FORM 480 500 6-51

A-72

CERRO DE PASCO CORPORATION • NEW YORK

INTER-DEPARTMENT MEMORANDUM

Date: July 31, 1951

To: R. P. Koenig

From: Lawrence Addicks

Subject: Lead Program

1. The subject of your memorandum of May 30th covers a very wide field and the comments I offer are naturally tentative. I also appreciate that the men resident at Oroya are in a better position to appraise many of the angles than I am. With these reservations I outline my first reactions.

2. Offhand the eventual building of a new lead smelter at La Fundicion, many miles from Oroya, does not appeal to me. The principal reasons are the additional altitude, the divided management, the doubtful water supply and the railroad balance. The last would require study but I should guess that the total ton-miles of raw, semi-finished and final products would favor Oroya. The gains are mostly in a claim that Oroya cannot do a good job on the tonnage required. Mr. Higgs' letter of June 21st shows careful thought and sets up conclusions which will have to be demolished before granting necessity for removal.

3. Aside from purely lead matters the equivalent zinc capacity must move hand in hand because our goal, and in low markets our necessity, will be to treat all concentrates products in Peru.

4. The lead refinery at Huaymanta has potential capacity to take care of any tonnage contemplated. Anode scrap melting clearly belongs within this unit. The same metal accounting reasons as in the copper refinery apply here and to my thinking far outweigh any advantages from ballast metal at the anode casting end.

5. Our metal loss record has been so confused that we need a definite policy of wherever possible consolidating distinct metallurgical operations as separate units, so that loss responsibility may be definitely placed.

6. As time goes on we shall probably have an increasing number of intermediate products in the complicated copper-zinc-lead relationship and it is well to have the means of dealing with these at hand without introducing transportation problems which, all else aside, always involve metal losses.

7. In judging these matters we must keep in mind that we may not continue to live in the present metal market paradise.

Ladx

Lawrence Addicks

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Ladx

Lawrence Addicks

L. Addicks

Lima, May 30, 1951

MEMORANDUM to: A. R. Merz
G. Reinberg

From: R. P. Koenig

Subject: Lead Program, Middle- and Long-Term View

1. The production of lead concentrates from the Corporation's mines and from independent properties in Central Peru is increasing. There is excellent evidence that Central Peru has many as yet undeveloped deposits containing lead (and zinc). The statistical position of lead on a worldwide and long-term basis would appear to be favorable for the contemplation of investing capital funds in order to increase production of elemental lead. Thus active consideration of an aggressive program leading towards increasing the production of refined lead by the Corporation is in order.

2. The purposes of this memorandum are:

(a) to outline the general terms of reference within which I feel the increase in the production of lead should be considered, and

(b) to initiate a coordinated effort leading to ascertaining if an increase in capacity is technologically feasible and economically attractive.

3. It would appear to me that for planning purposes the objective of the lead program as it can be seen today is to have a first-class plant from start to finish. This plant should be the last word technologically as well as mechanically. It should contemplate, among other things, in its basis of design -

(a) capacity of 160,000/000 pounds of refined lead of "Cerro" grade per annum;

(b) provision, from the beds or other storage facilities through to the casting of anodes, for future expansion to not less than 240,000,000 pounds of refined lead per annum.

The "Greater Cerro Project", if it develops, might well result in an increase in lead from the Cerro de Pasco Mine of 60,000,000 pounds per annum. This is based on a possible production of 5,000 tons per day of ore containing 3.5 percent lead. The possibilities of this project making sense are sufficiently good so that design of facilities such as the additions to or modification of the existing lead plant should be done in a manner that will aid rather than interfere with the increase to the above ultimate rate of production.

4. Thus the long-term objective would be to have a modern plant capable of increase without having to rebuild that which may be built in the relatively near future - e.g., new blast furnaces, bag house, revamping of sinter plant, etc. Within the framework of this objective as set out in 3-(a) there is a middle-term view: to increase lead capacity to, say, 145,000,000 to 155,000,000 pounds per annum by the modification of existing facilities and the addition of certain new facilities that would fit into the long-term objective. This would probably entail, among other things,

(a) installing one or more new sintering machines, these to fit into the ultimately new sintering plant. A bag house may well be installed in this phase.

