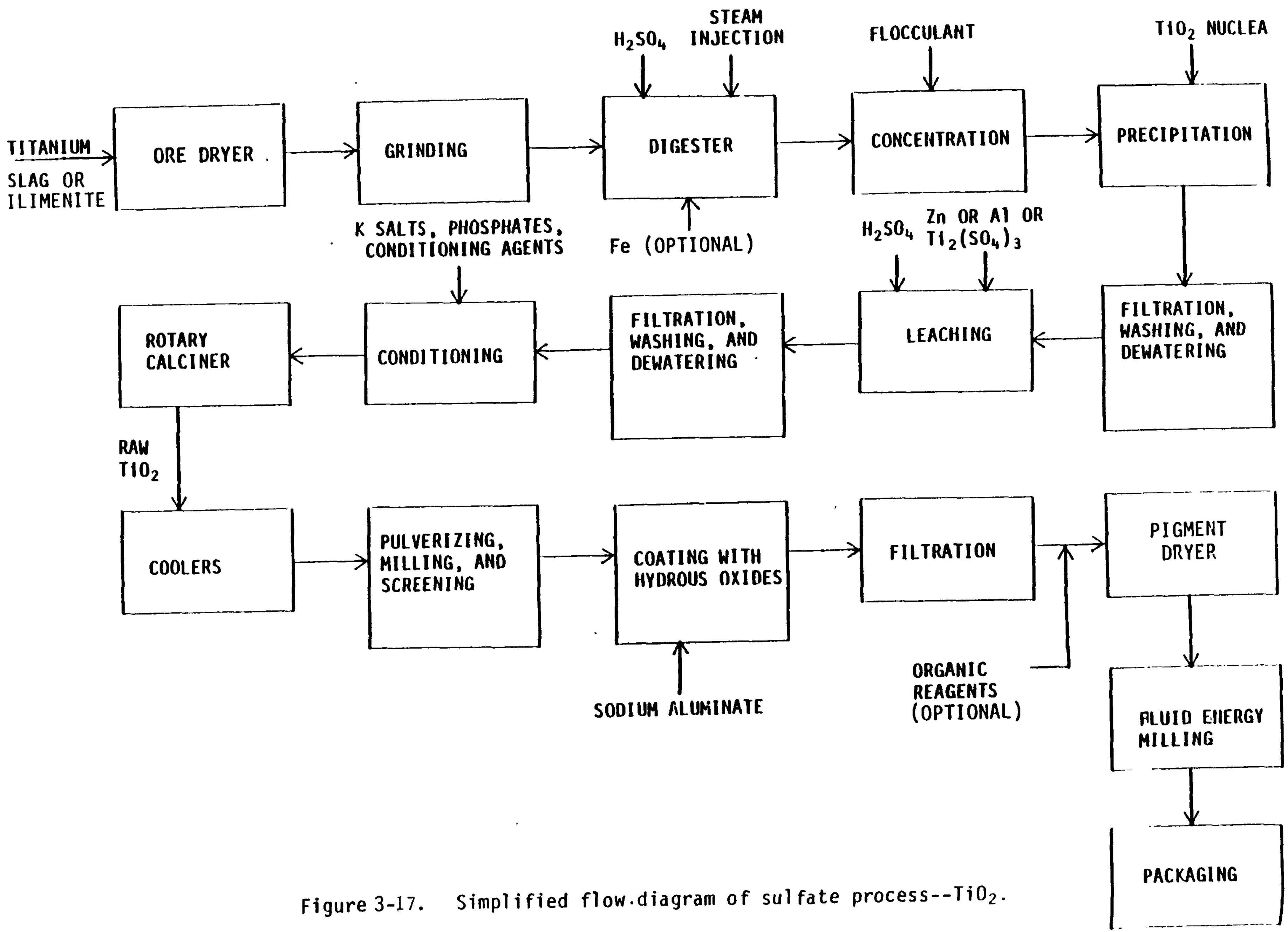


Figure 3-17. Simplified flow diagram of sulfate process--TiO_2.

