CERRO DE PASCO CORPORATION

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

MEMORANDUM

No. 33-51

To: The Directors June 18, 1951

From: R. P. Koenig

Subject: Copper Refinery and Precious Metal Losses, Continued

Memorandum No. 6-51 dated January 22, 1951, advised the Directors of some of the steps that were being taken in respect of the above subject. There is attached herewith a copy of a memorandum dated June 6, 1951, from J. W. Hanley, Superintendent of Smelting and Refining, to A. R. Merz, Manager of Operations. From this you will note that the Oroya staff have been following up many of the points that were highlighted by the Starr-Littlefield investigation. Much progress has been made but, of course, there is still considerable room for improvement. Not all of the points that were raised by Starr-Littlefield or by myself in subsequent correspondence in respect to previous metal losses and the copper refinery have yet been taken in hand, but I feel sure that with the follow-up system which is now operating in Oroya, a review of all of the correspondence will be made so that every suggestion, whether it be good or bad, will ultimately be tracked down to earth and either adopted or eliminated.

As further reports on this important matter come to hand, you will be kept advised.

Robert P. Koenig

RPK:ay
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
A. R. Merz (12)
J. D. Smith (3)
L. Addicks (1)
G. Reinberg (2)
W. C. Smith (2)
M. B. Littlefield (2)
H. D. Starr (2)
R. F. Mitchell (2)

CERRO DE PASCO CORPORATION

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La Oroya, June 6th, 1951.

TO: Mr. A. R. Merz,
Manager of Operations,
La Oroya.

FROM: J. W. Hanley,
Superintendent Smelting and Refining,
La Oroya.

SUBJECT: Starr-Littlefield Report and Additional Improvements.

Following is the status of work accomplished as per suggestions made in the Starr-Littlefield report, added improvements made and in progress according to Mr. Engelhardt's memo of 4/4/51 on Copper Refinery Losses, the writers memos of 12-9-50, 2-16-51, and 6-1-51 on the Parting Plant, and the writers memos of 5-28 and 5-30-51 on the Anode Residue Plant:

Copper Refinery - Starr-Littlefield Report.

1. Mixture of air and water at high pressure for scrap anode cleaning - this was tried but pressures not high enough. A pump was ordered on Req. S-20838 of 2-10-51 for a further trial. Pump is not as yet available.

2. Electrolyte circulation bottom to top of cell - all test work completed and Mr. Ricketts presently consolidating data for report to be made shortly.

3. Basement of Copper Refinery completely enclosed with access only through slime section - job completed and close control maintained.

4. Whitewashing under cells and cleanliness - this job completed and basement is kept very clean.

5. Erection of tank for input-output balance for copper, silver and sulfate ion - Improvements still being made in closer control of copper and precious metals. All solution leaving refinery is sampled daily, composited weekly for control. On completion of all improvements, if losses exceed good practice, tank will be erected.

6. Anode Specifications - Anodes have been much improved (weight, straightness, fins, etc.), supervision has been placed on anode casting. Refinery has right to reject any anodes not up to specifications. Current efficiency in refinery indicates that good cell conditions obtain.

7. Consider installation of Reverberatory Furnace, Anode Casting facilities and necessary auxiliary equipment.

   (a) Decided against furnace in Refinery and second holding furnace to be built at smelter.

   (b) Anodes at Smelter much improved and active interest in casting good anodes at all times.

   (c) See (b).

   (d) Decrease of Anode Spacing doubtful - will be kept under consideration.

   (e) Fire refining of blister prior to anode casting - past experience has proved this unsatisfactory.

   (f) Lectromelt vs. Reverberatory - for future consideration.

A.H.E. Memo 4-4-51 - Copper Refinery Losses.

1. Weights of Copper between Refinery and Smelter.

   (a) All anode cars have been thoroughly cleaned, painted, and tared. Cars will be kept in this condition.

   (b) All anode cars are tared weekly.

   (c) All anode racks have been painted, tared, and adjusted to an even 1000 kilos. These will be kept in good condition and checked as to weight monthly.

   (d) Boats for scrap have been tared. Boats and car are tared over Railroad balance in each trip to Refinery.

