M-157

Plant Descriptions
of

Penn-Dixie Cement Corp.
Plant No. 9, West Winfield, Pa.
By J. C. McGrath, Supt.

Medusa Portland Cement Co.
Wampum, Pa. Plant
By W. B. Hanlon, Director of Engg.

Universal Atlas Cement Division of United States Steel Corp.
Universal, Pa. Plant
By E. F. Harchelroad, Plant Mgr.

Green Bag Cement Division of Pittsburgh Coke & Chemical Co.
Neville Island Plant
By H. J. Haffner, Supt.

November, 1958

PORTLAND CEMENT ASSOCIATION
Research and Development Laboratories

5420 Old Orchard Road Skokie, Ill.

Presented at Regional Fall Meeting

GENERAL TECHNICAL COMMITTEE

PORTLAND CEMENT ASSOCIATION

Sept. 22-25, 1958, Pittsburgh, Pa.

UNIVERSAL ATLAS CEMENT

Division of United States Steel Corporation

Universal Plant

SYNOPSIS OF

PLANT OPERATION AND EQUIPMENT

FLOW DIAGRAM

MATERIAL, GAS, AND DUST

The Universal Plant of the Universal Atlas Cement, Division of United States Steel Corporation is located in the village of Universal, Penn Hills Township, Allegheny County about 15 miles east northeast of Pittsburgh.

All raw materials consumed are received by rail or truck. Limestone in size from 3/4" to dust is received by rail from two operations of the Michigan Limestone and Chemical Division of United States Steel, of which both are some 60 miles from the plant. Blast furnace slag is furnished by the Steel Corporation and is shipped by rail from three locations, Rankin, Duquesne, and Clairton, approximately 15 miles from the plant.

Pure silica sand is a waste product and is delivered from several foundries by truck.

Iron dust, which is retrieved from the blast furnaces in the steel mills, is delivered by rail from a distance of 15 miles.

Fuel is a 30 per cent ash coal, known as middlings, and is delivered by Pittsburgh Consolidation Coal Company by truck to the plant from a distance of about 7 miles.

Our labor supply comes from 18 municipalities. One-third of the workers reside in the village of Universal while some come from as far as 40 miles. There are approximately 200 employees at the present time.

About 11,000 operating and maintenance supply items are delivered from all corners of the country to the plant.

The Duquesne Light Company supplies the plant with 60 cycle power at 23,000 volts.

Raw materials are unloaded from railroad cars by Robins car shakeouts. A crane with a span of 80 feet delivers the various raw materials and fuels into hoppers for conveyance to the mill.

Slag with a moisture content approximating 25% is fed into three dryers, which are 8 ft. in diameter and 80 ft. long driven at 5.6 R.P.M. by a 75 H.P. motor. These dryers are operated at constant speed and waste heat gases from the kilns are used for drying.

Limestone contains about 3 per cent moisture and is dried in the air separator by waste kiln gases.

All four raw materials are proportioned by Merrick scales at the rate of 380 lbs. stone, 100 lbs. slag, 25 lbs. sand, and 2 lbs. iron dust per barrel of Type I cement. These materials are mixed and passed over a Tyrock screen, which is in closed circuit with a Williams hammer mill having a capacity of 30 tons per hour. This mixture of raw materials, size 3/8" minus, is fed to the ball mills by drag conveyors.

The Traylor ball mills are 10 ft. 6 in. diameter by 16 ft. long. They are loaded with 75 tons of grinding media, and are driven by 1000 H.P. synchronous motors at about 17 R.P.M. The output on Type I raw material is about 50 tons per hour at a fineness of 80 per cent through 200 mesh sieve. The ball mills are in closed circuit with 16 ft. Sturtevant air separators driven by 125 H.P. motors. These mills use a Hardinge ear for controlling feed to the mill. The finished product from the separators is delivered by Fuller Kinyon pump to the 14 blending tanks, which are 20 ft. in diameter and 57 ft. high, holding approximately 2300 barrels each. Ground raw material is fed into a single bin until it is filled. The kiln feed is drawn from 5 bins at one time, which from past experience produces a rather uniform composition. The raw mix in the blending tanks is delivered to an airlift tank by Fuller Kinyon pump.

There are two feed screws from the airlift tanks delivering to airslides, which in turn feed each of two kilns. The Smidth kilns are 11 ft. in diameter and 360 ft. long and are driven by 150 H.P. motors. The drive is Ward-Lenard system.

Each kiln has a 55 H.P. gasoline engine for turning the kilns over in the event of power failure. The kilns have Magnecon brick lining in the burning zone, which has proven very satisfactory. The draft in the kilns is controlled automatically. Fuel for these kilns passes through a B&W mill and is pulverized to about 90 per cent through a 200 mesh sieve. Fuel consumption is about 900,000 BTU per barrel.

One of the B&W coal mills is equipped with a constant volume coal feeder that supplies a uniform amount of coal with a predetermined amount of air at constant temperature leaving the coal mill.

Waste gases leave the kilns at about 1400°F. and pass through the dryers for drying raw materials. Additional water is added to the gases by spraying in the dryers to reduce the temperature of the dry raw materials and to hold the gas temperatures to 400 to 450°F. with about 15% moisture as the gases enter the electrical precipitators. Bailey balometers are mounted in each stack recording dust concentration in the waste gases leaving the stacks.

Clinker from the kilns passes through Allis Chalmers coolers, which are 100 ft. long by 4 ft. 6 in. wide and driven by 15 H.P. motors, and are automatic in operation. These coolers discharge into the clinker yard where a Milwaukee crane with an 80 ft. span lifts the clinker and delivers it to a Symons cone crusher. This crusher is in closed circuit with a Tyrock screen. The product is 3/8" minus going to our finish mill.

Clinker and gypsum are proportioned over a Merrick scale and fed to Traylor ball mills 10½ ft. diameter by 16 ft. long in closed circuit with a Sturtevant 16 ft. air separator. These ball mills carry about 75 tons grinding media driven by a General Electric 1000 H.P. synchronous motor. The ball mills have drag feeders controlled by Milltronics. The product is delivered by Fuller Kinyon pumps to two stockhouses with better than 800,000 barrels capacity.

The plant Machine Shop has been rehabilitated with all normal shop equipment. A new grinder, utilizing a salt solution, electric current in conjunction with a standard grinding wheel for final polishing.

Our Shop heating has been converted from gas hot air to gas fired infra-red heaters.

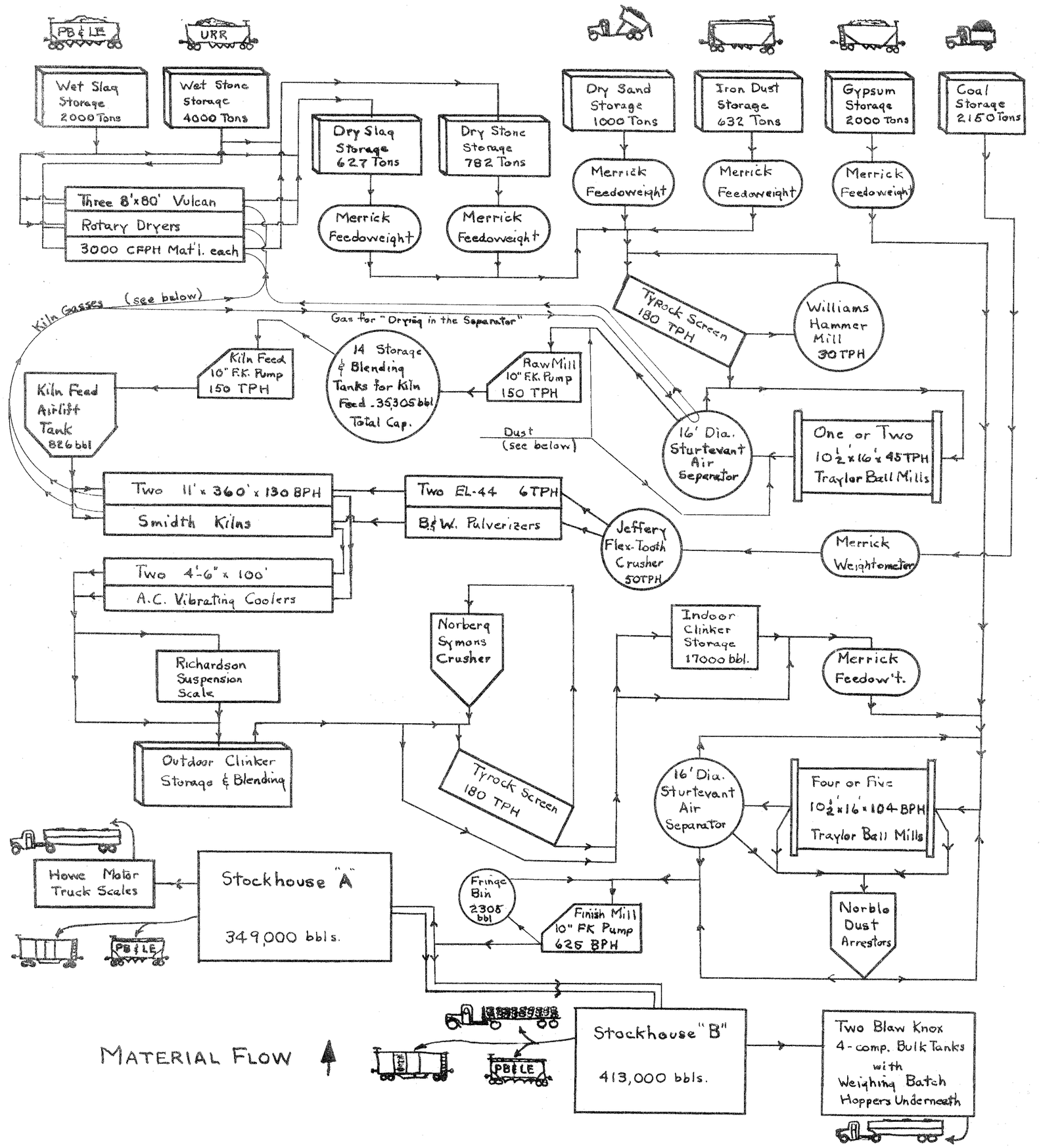
A new two-story, air conditioned building utilizing prestressed concrete beams and columns, precast concrete panels, and light weight concrete roof and floors, has recently been constructed. This building will contain the plant laboratories, supervisors' offices, and employee change house facilities.

The plant has 5 packing rooms with 8 packing locations. The stockhouse is equipped with Modern valve packers and three-tube Bates packers.

Cement is shipped from the plant both by truck and rail. 70 per cent of our shipments go by truck.

The mill is completely equipped with automatic lubrication, which is doing an excellent job and will pay for itself in a few years.

The principle of automation has been carried over into the laboratories to some extent. Two new apparatuses have been put into service for mill control. A Leco sulfur titrator is used in determining the sulfur content of portland slag cements and a German made automatic Blaine type air permeability apparatus is used for grinding control.


PB & LE
URR
Wet Slag Storage 2000 Tons
Wet Stone Storage 4000 Tons
Dry Slag Storage 627 Tons
Dry Stone Storage 782 Tons
Dry Sand Storage 1000 Tons
Iron Dust Storage 632 Tons
Gypsum Storage 2000 Tons
Coal Storage 2150 Tons
Merrick Feedoweight
Merrick Feedoweight
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Merrick Feedoweight
Three 8'x80' Vulcan Rotary Dryers 3000 CFPH Mat'l. each
Kiln Gasses (see below)
Gas for "Drying in the Separator"
Tyrock Screen 180 TPH
Williams Hammer Mill 30 TPH
Kiln Feed 10" F.K. Pump 150 TPH
14 Storage & Blending Tanks for Kiln Feed - 35,305 bbl. Total Cap.
Raw Mill 10" F.K. Pump 150 TPH
Kiln Feed Airlift Tank 826 bbl
Dust (see below)
16' Dia. Sturtevant Air Separator
One or Two 10½'x16'x 45 TPH Traylor Ball Mills
Two 11'x 360'x 130 BPH Smidth Kilns
Two EL-44 6TPH B & W. Pulverizers
Jeffery Flex-Tooth Crusher 50TPH
Merrick Weightometer
Two 4'-6" x 100' A.C. Vibrating Coolers
Norberg Symons Crusher
Indoor Clinker Storage 17000 bbl.
Merrick Feedow't.
Richardson Suspension Scale
Outdoor Clinker Storage & Blending
Tyrock Screen 180 TPH
16' Dia. Sturtevant Air Separator
Four or Five 10½'x16'x 104 BPH Traylor Ball Mills
Norblo Dust Arrestors
Howe Motor Truck Scales
Stockhouse "A" 349,000 bbls.
Fringe Bin 2305 bbl
Finish Mill 10" FK Pump 625 BPH
PB & LE
Stockhouse "B" 413,000 bbls.
Two Blaw Knox 4-comp. Bulk Tanks with Weighing Batch Hoppers Underneath
MATERIAL FLOW
GAS & DUST FLOW
Stack
Stack
3 Unit Precipitator
3 Unit Precipitator
3 Unit Precipitator
3 Unit Precipitator
MUL
TIC
LON
ES
Three 8'x 80' Vulcan Iron Works Rotary Dryers
Two 11'x 360' Smidth Kilns
= gas
= dust
Dry Slag Storage
Dust 6" F.K. Pump 25 TPH
Dust 6" F.K. Pump 25 TPH
30' Dust Storage Tank 1000 Tons
22' Dust Airlift Bin 232 Tons
ball mill discharge
Raw Mill Air Separator
Raw Mill 10" F.K. Pump 150 TPH
Kiln Feed