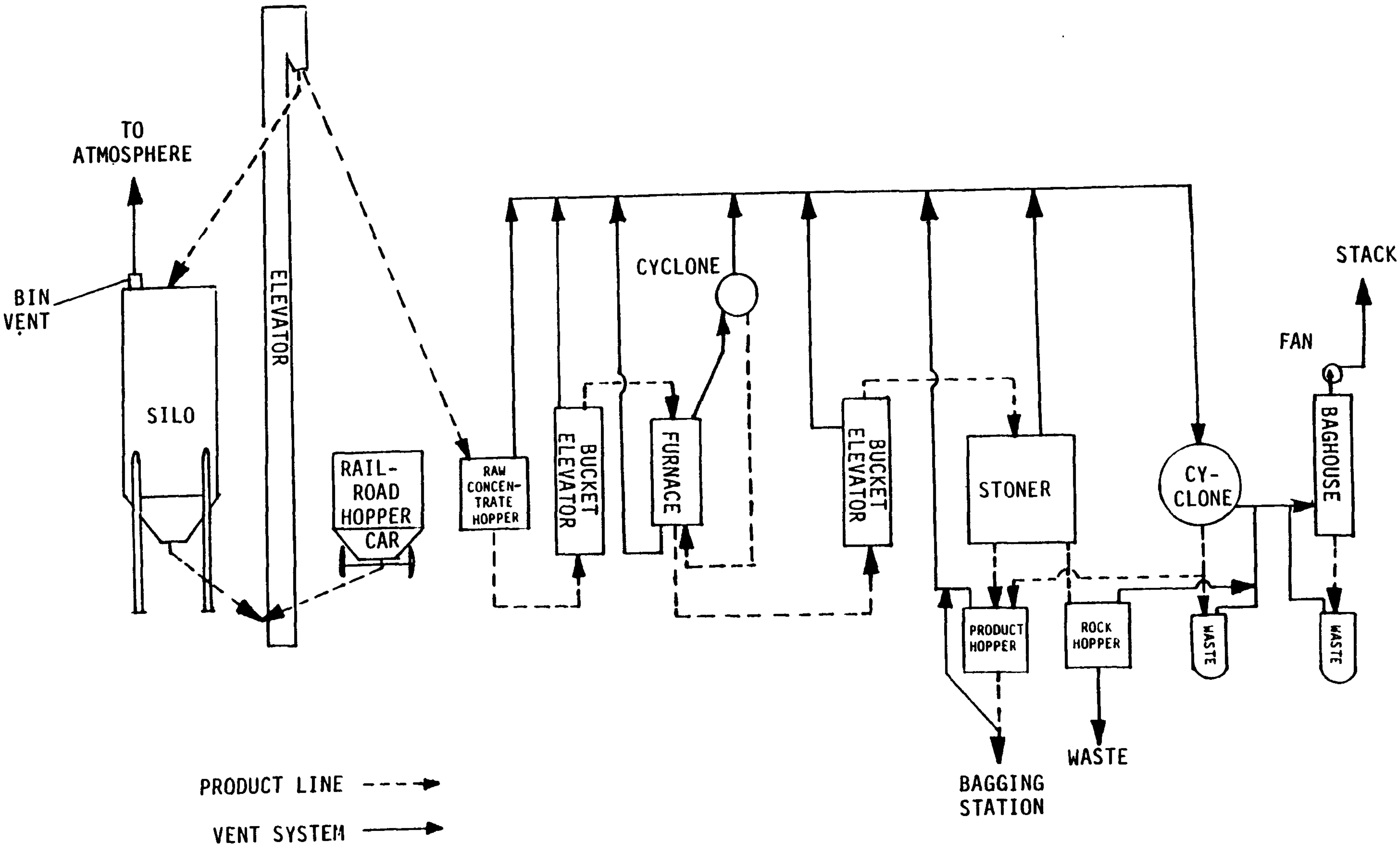


Figure 3-18. Vermiculite expansion system.

Section 4. General Provisions

The general provisions for NSPS are presented in Subpart A of 40 CFR Part 60, from Sections 60.1 to 60.18. These provisions should be consulted whenever there are questions regarding the applicability or implementation of this NSPS. In this section, summaries of Sections 60.14, Modification, and 60.15, Reconstruction, and the applicability of those provisions to the standards are discussed. This discussion will help to ensure identification of existing facilities to which the rule should or should not be applied.