   (e) All anode cars are thoroughly cleaned at Refinery on each trip.

2. Collection and Storage of Scrap Copper.

   (a) Corroded scrap is picked up before the end of each shift, washed and placed in boats for return to Smelter.

   (b) Baling machine has been relocated on furnace floor. Stripper scrap is charged directly to neutralizers or transported in baskets to scale to baling machine by crane. Scrap is stored on furnace floor awaiting charging to furnace.

   (c) Scrap from shears is loaded into baskets, weighed, and transported to furnace floor. Clean-up from around shears is part of shearing operation and all scrap is cleaned up by shearing crew before leaving job.

(d) Furnace scrap and liberator cathodes are stored on loading dock and loaded periodically into boats for return to smelter (as little as possible will be allowed to accumulate).

(e) Baskets in use on all above jobs (small scrap), have tare weights marked on them. Tares will be checked each two weeks and recorded.

3. Protection Measures.

(a) Fence line for Copper and Lead Refineries has been staked out for complete enclosure. Construction Department are to do the job and present estimate is 4 to 6 months to complete.

(b) All exits from floor of sulfate section to outside are closed and under lock except when opened by a supervisor. All doors on Furnace end of building are kept locked except door for man entrance and door to loading dock.

(c) Overhead crane for loading copper and concreting of loading dock are completed. This area will be fenced in as part of Refinery Proper and will be included in fencing program.

(d) Scrap storage area on furnace floor will be fenced in as part of fencing program.

4. Inventories.

(a) A check inventory will be made at Refinery when present furnace campaign is finished and all scrap cleaned up.

5. Copper Dust from Lectromelt.

(a) Present plan is to install baghouse for collection of Copper Dust. Baghouse is available and order has been placed for fan and motor for baghouse.

Copper Refinery Slimes Section - Starr-Littlefield Report.

1. All openings in Slime Section have been screened.

2. Double gate for slimes loading truck - will be given high priority on fencing program.

3. Improving accuracy of transfer of Copper Slimes to Anode Residue Plant.

(a) Closer weighing and check weighing are in effect.

(b) More accurate sampling and moisturing are in effect.

(c) The numbering of barrels is not necessary to obtain accurate and check weights.

(d) Proper forms are used for all routine work.

4. Reverb furnace for melting copper slimes separately is out.

5. A clean separation is made at inventory time and pertinent and accurate data is given for metallurgical records.

6. Adequate double lockers and inspection area are provided for in Slimes Section.

Copper Refinery Slimes Section - Additional.

1. Contract supervision has been placed in Slimes Plant. Contract man never leaves Slimes Plant during working periods.

2. Controls in Slimes Plant have been "tightened up" and are being further improved.

Lead Refinery Slimes Section - Starr-Littlefield Report.

1. Scrap melting kettles, anode casting wheel and auxiliary equipment - Operating staff in Oroya fully agree with this point and feel serious consideration should be given to proceeding with program.

2. Slimes Handling - Most of this program is held in abeyance since a new Anode Residue Plant is being designed. Slimes section will be totally enclosed and proper Change house will be provided.

Suggestions for Anode Residue Plant - Starr-Littlefield Report.

1. Reduction of slimes to metal in both copper and lead refineries would remove all slimes from Anode Residue Plant and facilitate housekeeping. This point also held in abeyance with design of new Anode Residue Plant.

2. Same as (1).

3. Further points:

(a) Present fencing does provide complete enclosure but is being further improved.

(b) Minor revisions are being made in Change house.

(c) Lighting has been improved in buildings and outside yard.

(d) All unnecessary items have been removed from Plant that are not part of current operations.

(e) Housekeeping will be improved.

(f) Standard forms have been provided for all routine records - good records are kept on all operations.