(b) complete installation of Escher-Wyss Blowers (currently available) for furnishing air to the existing blast furnaces.

(c) modify and increase anode casting and related equipment (if necessary, see 4-(e).

(d) Modify tank house and add to its supply and distribution of electrical energy. The size of the existing tanks permits more anodes per tank than are currently being used; the present ampere density is below the known critical point; and present anode spacing is wider than that previously used, again opening up possibilities of the addition of still more anodes per tank.

(e) add well-designed and properly located scrap anode melting and casting equipment to the lead refinery, thus perhaps obviating the modification of present Oroya casting setup (4-c). This suggestion has previously been made by Oroya and it would seem that it is now germane to include it in this overall coordinated program. The design of this facility to be predicated on the most efficient handling of materials possible.

(f) add additional melting and casting equipment for refined lead.

(g) arrange the smelter dust collecting equipment, both bag houses and Cottrells, so that dusts collected from the copper circuit are kept completely separated from dusts collected from the lead circuit. Only in this way can accurate metallurgical control on the lead circuit be established. Only with accurate metallurgical control and costs can proper custom ore purchase contracts be established. Facilities for weighing and sampling the dusts originating in both circuits should, of course, be made available.

5. While sufficient power for this increase in refined lead capacity will quite probably be available when Paucartambo is finished, the present studies being made by the Hydro Department and Ebasco may indicate that enough power could be squeezed out to do this even prior thereto. Certainly during the rainy season there should be a good chance of finding sufficient power and thus the plant increase from its presently contemplated capacity of 120 or 130 million pounds per annum to 145-155 million might run during its first year or two for, say, seven months rather than for twelve months.

6. Should the total lead production increase to 145-155 million pounds per annum from recent past figures of 75 to 85 million pounds with no corresponding increase in copper feed and, thus, with no corresponding increase in leady intermediate products originating in the copper circuit, which products contain a higher percentage of bismuth, antimony, and arsenic than do most lead concentrates, then the slime forming impurities in the lead anodes might well decrease by a significant degree. While the total production of bismuth would increase, the ratio of bismuth to lead would probably decrease.

This may well permit the casting of heavier anodes (Trail) which are less apt to be bent and with which proper current efficiency can be maintained with closer anode spacing (Trail). This in turn might result in a smaller percentage of scrap lead returned from the refinery in the form of corroded anodes for re-melting, higher overall efficiency, and lower costs. It is logical to conclude that lead recovery from material smelted in the lead blast circuit is sufficiently higher than from lead contained in feed to the copper circuit. The latter is recovered from the copper circuit in the form of flue and Cottrell dusts and is then subsequently put through the lead blast furnace circuit. Thus the final recovery is subject to the losses experienced in both circuits. As the figures on recovery are at present only available on an overall basis, i.e. the lead recovered is related to the total lead intake within the lead of the copper circuits, the increase of lead intake into the lead furnace may well result in a higher overall recovery. The effect of this on the "margin" should be significant and thus not only increase profit but permit the Corporation better to compete with custom smelters in the United States and Europe.

7. It is requested that both Oroya and New York Engineering comment to me on the feasibility of increasing the production of refined lead to 145-155,000,000 pounds per annum. Then the future course of action can be determined.

Robert P. Koenig

RPK-tg
cc: NYO (5)
(GPS
(WCS
(MBL
LO (2)
ARM (6)

FORM 405 1000 8-51

CERRO DE PASCO CORPORATION • NEW YORK

INTER-DEPARTMENT MEMORANDUM

A-15

Date: February 19, 1952

To: R. P. Koenig

From: Lawrence Addicks

Subject: New Lead Smelter

1. Following your request of yesterday I have discussed with Mr. Smith the findings of the recent group tour of the smelters. No major difference of opinion seems to have arisen as to the significance of the observations made.

2. Asfar as sintering is concerned practice has crystallized in such a definite pattern that there is not much to argue about. The first step already authorized for rebuilding the lead smelter covers only this item. I think a second one to provide proper drossing facilities should be undertaken immediately. Given a good sinter and efficient withdrawal of otherwise circulating impurities by drossing, almost any kind of a blast furnace will do good metallurgical work.