Modification

Definition of Modification. Under Section 111 of the CAA, a modification is any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies.

Applicability to Dryers and Calciners. The impact of the modification provisions on existing dryer and calciner facilities at mineral processing plants should be minimal. Repairs to dryer and calciner components subject to high temperatures, abrasion, and impact (e.g., end seals, flights, refractory lining) are routinely performed and, thus, are not generally considered modifications. Also, many repairs do not result in an increase in the particulate matter emission rate.

Normal maintenance procedures are similar for most dryers. Typical maintenance includes replacing refractory brick or patching with castable refractory once every 2 to 4 years; repairing or replacing dryer lifters once a year; repairing trunnions and trunnion bearings once every 2 to 5 years; repairing or replacing the dryer liner once a year; rebricking the firebox once every 2 to 8 years; replacing the ring and pinion gears, lubricating and greasing moving parts daily. Other maintenance performed as needed includes replacing belts, sheaves, bearings, and shafts; repairing or replacing the burner; and replacing gaskets and flexible connectors. For spray dryers, additional maintenance includes repairing the spray feeding system.

Normal maintenance procedures for most calciners include rebricking or replacing the castable refractory once every 2 to 10 years; repairing kiln trunnions and trunnion bearings every 5 to 10 years; replacing kiln seals once a year; repairing the shell once every 6 months; and lubricating and oiling moving parts daily. Maintenance performed as needed includes replacing kiln flights or spillers; repairing or replacing motor bearings; repairing kiln drives, feeders, conveyors, and discharge equipment; and replacing control valves. For flash calciners, additional maintenance includes repairing or replacing fluid bed gas distribution plates. Additional maintenance items for multiple hearth furnaces include replacing furnace arms and teeth once a year and repairing or replacing the upper and lower hearths once every 5 to 8 years. Additional maintenance for expansion furnaces includes repairing or replacing the expansion tube once every 3 years.

When expansions at existing plants take place, usually a completely new dryer or calciner is added. Such an increase in production would not be considered a modification but rather a new source. Drying and calcining operations usually operate below 100 percent of capacity and are capable of handling increased throughput without additional equipment. If a raw material or fuel change occurs for which the dryer or calciner was originally designed, the change is not considered a modification. However, those changes that result in an increased production rate above the original design production rate are considered a modification.

The appropriate enforcement office will make the final determination as to whether a source is modified and, as a result, becomes an affected facility.

Exceptions. As described in Section 60.14(e), there are six specific exceptions to the modification provisions, any one of which by itself, is not considered a modification. Also, whenever a regulation is more specific than the general provisions, the regulation takes precedence [Section 60.14(f)]. The exceptions under 60.14(e) are as follows:

1. Maintenance, repair, and replacement which the Administrator determines to be routine for a source category;

2. An increase in production rate of an existing facility, if the increase was accomplished without a capital expenditure on the facility;

3. An increase in the hours of production;

4. The use of an alternative fuel or raw material if, prior to the date that the source became subject to an applicable standard, the facility was designed to use the alternative fuel or raw material;

5. The addition or use of any air pollution control system or device except when such a system is removed or replaced by a system that the Administrator determines to be less environmentally beneficial; or

6. The relocation or change in ownership of an existing facility.

Capital expenditure. The second specific exception mentioned above hinges on the term "capital expenditure." Capital expenditure is defined in Section 60.2 as an expenditure for a physical or operational change to an existing facility which exceeds the product of the applicable "annual asset guideline repair allowance percentage" (specified in Internal Revenue Service (IRS) Publication 534) and the existing facility's basis (defined by Section 1012 of the Internal Revenue Code). However, the total expenditure for a physical or operational change to an existing facility must not be reduced by any "excluded additions" (as defined in IRS Publication 534) as would be done for tax purposes.

Requirements following modification. Once modified, an existing facility becomes an affected facility to which a standard applies. Compliance with the applicable standards must be accomplished within 180 days of completing the physical or operational change [Section 60.14(g)].

Reconstruction

Definition. Reconstruction is defined in Section 60.15(b) and means the replacement of components of an existing facility to such an extent that (1) the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, and (2) it is technologically and economically feasible to meet the applicable performance standard.