Further Improvements to Anode Residue Plant - JWH memos 5/28 & 5/30/51

1. Scheduled cleaning of flues, baghouse repairs, installation of two new baghouses,and neutralization of slimes.
2. Improved housekeeping in Slimes scraping area.
3. Improved maintenance of Slimes Drum Dryer.
4. Screening of Plant windows for added protection.
5. Removal of ladders and other such objects which aid in theft.
6. Cupel baghouse to be integral part of Plant with no access to yard.
7. Reversal of screw conveyor on Cupel Baghouse and maintaining cupel baghouse dust in totally enclosed area.
8. Double locks on gates and vault.
9. Crushing and screening of Cupel Products.
10. Barbwire over present fencing.
11. Completion of Change house as quickly as possible.
12. Screening of windows on Anode Residue side of New Zinc Tank house.
13. Proper maintenance of ditch carrying pipelines.
14. Over-all improvement in Plant housekeeping and Plant Control.

Suggestions for Parting Plant - Starr-Littlefield Report.

1. Housekeeping in Plant has been greatly improved - see additional points.
2. Standard forms are used for all routine records.
3. Improved methods have been adapted for gold recovery.

Additional Parting Plant JWH-ARM 12/9/50, 2/16/51 & 6/1/51:

1. Gold melting room painted and housekeeping improved.

2. Parting Room - ventillation improved, old slimes roaster torn out and new type roaster installed, platform around gold kettles completely demolished and new steel platform built, kettles improved and kept in good condition, all unnecessary equipment removed, complete painting job done and new vault for slimes built in parting room.

   Retort furnace added to Gold Parting room so that slimes can be melted prior to parting - this has given closer control on process and has improved grade of gold bullion.

3. No improvement could be made with present cementation equipment. Schedule now set up to completely revamp cementation room during first twenty days of June.

4. Main plant has been completely painted, generally tidied up, all unnecessary objects removed, additional lighting has been placed under cells. Cells have been painted to spot spills and general housekeeping has been greatly improved.

5. Tighter controls such as screening on doors, more rigid inspection (evidenced by picking up individuals with precious metals in plant), have been enforced.

Suggestions for Metallurgical Records - Starr-Littlefield Report.

1. Include in Metallurgical Data

   (a) Summary of inventories included.

   (b) Metal Intake to Copper & Lead Smelters included.

   (c) Metal Loss or gain included.

   (d) Metal Balances included.

Note: All above are included in separate report which comes out monthly from Metallurgical Office.

2. Sampling and Control Manual prepared and all members of staff have copy.

3. Operators have copies of their plant costs and metallurgical recoveries. All operators make out properly signed inventories and reports for the preparation of metallurgical data and records.

4. Single sheet records of metallurgical and cost data have not as yet been prepared for copper smelter, copper refinery, lead smelter, lead refinery, anode residue and parting plants. The metallurgical office do have the sample of A.S.& R. reports and have been asked to prepare similar sheets for above.

5. Necessary precision of figures now are in effect in the metallurgical report.

Suggestions for Accounting Records - Starr-Littlefield Report.

1. Cost charge numbers at Copper Refinery for better breakdown of costs was placed in effect Jan. 1, 1951.

2. Cost charge Numbers for all other departments have not been completely reviewed so that costs will more closely follow the process. This point will be reviewed.

Outline of Design for Lead Refinery Addition.
Outline of Design for Copper Refinery Addition.

Both of above points are in abeyance but operating departments feel that scrap melting facilities for lead should be provided in Huaymanta and a combined storage for copper and lead anodes with proper crane service should also be provided in Huaymanta.

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The above report carries in detail all improvements that have been made, those in progress, and those scheduled in the Refinery Departments since the receipt of the Starr-Littlefield Report. Progress has been made and will continue to be made. All members of the Staff receiving a copy of this report MUST FOLLOW ALL CONTROL POINTS CAREFULLY and extend their best efforts toward carrying all unfinished improvements to completion. Any further ideas toward improving Refinery and allied conditions will be most welcome and will be added to this present list.

