

Serial No. KN 71-16

Copy No. 16

E. I. DU PONT DE NEMOURS & COMPANY
256 VANDERPOOL STREET
NEWARK, NEW JERSEY

RETURN TO
JACKSON LABORATORY
FILE ROOM

NEWARK PLANT
PIGMENT COLOR RESEARCH REPORT

SOLID LEAD HANDLING

Period Covered

JUNE 1969 - JUNE 1971

FILE: 121

DATE: 7/7/71

N42415

KN-71-16
Copy #16

KN 71-16

Copy No. 16

1. Numerical File
2. Research Office File 121
3. Newark Library File 121
4. M. Hunt, Pigments, Wilmington
5. W.S. Struve/J. Jackson/A.R. Hanke
6. R.H. Wetzel, Newport (Circ. and file)
7. E.E. Jaffe/E.F. Klenke/B.H. Perkins/Library
8. P.J. Monahan, Newark (Vital Records)
9. N.G. Fisher, Central Research Dept., Wilmington
10. Newark Library - for Central Report Index
11. Newark Library - for Central Report Index
12. B. C. Hertz
13. Extra
14. "
15. "
16. "
17. "

NEWARK PLANT

PIGMENT COLOR RESEARCH REPORT

TITLE: SOLID LEAD HANDLING

PERIOD COVERED: JUNE 1969 - JUNE 1971

SUBMITTED BY:

B. C. Hertz
B. C. HERTZ

Date Submitted: 6/25/71

APPROVED BY:

E. F. Klenke, Jr.
E. F. KLENKE, JR.

Date Released: 7/7/71

ABSTRACT: A solid lead handling system was designed and installed to feed the melting furnace. The feed supply was changed to include 2500 pound ingots. The new system consists of a hand truck used to deliver 2500 pounds of lead to a basket positioned under a powered overhead hoist and crane. The operator remotely feeds the furnace without exposing himself to the hot molten metal. These changes will increase safety, decrease manual labor and increase capacity.

RETURN TO
JACKSON LABORATORY
FILE ROOM

TABLE OF CONTENTS

	<u>PAGE</u>
INTRODUCTION.....	1
PATENT STATUS.....	1
SUMMARY AND CONCLUSION.....	1
EXPERIMENTAL DATA.....	2
REFERENCE.....	2
APPENDIX #1.....	3
#2.....	4
#3.....	6
FIGURE 1	7
DRAWING W-399984.....	Final Page

INTRODUCTION

In the manufacture of lead nitrate, molten lead is added to an aqueous nitric acid solution. The old system of delivering the solid lead to the melting furnace consisted of an overhead hoist mounted on a monorail. Suspended from the hoist cable was an ice tong type of clamp used to grasp ten 100 pound pigs. Lead was delivered to the plant in the form of stacks of 25 individual lead pigs bound together by metal straps. The operator would strip the stacks down to 1000 pound feed charges, grasp the charge with the tongs and manually position the load over the furnace.

PATENT STATUS

None

SUMMARY AND CONCLUSIONS

The old system required feeding the furnace five times per batch. With the new hoist and tractor the operator can handle a unit load of lead (2500#) and thus only feed the furnace two times per batch. With the powered tractor it is no longer necessary to manually position the load over the furnace and the operator's exposure to the hot molten metal is reduced. The lead is contained in a basket and the danger of the lifted load slipping and falling is diminished.

The use of 2500 pound ingots to replace the stacks of 100 pound pigs was also investigated. This would eliminate stripping the stacks and restacking poorly oriented stacks, as well as simplifying handling and storage. Quality improvements were anticipated as metal straps, a source of contamination, would be eliminated. The danger of water trapped between the pigs, with

subsequent splattering on contact with the molten metal, would also be removed with the use of the 2500 pound ingots. Our experimental results indicated that sufficient heat transfer area was available to melt the ingots and plant tests have proved the validity of our data.

The system was installed in March of 1971 and was started up successfully. No problems were encountered in melting the ingots.

EXPERIMENTAL DATA

Heat Transfer Area

<u>Run</u>	<u>Size</u>	<u>lbs/°F ft²min.</u>	<u>Melt Rate lbs/hr</u>
1	100# pig	.177	7,200
2	100# pig	.206	8,350
3	100# pig	.248	10,000
4	366# cylindrical ingot	.190	7,700

Sample Calculation: Case 4

Weight: 366#
 Surface Area: 11.80 ft²
 Temp. Diff. 553°F
 Time: 1'56"

$$\frac{366}{1.80 \times 553 \times \frac{115}{60}} = .19\#/\text{°F, ft}^2 \text{ min}$$

Melt Rate:

Surface Area: 2.25 ft²
 Temp. Diff. 300°F
 Time: 60 min
 $.19\#/\text{°F, ft}^2 \text{ min} \times 60 \text{ min} \times 2.25 \text{ ft} \times 300\text{°F} = 7700\#/\text{hr}$

REFERENCE: Notebook #1955K

- 3 -

BASIC DATA
LEAD PIG FEEDING
NEWARK PLANT

I. BASIS

- A. Melt Rate: 5,000 lb/hr (avg.) (8 batches/shift)
7,000-8,000 lb/hr (instantaneous)
- B. Lead Form: Strapped stacks of pigs
2,500 to 3,000 lb/stack
- C. Operator Attention:
Lead Melting - $1/3$ man (10 min. every $1/2$ hour)
Other Nitrating Duties - $2/3$ man (patrol)
Total - 1 man/shift
- D. On Site Storage Required: (Independent of Lead Yard)
9 hrs - (12 to 8 shift + 1 hr overlap)
16 to 18 stacks, depending on lb/stack

II. PROPOSED TECHNIQUE

- A. Load a strapped stack into steel basket with small fork truck.
- B. Lift basket load to furnace with powered monorail hoist and tractor.
- C. Lower basket load to molten lead pot and rest on grate.
- D. Lead melts down, leaving only steel straps behind. This will require 25 to 40 min. depending on load size and furnace BTU input.
- E. While stack melts, next stack is loaded into second basket to be ready for change out. Up to three baskets can be provided; one melting, and two standby.
- F. During meltdown and after basket loading, operator has time (20 minutes) free to patrol rest of nitrating operation.

- 4 -

SPECIFICATION FOR ELECTRIC
MONORAIL HOIST + TRACTOR

4,000 lb capacity

I. GENERAL

This specification defines one (1) monorail electric hoist and tractor; it also includes 25 ft of matching monorail with one curve.

II. SCOPE OF OPERATION

This unit will operate indoors in a nonelectric hazard area; the hoist will pick up steel baskets from the floor containing up to 3000 lbs of lead pigs. The load will be raised and transported about 20 feet over a molten lead pot; the load will be lowered into the molten lead (several inches) to allow the lead pigs to melt away on a continuous basis. The hoist will remain in position during melt-down, about 30 minutes. Hoist and tractor will normally be controlled by pushbutton pendant, however, if the molten lead starts to overflow the pot, a level sensor (by purchaser) will cause the hoist to automatically raise the lead basket from the pot, to the full "up" position; the hoist will have parallel control wiring to permit this.

III. SPECIFICATION DETAILS

A. Hoist

Capacity:	4000 lbs	Lift Speed:	15 ft/min (max)
Type:	Wire rope, drum reeved	Mounting:	Trolley, with two safety lugs
Duty:	24 hrs, one cycle every 30 minutes	Lift:	14 feet
Hook:	Swivel, safety snap type to accommodate eye of two inch I.D. x 3-1/2 in. O.D.		

Electrical Service:

Available voltage - 220/440V, 60 cycle, 3 phase hoist and tractor motors to be wired for 160°F service.

Controls:

Hoist to have rigid, 4 ft long extension boom, set at 45° from monorail axis, for control drop cord; single control box to have "up-down" control for hoist, and "forward-reverse" control for tractor; all controls to be "dead man" type. Control drop-cord to be nominally

- 5 -

nine feet long from end of boom; however, control cord to be attached with enough slack between boom end and hoist terminal connection to permit adjusting this length plus two feet without rewiring.

Hoist and tractor to receive power through stretch type "coil-cord," terminated at approximately the midpoint in the monorail system. Double wiring will be required to permit parallel hoist control, mentioned in scope above.

B. Tractor

Tractor to be connected to hoist and have independent motor and rubber traction tire principle where increased load increases traction. Tractor to have forward and reverse speed of 30 ft/min and be equipped with ballast resistor for "inching" control.

C. Monorail

Rail to be designed to fit hoist and tractor trolleys; and will have adjustable stop at both ends. Quotation should include adequate short hangers to be attached to close structural support steel by purchaser. Exact details of support will be confirmed later with purchaser.

No. feet straight rail - 25

No. 4 ft radius curves - 1

- 6 -

PURCHASE SPECIFICATION
FOR
ELECTRIC WALKIE FORK TRUCK

I. GENERAL

This specification covers one (1) industrial walkie, straddle type electric lift truck; it includes one (1) battery and a "built-in" eight-hour battery charger.

II. SCOPE OF OPERATION

This truck will operate indoors, on a concrete floor handling strapped stacks of pig lead. It will operate on a three shift basis, about two cycles per hour and will be plugged in for trickle battery charge between uses.

Load Size: (See Fig. 1)

25"L x 25"W x 27"H (Max. Dimens.)

3000 lbs at 13 inch L.C.

Max. number of two ft lifts/hr hr: 20

Max. number of loaded, 20 ft trips/8 hrs: 20

III. SPECIFICATION DETAILS

A. Type truck: Walkie forklift, battery powered, straddle design.

B. Hazard: None

C. Fork Lift: 58 inches

Forks must go to the floor

D. Fork Size: (Ref. Fig. 1)

Length - 26 inches Width - 4 inches (max.)

Thickness - 1-1/2 inches (max.)

Fork spacing must be adjustable in one inch increments.

E. Mast Collapsed: 71 inc. high (max.)

F. Wheels: Drive Wheel - 10" dia. x 6" solid cushion rubber
Outrigger Wheels - 4" dia. x 3" urethane elastomer
(tandems)

- 7 -

- G. Outrigger Dimension: (Ref. Fig. 1)
- H. Wheel guards or skirt will be provided to prevent drive or rear load wheels from passing over operator's feet.
- I. Steering: Truck to be steered by steering handle which turns the drive wheels through a minimum arc of 90° in each direction. If Tee steering handle is supplied ends of handle to be fitted with hand guard, as per Du Pont Standard V4A.
- J. Visibility: Since the load is small in overall dimensions, visibility through the mast is important. A "Simplex" mast should be considered, and the battery-drive compartment should be as low as possible.
- K. Bearings: All wheels and steering pivot to be provided with sealed, prelubricated ball or roller bearings.
- L. Brakes: A brake, automatically applied when the steering handle is in either the max. down or up position, is required. Steering handle shall be spring loaded so that it returns quickly to the vertical "Brake Applied" position when released by the operator. Control circuit shall be so arranged that motor power is interrupted whenever brake is applied. Handle to have contact to enable operator to use reverse current braking.
- Brake capacity shall be sufficient to bring fully loaded truck to a stop when travelling down a 5% incline.
- M. Speed Controller:
- a. Forward speed control in a series of 2 or 3 steps.
 - b. Speed control lever or button to return to neutral when operator released lever.
- N. Hydraulic: Hoist and tilt mechanism shall not be driven by drive motor; overpressure will be relieved by bypass; limited orifice will prevent fork fall in event of hydraulic line rupture.
- O. Battery-Charger:
- Charger - Built-in packaged type; to have eight hour charge capability for 80% drained battery; to have 8 ft long heavy duty power cord with plug-in connection at the truck (cord not normally carried with truck); battery will be protected from overcharge. Plant electrical characteristics: 22-/440 volts, 3 phase, 60 cycles.
- Battery capacity: 340 amp hour (min.)
- P. Complete Maintenance instructions (2 sets) to be furnished on truck, battery, and charger.

New Jersey Office Supply Co.

Filing Specialists

401 Frelinghuysen Ave., Newark, N. J.

PHONE Blgelow 3-0050