The term "fixed capital cost" included in the definition is the capital needed to provide all the depreciable components.

Applicability to Calciners and Dryers. When an existing facility is reconstructed, it becomes an affected facility, regardless of any change in emission rate. The modification and reconstruction provisions should not cause many calciners and dryers in the 17 mineral industries to become affected facilities because replacement or refurbishing of equipment parts subject to high temperatures, abrasion, and impact (e.g., end seals, flights, and refractory lining) is performed on a regular basis and is considered routine maintenance rather than reconstruction (see Section 60.733 of the regulation).

Notification requirements. An owner or operator of an existing facility who proposes to replace components and the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility must notify the enforcement office of the proposed replacements. It should be noted that the fixed capital cost of the new components includes the capital cost of all depreciable components replacement that commences within any 2-year period following proposal of the standard. The notice must be postmarked 60 days, or as soon as practicable, before construction of the replacement begins, and the notice must contain the seven key elements specified in Section 60.15(d):

1. Name and address of the owner or operator;
2. The location of the existing facility;
3. A brief description of the existing facility and the components which are to be replaced;
4. A description of the existing air pollution control equipment and the proposed air pollution control equipment;
5. An estimate of the fixed capital cost of the replacements and of constructing a comparable entirely new facility;
6. The estimated life of the existing facility after replacements; and
7. A discussion of any economic or technical limitations the facility may have in complying with the applicable standards after the proposed replacements.

Procedure following notification. A determination of whether the proposed replacement constitutes a reconstruction will be made 30 days from receipt of the notice. The determination will be made by the appropriate enforcement office, and will be based on technical and economic information specified under Section 60.15(f):

1. The fixed capital cost of the replacements compared to the fixed capital cost that would be required to construct a comparable entirely new facility;

2. The estimated life of the facility after the replacements compared to the life of a comparable entirely new facility;

3. The extent to which the components being replaced cause or contribute to the emissions from the facility; and

4. Any economic or technical limitations on compliance with applicable standards of performance which are inherent in the proposed replacements.

Section 5. Existing Sources Affected

Sources affected by the NSPS are calciners and dryers in 17 mineral processing industries. The 17 mineral industries and applicable Standard Industrial Classification (SIC) codes are listed in alphabetical order in Table 5-1. Also, the major product uses are listed in the order of their importance for the industry. Note that a number of industries share common end product uses. A partial list of facilities within the 17 mineral industries identified during development of the NSPS was taken from Table A-1 of the background information document, EPA-450/3-85-025a, October 1985. This list is presented in Table 5-2. It should be noted, however, that the list is not complete and may not be completely accurate at present because of the length of time that has passed since technical work on the NSPS was performed. It is presented here only as a guide to assist in identifying sources that may be affected.

TABLE 5-1. MINERAL INDUSTRIES: SIC AND PRODUCT USES

Mineral Industry (SIC)[a]	Product uses
1. Alumina (1051, 3334)	Aluminum metal, abrasives, refractories, chemicals
2. Ball clay (1455)	Pottery, sanitary ware, tile, china/dinner ware
3. Bentonite (1452)	Drilling mud, iron ore pelletizing, foundry sand
4. Diatomite (1499)	Filtration media, fillers
5. Feldspar (1459)	Glassmaking, pottery, porcelain enamel
6. Fire clay (1453)	Refractories, mortars
7. Fuller's earth (1454)	Pet waste, oil and grease absorbents
8. Gypsum (1492, 3275)	Wallboard, building and specialty plasters
9. Industrial sand (1446)	Glass, foundry sand
10. Kaolin (1455)	Paper coating, paint
11. Lightweight aggregate (1499)	Concrete block, precast and prestressed concrete products
12. Magnesium compounds (3295)	Refractories, livestock feed additives, chemicals, pharmaceuticals, fertilizers, construction materials, electrical heating rods, fluxes, petroleum additives
13. Perlite (1499, 3295)	Soil conditioners, loose-fill insulation, construction fillers
14. Roofing granules (3295)	Coated and uncoated roofing shingles
15. Talc (1496)	Ceramics, paint, plastics
16. Titanium dioxide (2816)	Paint finishes, paper
17. Vermiculite (1499, 3295)	Soil conditioner, lightweight concrete aggregates, loose-fill insulation

[a]Standard Industrial Classification.