J. W. Hanley,
Superintendent of Smelting and Refining

cc: ARM-3
AHE JAD-2
ILB ABB-2
DAR PJH-2
JMM WBS
HWH AT
AHK CEH
KH MEB
AHJ KT
DHM DAH
EHG file-2

JWH/af

Separation of Cu + Zn by Ion Exchange

Bretan + Schlecten

Journal of Metals, Jul. '51

Apparent Lead Smelting Recovery

1941	90.29
1942	91.07
1943	90.33
1944	89.19
1945	93.72
9 mos. 1946	94.91

Lead Plant

Year	1941	1942	1943	1944	1945	1946 (7 mo)
Pb in Ores.	81.33%	81.43%	81.39%	79.84	97.39	97.14
Pb in Returns	18.67%	18.57%	18.61%	20.16	2.61	2.86
Total	100.00%	100.00%	100.00%	100.00	100.00	100.00
Pb in Bullion	89.02%	89.63%	88.31%	86.76	84.13	77.34
Pb in Slag	1.39%	1.64	1.47%	1.50	1.35	1.37
Pb in By Pro.	2.27%	1.44	2.02%	2.43	9.59	17.57
Pb unaccted.	7.32%	-7.29	-8.20	-931	-4.93	3.72
	100.00%	100.00%	100.00%	100.00	100.00%	82.43
	9.71	8.93	9.67	10.81	6.28	5.09
	90.29	91.07	90.33	89.19	93.72	94.91
Coffin in Ores.	67.49%					
Coffin in Returns	32.51%					
Total Cu.	100.00%					
Cu in Bullion	2.79%					
Cu in Slag	19.31%					
Cu unaccted for	+ 3.16%					
Cu in By Product	81.09%					
Total Cu.	106.35					

Copper Plant

Year.	1941	1942	1943	1944	1945	1946 (7 mo)
Copper Charged	100.0%	100.00%	100.00%	100.00%	100.00	100.00
Copper in Bullion	96.85%	96.82	95.96	95.45%	96.17	91.43 85.63
" " Slag	5.76%	5.29	5.12	4.82	4.05	5.6 > 4.17
Total	102.61%	102.11%	101.08%	100.27%	100.22%	89.80% ~~50~~
Silver Charged	100.00%	100.00%	100.00	100.00	100.00	100.00
Silver in Bullion	98.01%	98.08%	97.84	97.41	96.17	93.18
" " Slag	3.14%	2.41%	1.89	2.24	2.18	1.94
	101.15%	100.49%	99.73	99.65	98.35	95.12
Gold Charged	100.00%	100.00	100.00	100.00	100.00	100.00
Gold in Bullion	100.00	100.00	100.00	100.00	99.02	94.37

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Mr. Addicks

Lima, April 26, 1951

MEMORANDUM to: A. R. Merz

From: R. P. Koenig

Subject: Lead Losses - Investigation thereof

1. Your memorandum of April 24, 1951 and A. H. Engelhardt's memo of April 18 have been read by me with interest and enthusiasm. I am naturally pleased that the lead problem is getting the degree of thought, attention, and action reported in the above.

2. I should like to make some comments.

(a) Sintering Plant. I notice that little mention is made in the above memoranda to the sintering plant. It must be apparent that the losses here are very high. Just the fact that in January and February 2,000 tons of material were recovered from the ground in and around the sintering plant indicates the quantitative order of magnitude of such losses. I therefore assume that steps are actually in progress to put these losses under control. Higgs in his memorandum of March 29 mentioned stack losses at the sintering plant but does not mention losses at transfer points, loading chutes, crushers, etc., even though fingers have been repeatedly pointed at these places.

(b) Blast Furnace Fumes. If my memory serves me correctly I have noticed the blast furnace operators opening up both charge doors on the lead furnaces to their full extent simultaneously with the resultant emission of enormous quantities of fume. Probably less fume would be lost if only one door were open at a time. While chairs or pivoted stops are now being installed to reduce the height of the opening during the sweeping up period, I believe that further improvement in fume retention may well be in order. I should think it would be possible to arrange the valves on the doors so that in normal charge operations only one door could be opened at a time. A second or alternative air hookup could be provided so that both doors could be opened when operating conditions make it essential to poke about in the furnace from both sides at the same time.

(c) Blast Furnace Operations. Would it not be worthwhile to prepare for distribution to the lead blast furnace shift bosses and sobrestantes clear and simple operating instructions in Spanish and in English regarding the manipulation of the doors, chairs, charging procedure, and then insist on the instructions being carried out - even on the graveyard shift?