3. The drossing department is a relatively small one and should rapidly pay for itself. There is room for argument whether or not to use soda and as to replacing oil fuel with electricity. I should cut this knot by putting both ideas into operation, discarding the loser after demonstration. This might save endless delays and later discontent. The net lead output of the blast furnaces is badly cut by an unnecessary and metallurgically thoroughly undesirable circulating load.

4. As to blast furnace design, to come up later, there will always be universal disagreement. Each man always has his pet shape and all of them seem to work. My judgment would be to accept any design the local staff recommend. We have a unique factor in that the altitude requires a greater volume of air to get the same weight of oxygen. Oxygen enrichment may come if we have time enough in our building operations. In the meantime the actual furnaces are probably the least of our worries.

5. I think the size of the blast furnace requires some thought. An oversized unit sometimes gives trouble in fitting its capacity to the load where two smaller ones would be more flexible.

6. In general I think we need a sort of flywheel storage of intermediate products for smoother management. For instance there should be a normal figure for stock of say anodes to carry a refinery over an emergency failure of the process behind it and so on. We have too many bottlenecks followed by floods in the attempt to rush metals to market.

7. Another peculiarity of Cerro, perhaps not directly connected with what we are discussing, is the linkage of several metallurgical systems with inter-

locking by-products. For example the Sterling process is going to produce iron with copper and silver values, and in a 200 ton-a-day zinc plant the tonnage will be considerable. Presumably we can sell the iron as pig and waste the values, work it into the lead charge, into the copper charge, or use it for cementation of copper from solution. The fact that the zinc system has to solve this problem does not mean it should be forced on one of the others -- or at least it should be charged for without mercy if harmful or paid for if beneficial. Otherwise it is hard to hold a man personally responsible for his costs.

Lawrence Addicks

LA:JC

L. A.

FORM LO5 D. 5M. 1-52

CERRO DE PASCO CORPORATION - LIMA

CORRESPONDENCIA INTERDEPARTAMENTAL

Fecha February 24, 1952

A: A. H. Engelhardt

De: R. P. Koenig

Materia: New Lead Smelter at Trail -
Consolidated Mining & Smelting Company

Herewith some information which I have picked up on the new Lead Smelter at Trail. This has to do principally with refinements of design, a matter which I consider of much importance. Once the basic design is decided on then the refinements are those things that add to the efficiency of the plant and to the overall climate within which good operating and maintenance practices can be insisted upon.

Although the Trail installation introduces nothing particularly new in the way of operating practice, the construction is said to be as modern as it is possible to make and all the latest ideas have been used. Instrumentation has been employed as far as practical for control and recorders keep a running story of the performance and conditions throughout the plant. Instruments will be grouped along with motor controls in orderly and attractive arrangements as is the modern practice. The designers have gone to great lengths to design a plant that will be clean. As smelters are notoriously dirty places and, therefore, working conditions are most unpleasant, it is thought that the new Lead Plant at Trail will set new standards for efficient operations.

1. Bag House Dust Handling.

A Fuller Kinyon dust pump returns dust to be mixed with the sinter charge for blast furnace feed. This is thought to be a great improvement over the old system where the dust was trammed back to the smelter in open cars allowing much of it to be swept off into the air.

2. Bag House.

In the new Cominco installation, any dust that escapes in and around the bag house will not be permitted to stay around for long. Apparently all corners and obstructions where dust might hang up have been removed. On the "I" beams, for instance, cement is used to fill in between the flanges. (You will recall that I brought to your attention that at Port Pirie the "I" beams are covered with a gabled sheet iron "roof".) The roof of the sinter plant is to be suspended from trusses outside the building, thus eliminating the network of steel members under the ceiling which ordinarily would hang up large quantities of dust. Cement floors are sloped to provide

easy drainage for frequent washings.

The sintering plant building will be approximately 120 feet by 310 feet. It will have three large sintering machines which are being built by the Dominion Engineering Company in the Consolidated workshops at Trail. Each machine will be 10 feet wide with 60 feet wind boxes, and the three will do the work that is now accomplished by fourteen smaller ones. The advantages of having a few big machines instead of a number of small ones include the fact that maintenance and operating costs should be sharply reduced. Also with a fewer number of machines there is less opportunity for excess air to be drawn into the sinter gas, and therefore it would be possible to feed a higher grade of gas to the sulphuric acid plant.