TABLE 5-2. FACILITIES IDENTIFIED IN MINERAL INDUSTRIES

Company	Location
3M Company	St. Paul MN & Wausa, WI
A.P. Green Refractories Company	Mexico, MO
Aglite, Inc.	Minneapolis, MN
Allied Chemical Company	Morristown, NC
Allied Chemical Company	Owensville, MO
Aluminum Company of America	Point Comfort, TX
American Industrial Clay Company	Sandersville, GA
American Colloid Company	Lethohatchee, AL
American Colloid Company	Aberdeen, MS
American Cyanamid Company	Savannah, GA
Amlite Corp.	Snowden, VA
Amoco Minerals Corp.	Englewood, CO
Arkansas Lightweight Aggregate Corp.	West Memphis, AR
Armstrong World Industries	Lancaster, PA
Balcones Minerals Corp.	La Grange, TX
Barcroft Company	Lewes, DE
Basic Chemicals	Gabbs, NV
Basic, Inc.	Gabbs, NV
Big River Industries	Baton Rouge, LA
Bird & Son, Inc.	Charleston, SC
Black Diamond Company	Galena, KS

TABLE 5-2. (Continued)

Company	Location
Black Hills Bentonite Company	Mills, WY
Burgess Pigment Company	Sandersville, GA
C-E Minerals	Andersonville, GA
C-E Refractories	Vandalia, MO
C-E Raymond	Abilene, KS
Carolina Stalite Company	Salisbury, NC
Carolina Perlite Company	Gold Hill, NC
Cedar Heights Clay Company	Oak Hill, OH
Chandler Materials Company	Choctaw & Tulsa, OK
Combustion Engineering, Inc.	Windsor, CT
Cyprus Industrial Minerals Company	Gleason, TN
Dresser Industries, Inc.	Dallas, TX
E.I. du Pont de Nemours & Company	DeLisle, MS
Eagle-Picher Industries, Inc.	Reno, NV
Eagle-Picher Industries	Lovelock, NV
Eastern Magnesia Talc Company	Johnson, VT
Englehard Minerals Company	Attapulgus, GA
Excel-Minerals Company	Buttonwillow, CA
F.L. Smidth and Company	Cresskill, NJ
Flintkote Company	Sweetwater, TX
Flintkote Company	Blue Diamond, TX

TABLE 5-2. (Continued)

Company	Location
Florida Rock Industries, Inc.	Brooksville, FL
Floridin Company	Quincy, FL
Foote Minerals Company	Kings Mountain, NC
Frederick J. Dando Company	Irondale, OH
Freeport Kaolin Company	Gordon, GA
GAF Corp.	Blue Ridge Summit, PA
Galite Corp.	Rockmart, GA
General Shale Products Corp.	West Memphis, AR
Gouverneur Talc, Inc.	Gouverneur, NY
Grefco, Inc.	Antonito, CO
Grefco, Inc.	Lompoc, CA
Grefco Minerals, Inc.	Torrance, CA
Gulf and Western Natural Resources Group	Nashville, TN
H.B. Reed, Inc.	Highland, IN
H.C. Spinks Clay Company	Paris & Gleason, TN
Harbison-Walker Refractories	Ludington, MI
Harris Mining Company	Spruce Pine, NC
Hydraulic Press Brick Company	Cleveland, OH
I.U. International, Internationl Management Corp.	Philadelphia, PA
IMC Corp.	Mundelein, IL

TABLE 5-2. (Continued)