(d) I trust that some action is being taken in respect to Hull's observation (paragraph 3 of his memorandum of March 29) that lead may be entering the converters "either from the lead furnaces or from sinter through the belt system put to silica bins." It is not explained in the above memo how lead might come from the lead furnaces. However, keeping the silica flux to the converters as nearly lead-free as possible would certainly seem to be in order.

(e) I also assume that positive steps to permit double weighing, including the installation of additional track scales, are underway. Of course, all such scales should be equipped with weight printing devices and with proper record cards for metallurgical accounting purposes.

3. I should also like to make some general comments which are not necessarily connected with the lead problem but which are part of the over-all smelter problem and therefore may well influence the lead recovery.

(f) Would not an aggressive smelter cleanup gang in charge of a resourceful, meticulous and dedicated man be worthwhile. When I got off the "beaten track" in Oroya and in Huaymanta I noticed disorderliness, machinery parts, and much scrap metal (principally lead) lying about. I think it would pay off to insist that the smelter supervisory staff get off the "beaten track" at periodic intervals, observe what goes on, and then request that the cleanup gang be sent around. If a procedure of this kind were organized then, when the top smelter or even the top management staff gets off the "beaten track" and still finds things messy, responsibility can be pinned down. Cleanliness requires that on the one hand a boss sees and recognizes the lack thereof, and on the other hand that orders be given to clean up.

(g) I understand that the several Cottrell units, as a whole, are equipped with recording type smoke meters as distinguished from instantaneous recorders on the smaller sub-sections. If this is the case why not have the recorded graphs analyzed statistically at periodic intervals and have top smelter management advised as to what is good and bad about the various sections in the Cottrells. Statistical analysis of course implies not just reporting what the graphs indicate but adding critical and interpretive comments and suggestions. If the several sections of the Cottrells do not have recording smoke meters I suggest that the advisability of installing them be actively considered. I should think that some system of this kind would tend to pin down performance, not only of the Cottrells but of the several sections of the smelter feeding smoke into the Cottrells, with greater precision.

(h) General Dust Problem. Why not have New York Engineering do something about the recovery of dust in the large roaster flue? The substitution, of the present system of drawing dust into cars and then conveying the fine dust back on to the beds, by an Airslide (as suggested several months ago) which in turn feeds into a pelletizing drum should be laid out and estimated. If the plan stands up then a packaged job could be obtained in the United States.

(i) Is it not appropriate to do something about the reclaiming belt system in the bedding plant? The continuous spills and subsequent cleanup are messy, wasteful of labor, and dusty. My impression is that the idlers and the belts are far too narrow but that the pits are wide enough to carry a belt installation of appropriate size. Here is another job for New York Engineering and the manufacturers to lay out and estimate.

(j) In reference to page 4 of Engelhardt's memorandum, third paragraph from the bottom, I should like to call his attention to the fact that AFE 12-50 dated November 2, 1950 allocates $13,500 for fixing up the roaster dust calcine handling facilities.

4. I could not agree more than with Engelhardt's statement that improvements in metallurgical accounting procedure, except from the standpoint of appraising losses and thus getting them out of the "unaccountable" category, can wait until significant progress has been

Robert P. Koenig

made in eliminating losses. However, I feel that it would be worthwhile to take someone from the metallurgical office, if this is not already being done, along on at least some of the trouble investigating trips. The accountants should certainly be intimately acquainted with metallurgical processes, with their failings, and with room for improvement; otherwise they just juggle figures without interpreting them.

Robert P. Koenig

RPK-tg
cc. NYO (6)
(G. Reinberg
(H. D. Starr
(W. C. Smith
(M. B. Littlefield
ARM (6)
(A. H. E.
JDS (2)
(H. A. G.
Lawrence Addicks ✓

Mr. Addicks

Lima, April 24, 1951

MEMORANDUM to: Files

From: R. P. Koenig

Subject: Lead Losses - Accountability

1. The recent additions to the already voluminous file on lead losses and metallurgical accountability causes one to comment on a phase of the problem which borders on semantics, but which, I believe, has something to do with the continuing metal losses.