3. The only break in the Trail flow sheet which will interfere with the automatic movement from the time the ore or concentrates arrive at the plant and lead comes out at the other end is between the sintering plant and the blast furnaces where it will be necessary to transport the sinter a short distance in open cars.

4. Capacity.

The capacity of the new lead smelter will be about the same as the present one; that is, it will be able to turn out around 750 tons of lead bullion a day - (approximately twice as large as our target of 220,000,000 pounds of lead per year).

As a matter of fact the Lead Smelter is currently running well below capacity and lead ores and concentrates are particularly sought on a customs basis, as we know from the competition we are receiving from Trail here in Peru.

The eventual scheme for the new Lead Smelter involves the erection of a new furnace building, but that is not included in the present program. One angle that is being investigated is whether electric furnaces would do the job better and more economically than the ordinary blast furnace type. Not much is yet known about this development. We should try and follow it particularly as we are confronted with a problem of finding enough coking coal. If low volatile coal will do in an electric furnace (and I should think low volatile is preferable to high volatile in this type installation) the coking coal problem might largely disappear.

RPK-dvc
cc: AHE (8)
WCS
LA
GR
MBL
NY Engineering
RPK-NY-Lima
NY Circulating & Central

Robert P. Koenig

CERRO DE PASCO CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

Central Files

MEMORANDUM

No. 2-52

To: The Directors January 3, 1952

From: G. P. Sawyer

Subject: Rehabilitation and Expansion of Present Lead Plant

At the meeting of the Board to be held January 8, 1952, there will be presented a request for an A.F.E. in the amount of $1,350,000.00 to cover the purchase and installation of a new sintering machine and certain auxiliary equipment for the lead plant at Oroya. This request represents the first step in a plan for the modernization and expansion of the present lead plant--a matter which has been under study for some time---and the following information is presented in advance in order that you may have a clear idea of the objectives and the program proposed to accomplish them.

As supplementary information there is enclosed a brief history of the Corporation's lead smelting and refining operations, as well as a short description of the present plant. The latter has been prepared with emphasis on the deficiencies of the present plant rather than on the details of its equipment.

The ultimate long term objective is a modern lead plant from ore receiving to finished product with a planned capacity sufficient to handle the foreseeable future production of the Corporation's mines as well as that of mines operated by others which are geographically located so as to make shipment of their production to Oroya economically feasible.

The problem is to accomplish this objective and yet maintain uninterrupted production from the existing facilities.

The program proposed is to approach the ultimate objective in orderly steps, making use of such elements of the present plant as are desirable and to purchase and install such new equipment as is required to meet the needs of the relatively near future and which can be expanded or added to without rebuilding.

Present production from the Corporation's own mines is about 45,000,000 pounds of recoverable lead per year and that of potential custom shippers is about 60,000,000 pounds, making a total of about 105,000,000 pounds annually.

By 1955-56 it is expected that the production from the Corporation's own mines will be in the neighborhood of 72,000,000 pounds and the total available to the Oroya smelter about 135,000,000 to 145,000,000 pounds. This figure has been chosen as the capacity of a lead plant capable of handling the lead that will be available in the relatively near future.

Certain long range possibilities such as production from Yauricocha, the Greater Cerro Project and increased production from independent producers make it advisable to set a higher figure for the ultimate planned capacity, and 240,000,000 pounds of recoverable lead annually is being used for purposes of long range planning.

Production from the present lead refinery at Huaymanta, for several months last year, was equivalent to an annual production of about 135,000,000 pounds of refined lead. By increasing the current density, a refining capacity of 150,000,000 pounds per year can be expected without major changes. If supplied with suitable charge, the present blast furnaces can produce 145,000,000 to 155,000,000 pounds of lead, but some provision must be made for smelting copper dross, thus relieving the lead furnaces of this burden and improving metallurgy.

The present sintering unit lacks adequate charge preparation and materials handling facilities and is incapable of producing sinter of the necessary quality for maximum output from the lead furnaces. This circumstance has limited lead production to the equivalent of about 100,000,000 pounds annually, and the correction of this deficiency is the logical first step to take in the rehabilitation and expansion program. The age, size and mechanical condition of the present sintering machines and related facilities preclude the possibility of economically modernizing them without substantial additions of new equipment.

It is therefore proposed to purchase and install in the present sintering unit new bins, conveying equipment, a new sinter crushing unit and new charge preparation facilities. This equipment would have sufficient capacity to handle the ultimate requirements and is necessary to provide the blast furnaces with a proper sinter which is essential for good lead smelting. In addition, it is proposed to purchase and install at this time one new 72" x 40' sintering machine to increase the capacity of the sintering unit to the equivalent of about 150,000,000 pounds of recoverable lead annually.

A preliminary estimate of the total cost of these improvements is submitted below:

Blending, Mixing & Conveying Equipment	$ 90,000
Sinter Crushing, Screening & Conveying Equipment	285,000
One 72" x 40' Sinter Machine & Auxiliary Equipment	160,000
Dust Collection & General Plant Services	60,000
Structural & Building Materials	185,000
Total F.A.S.	780,000
Freight & Importation	160,000
Peru Expense	235,000
Sub-Total	1,175,000
Engineering & Contingencies (15%)	175,000
Total	$1,350,000

Once this installation is complete, the lead plant as a whole would be able to produce about 150,000,000 pounds of recoverable lead annually at high operating efficiency. This will be sufficient to take care of the estimated intake of lead bearing materials available to the Oroya smelter in the relatively near future. Additional steps can then be taken toward the ultimate goal as deemed advisable. The next logical step would be to provide smelting facilities for the copper dross and successively to replace the present old sintering machines with larger ones.

The improvements covered by the request for A.F.E. under review are dictated by maintenance requirements alone because it is necessary to begin the rehabilitation of the sintering unit in some form immediately. These improvements as proposed accomplish both the problem of rehabilitation and that of expansion.

It will be noted that the capacity of the present plant does not meet the expected nearby future intake by about 40,000,000 pounds of recoverable lead annually. This corresponds roughly to the treatment of 40,000 tons of concentrates per year. The additional net profit to be derived from the treatment of this tonnage of concentrates would more than pay for the cost of the proposed improvements in two years.

Geo. P. Sawyer

GPS:wbg
Encls.

To: Messrs. D. H. Allen
H. Bancroft
E. W. Bourne
W. A. M. Burden
E. A. Fish
L. C. Graton
R. P. Koenig
D. H. McLaughlin
F. F. Russell
G. P. Sawyer
R. M. Stewart
cc: M. D. David
R. F. Mitchell
H. D. Starr
A. H. Engelhardt
J. D. Smith

CERRO DE PASCO CORPORATION

HISTORY OF LEAD SMELTING AND REFINING OPERATIONS AT OROYA

Lead smelting operations were started in Oroya in 1928 employing a remodeled copper blast furnace and the sintering equipment originally installed in the Oroya smelter for the agglomeration of fine copper ores. Two furnaces were added later, one being purchased and the other converted from one of the copper blast furnaces.

The bullion produced contained excessive amounts of antimony, arsenic and bismuth and as it was exported for refining, very high refining charges were incurred.

Early in 1930, T. E. Harper, Jr. and Gustave Reinberg, Jr. developed an electrolytic refining process which made possible the economical treatment of lead bullion with high impurity content. A pilot plant utilizing this process was put into operation in 1934 and was replaced in 1937 by a larger plant having a capacity of 110 tons of refined lead per day. This latter plant operated until the early part of 1951 when it was replaced by the new lead refinery at Huaymanta.

DESCRIPTION OF PRESENT LEAD PLANT

The essential elements of the present plant are:

1. Bedding Unit
2. Sintering Unit
3. Blast Furnaces
4. Melting, casting and drossing
5. Refinery

Bedding Unit

The charge for the lead blast furnaces is bedded on two of the beds originally installed in the Oroya smelter for the handling of copper bearing material. While not ideal, this arrangement is adequate and provides an excellent method for proper blending of the charge.

Sintering Unit

The sintering unit consists of ten sintering machines each 42" x 22'. All of the machines are at least thirty years old, some having been moved from the old smelter at La Fundicion and additional ones purchased when the present smelter was erected in Oroya. The draft fans are of smaller capacity than required for lead sintering and the present equipment used for blending and charge preparation is wholly inadequate for the production of good sinter.

Blast Furnaces

The three lead blast furnaces, two of which were converted from copper blast furnaces, are all of different sizes. These furnaces are poorly arranged and the charging equipment is cumbersome and wasteful of man power on the charge floor. Since they were converted from copper blast furnaces, the tops permit an excessive amount of smoke and fume to escape at the feed floor and a heavy dilution of furnace top gas with air resulting in poor fume-collecting efficiencies. Air supply has been furnished by two Root type blowers moved to Oroya from La Fundicion, but these are now being replaced with modern blowers available from existing equipment not being utilized in other operations.

Melting, Casting and Drossing

The present plant is lacking in facilities for the separate treatment of the copper dross resulting from lead operations, and these are currently recirculated through the blast furnaces.

Refinery

The present lead refinery occupies one half of the original copper refinery at Huaymanta. It is a modern, well equipped plant except for minor deficiencies in anode cleaning and washing facilities which are now being corrected.

GPS:wbg
1-3-52

FORM 40G 1000 2-51

CERRO DE PASCO CORPORATION • NEW YORK

INTER-DEPARTMENT MEMORANDUM

Date: February 18, 1952

To: R. P. Koenig

From: W. C. Smith

Subject: Lead Plant Sinter

During the last thirty-four years I have had occasion to visit most of the lead smelting plants in the United States and Mexico several times. During this period definite trends in the thinking of the lead metallurgists have been apparent. These may be listed as follows:

1. The necessity of finer crushing or grinding of the various components.

2. More complete mixing of the charge prior to the first-over sintering.

3. The use of larger amounts of first-over sinter or fines from the second-over sinter in the first-over mix as a diluent for sulphur.

4. The elimination of sulphur in the second-over sinter to 1-1½ percent.

5. All first-over sinter is being crushed to at least ½", preferably ¼", before going to the second-over operation.

A few years ago crushing the charge to the first-over from 1/2" to 5/8" was considered ample. Today the tendency is to crush and grind to more or less 10-mesh.

With this fine crushing, pelletizing of the first-over charge is definitely advantageous, if not necessary. Experimental work at Bunker Hill and Sullivan and Trail plants have indicated that by fine crushing, good mixing and pelletizing, extremely high production rates on the first-over machines can be obtained.

The present tendency is to crush the first-over sinter in two stages: first, through corrugated rolls, followed by large-diameter, smooth-faced rolls. Midvale smelter has screens in closed circuit with the smooth rolls to insure proper sizing of the second-over feed and they have been for years, and are, producing the best second-over sinter of any smelter we saw.

For Oroya, it would seem to be particularly important to fine-grind the limestone component of the lead beds before its addition is made to the beds.

I believe that Higgs, Johnson, Schellinger and Smith are all agreed

that the desired equipment for Oroya would be:

a. Fine grinding of limestone and other coarse material prior to bedding.

b. Passing the reclaimed bed material through a hammer mill in order to disintegrate any lumps such as concentrates or dust calcines.

c. A large storage tank, sufficient for 8-10 hours operation. This would permit the use of reclaiming machines on other beds without interruption of the sinter plant feed.

d. A large mixing table, followed by

e. Pelletizing drums.

The first-over sinter can be thoroughly wet with water and handled on rubber conveyor belts. It should then pass through corrugated rolls, through smooth rolls and then screened, the oversize material going back to the smooth rolls, except for a small percentage which can be separated and bedded on the sinter grates in order to prevent the finer material from sifting through.

The second-over sinter should be handled by means of pan conveyors until it has been cooled sufficiently to be handled by rubber belt conveyors.

A screen to remove the fines from the second-over sinter prior to its being sent to the furnaces may be necessary. However, many plants which produce really good sinter do not remove the fines. We believe that provision should be made for this screening operation at Oroya.

The lead furnaces will almost run themselves if given good sinter.

The above recommendations have been discussed with Messrs. Reinberg, Biggs and Strong.

W. C. Smith

WCS:JC
cc: RPK,Lima (1)
GR(1)
JDS (1)
AHE (8)
Cen. File
Cir. File