Company	Location
IMC Chemical Group, Inc.	Spruce Pine, NC
International Minerals & Chemical Corp.	Aberdeen, MS
Jesse S. Morie & Son, Inc.	Mauricetown, NJ
Jesse S. Morie & Son, Inc.	Junction City, GA
Johns-Manville Perlite Corp.	Antonito, CO
Kaiser Aluminum and Chemical Corp.	Gramercy, LA
Lawson United Feldspar and Mineral Company	Spruce Pine, NC
Lawson-United Feldspar and Mineral Company	Baton Rouge, LA
Lorusso Corp.	Walpole, MA
Manley Brothers, Inc.	Chesteron, IN
Manville Products Corp.	No Agua, NM
Martin-Marietta Chemicals	Manistee, MI
Martin-Marietta Alumina, Inc.	St. Croix, U.S. Virgin Islands
Mid-Florida Mining Company	Lowell, FL
N.L. Baroid, N.L. Industries, Inc.	Houston, TX
National Gypsum Company	Savannah, GA
National Gypsum Company	Charlotte, NC
National Gypsum Company	Richmond, CA
National Gypsum Company	Wilmington, NC
New Jersey Silica Sand Corp	Millville, NJ
Oil-Dri Corp. of America	Ochlocknee, GA

TABLE 5-2. (Continued)

Company	Location
Oil-Dri Corp. of America, Inc.	Chicago, IL
Old Hickory Clay Company	Mayfield, KY
Ormet Corp.	Burnside, LA
Patterson Vermiculite Company	Enoree, SC
Pennsylvania Glass Sand Corp.	Berkeley Springs, WV
Persolite Products, Inc.	Florence, CO
Pioneer Talc Company	Allamore, TX
Redco, Inc.	North Hollywood, CA
Reynolds Metals Company	Richmond, VA
SCM Corp.	New York, NY
Silbrico Corp.	Antonito, CO
Solite Corp.	Arvonia, VA
Southern Talc Company, Inc.	Chatsworth, GA
Spartan Minerals Corp.	Pacolet, SC
Strong-Lite Products	Pine Bluff, AR
Texas Industries, Inc.	Houston, TX
Texas Industries, Inc.	Clodine, TX
The Schundler Company	Metuchen, NJ
The Feldspar Corp.	Spruce Pine, NC
The Milwhite Company, Inc.	Houston, TX
The Milwhite Company, Inc.	Van Horn, TX
The Fuller Company	Bethlehem, PA

TABLE 5-2. (Continued)

Company	Location
Tombigbee Lightweight Aggregate Corp.	Livingston, AL
United States Gypsum Company	Chicago, IL
United States Gypsum Company	Fort Dodge, IA
United States Gypsum Company	Shoals, IN
United States Gypsum Company	Sweetwater, TX
United States Gypsum Company	East Chicago, IL
United States Gypsum Company	Southland, OK
Vermont Talc	Chester, VT
Virginia Vermiculite, Ltd.	Arlington, VA
Virginia Vermiculite, Ltd.	Trevilians, VA
Vulcan Materials Company	Bessemer, AL
Vulcan Materials Company	Birmingham, AL
W.R. Grace & Company	Cambridge, MA
W.R. Grace & Company	Irondale, AL
W.R. Grace & Company	Enoree, SC
Whitehead Brothers Company	Leesburg, NJ
Windsor Minerals, Inc.	Windsor, VT
Witco Chemical Corp.	Woodcliff Lake, NJ
Wyo-Ben, Inc.	Lucerne, WY

APPENDIX A

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Linda Herring	(919) 541-3803	629-5358
Compliance Issues		
Ellen Rattigan	(703) 308-8531	678-8531
Sally Mitoff	(703) 308-8692	678-8692

TECHNICAL REPORT DATA

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1. REPORT NO. EPA 450/3-85-028	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Enabling Document for New Source Performance Standards for Calciners and Dryers in Mineral Industries		5. REPORT DATE December 1991 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Office of Air Quality Planning & Standards U.S. Environmental Protection Agency Research Triangle Park, NC 27711		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Director of Air Quality Planning & Standards Office of Air and Radiation U.S. Environmental Protection Agency Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE EPA/200/04

15. SUPPLEMENTARY NOTES

16. ABSTRACT

Standards of performance for the control of emissions from calciners and dryers in mineral industries have been promulgated under the authority of Section 111 of the Clean Air Act. These standards would apply to new, modified, or reconstructed calciners and dryers in 17 mineral industries. This document contains a summary of the standards, requirements of the general provisions (under Subpart A, 40 CFR Part 60), a summary process description for 17 industries, and other information pertaining to the implementation of these standards.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution Enabling Pollution Control Standards of Performance Particulate Emissions Mineral Processing Plants	Air Pollution Control	13B

18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 60
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE