AIR POLLUTION

SECOND EDITION

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Sources of Air Pollution and Their Control

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Air Pollutant Emissions and Their Control

The most serious pollution source arises from lime kiln dust and carbon dioxide, which may also be considered a pollutant if it is not recovered for process uses. Minor sources include soda ash and anhydrous caustic handling and flaking operations. Dust control equipment for the lime kiln was discussed in Section VII,A.

X. Phosphate Fertilizers

A. Phosphate Rock Preparation

Phosphate rock preparation involves benefication to remove impurities, drying to remove moisture, and grinding to improve reactivity.

In the United States phosphate rock is mined principally in Florida, the mountain states (Idaho, Montana, Wyoming, Utah), and Tennessee. New mines are opening in North Carolina. It is estimated that a total of 27 million tons was produced in the 1965–1966 fertilizer season (*22*). Mining of phosphate rock in the United States is done primarily by strip mining. In Florida, which provides about 70% of the production, the rock is found as a phosphate rock matrix about 20 feet in depth, lying beneath an overburden normally averaging 15 feet thick.

Usually, direct fired rotary kilns, 25–100 feet long, 8–10 feet in diameter, are used to dry phosphate rock (Fig. 18). These dryers use natural gas or fuel oil as fuel and are fired countercurrently. From the dryers,

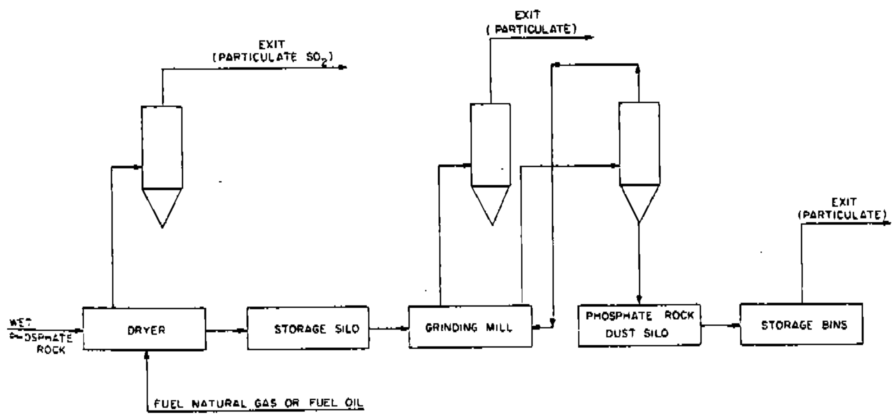

FIG. 18. Flow diagram of phosphate rock storage and grinding facilities, noting potential air pollution sources.

the material may be ground before storage and is finally conveyed to large storage silos. Air-swept ball mills are preferred for grinding phosphate rock.

Air Pollutant Emissions and Their Control

Although there are no significant emissions from phosphate rock beneficiation plants, emissions may be expected from drying and grinding operations. These emissions consist primarily of fine rock dust, but some sulfur dioxide may be present in the dryer exhaust from the combustion of the sulfur in the fuel. Phosphate rock dryers are usually equipped with dry cyclones followed by wet scrubbers. Particulate emissions are usually higher when drying pebble rock than concentrate. Because of its larger size, pebble rock usually has small adherent particles of clay and slime which, upon drying, are blown to the collectors or the atmosphere.

Phosphate rock grinders are a closed system except for vents to the atmosphere to control moisture. Because of the extremely fine 200-mesh particle size, considerable quantities of dust can be emitted from phosphate rock grinders with the vented air. For this reason, fertilizer plants are normally provided with baghouse collectors which will reduce atmospheric emissions from phosphate rock grinding to about 1 pound of dust per day per grinder. Other points of emission in a phosphate rock grinding and preparation plant are transfer points on conveying systems and discharge points at storage hoppers and silos. These can be provided with hoods and an exhaust system to collect the dust. One example is a bag collector, installed on top of a holding bin with dust pickup points not only from the bin but from the conveyor and weigh scale, with a capacity of 4,000 cfm and an efficiency of greater than 99% (*52*).

B. Normal Superphosphate Production

Normal superphosphate is the term applied to the fertilizer produced by reacting sulfuric acid with phosphate rock. Normal superphosphate contains from 16 to 21% phosphoric anhydride (P_2O_5).

Past practice has been to locate the plants near the consumer, which means that the phosphate rock is shipped from the mining area to the plant. There are today over 200 normal superphosphate plants throughout the United States. Production and the total number of plants has declined slowly in recent years as more concentrated P_2O_5 products have been developed to meet the high analysis requirements. Production in 1966 was estimated to be 1.07 million tons (*22*).

While there have been devel
basic steps in the production of n
the same over the years (Fig. 19).
mixed (*22, 53*), dropped into a c
the slurry mixture to set into a so
the acidulation to go to completi
or continuous, depending upon
U.S. plants use the batch process.
a pan mixer capable of mixing a
charge is 5 parts rock to 4 parts a
the mixer and then dropped into
this country have a capacity of a
with capacities up to 300 tons. T
tinuous and an experienced oper
of superphosphate (*54*).

The cone mixer developed by
come into use in many plants b
maintenance cost, and simple ope
with either a batch or continuous

Depending upon the type of d
minutes up to overnight before b
operate automatically with a cut
mass from the den; others must b
by hand. Continuous dens are e
which permit the mixture of aci
the end of the belt. A cutting kni
belt. It is then carried to storage
from the dens is uncured and m
to 6 weeks to permit the acidulat

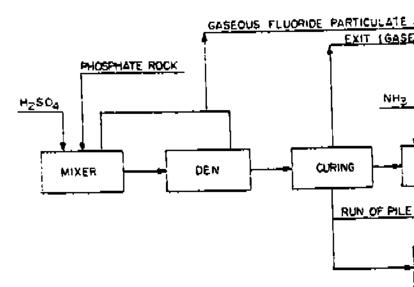

FIG. 19. Flow diagram of normal su
and sources. Control devices are not sh