This has to do with certain accounting terminology which while probably acceptable to many accountants seems to me to have a significant (and perhaps deleterious) influence on thought and action of the operating staff. It may seem strange to some to mix the meaning of words up with operations. However, I point out the now generally accepted (by the operating staff) fact that the inclusion of the word "Copper" in the Corporation's name has not been an entirely happy thing in recent times. So, perhaps, the use of "Weight and Assay Correction" for metal gains and "Unaccountable Losses" for losses tends to obscure the facts and thus not cause the operators to chase things down item by item, step by step, process by process, to find out what is wrong and to correct it.

Parenthetically, I think the work Starr and Littlefield did on precious metals accomplished just that; and, now, a similar review of lead smelting practices is at long last under way. It is hoped that the results and recommendations of these two efforts will be followed up.

2. For ready reference I am attaching copies of the following memoranda:-

W. E. Chancellor to A. R. Merz, March 30, 1951, "Metallurgical Balances".

K. Hull to J. W. Hanley, March 29, 1951, "Copper Smelter Lead Balance".

H. W. Higgs to I. L. Barker, March 29, 1951, "February Lead Loss".

A. R. Merz to R. P. Koenig, March 31, 1951, "February 1951 Metallurgical Accounts - Lead Recovery".

upon which, among other things, my subsequent argument is based.

3. I feel that the 1,770 tons of cleanup containing 666 tons of lead that were picked up in January and the "cleanup pickup" in February (I am not clear on the amount of the latter) should be considered as a "windfall". After all, it represents to a very large extent the accumulation of a part of the "unaccountable losses" over a long period of time. (Query: When was last real cleanup of an "archaeological" character like this undertaken?) How it will be treated on the metallurgical accounts and on the corporate books is another matter, but surely a concrete, tangible and real addition to the lead beds of material of this kind should not be used to cover up the more nebulous, intangible, and mysterious loss in February, and used as a means of saying that "so far this calendar year hasn't been too bad." I gather from conversations in Oroya that other considerations were involved, but they were never disclosed to me.

4. Again I question the advisability of using a term such as "normal unaccountable loss." It would appear that in a well ordered plant there would be no unaccountable losses and certainly not a "normal" one. I am the first to admit that there will never be a completely closed metallurgical balance, no more than there ever is or can be a closed survey. Anything that smacks of being closed is immediately suspect. However, I venture to tread on the (to me) delicate ground of smelting practice to the extent of saying that the differences in what is reported to come into the plant and what is reported to go out might well fall within the normal tolerances of the several weights and assays involved, adjusted by expected and known and quantitatively estimated mechanical losses. When such a Utopian state of affairs is reached then the (to me) confusing way of saying that a metallurgical gain - whatever the quantitative amount - is a "weight and assay correction," and a loss - again whatever the amount is an "unaccounted loss" would and could be substituted for meaningful gains and losses within the reasonable and proper expected tolerances of scales and analytical chemical processes. Such mechanical losses as can again reasonably be expected should be, in this plant (run on an optimum basis), subject to quite close estimation and again emerge from the foggy atmosphere of unaccountability into a clearer area of precision. After all, the points where mechanical losses occur are not infinite, or they shouldn't be. I am informed that approximately 3,000 tons of lead per annum are lost. This is at a rate of 8.2 tons per day, or 0.34 tons per hour, assuming the lead content of the material lost to be 40% thus 0.85 tons per hour are lost. This is 28 pounds per minute.

5. The statement by Mr. Higgs that "actually we have done very little toward correcting unaccountable losses in the Smelter as a whole, so that I can see little or no reason for expecting that better results should be obtained this year than in the past" leaves me flabbergasted. This is in direct opposition to frequently expressed Corporation policy, to what I have been continually urging, and to everything I can think of. I am perhaps labouring under a false impression as to what the smelter staff is trying to do - after all, it has increased approximately 300 percent in six years in supervisory manpower, and the number

of empleados and obreros has increased during this period by a number greater than the increase in production. I will admit the number was below par at the beginning of the period (until very recently) but that is hardly an explanation of the continuing failure to come firmly to grips with all phases of the problem.

6. However, Mr. Higgs takes the sting out of the previous statement by saying that certain losses estimated at 160 tons per year - or 5 to 6% of the "unaccounted losses (sic) for the year" - have been stopped and that he is on the track of 400 tons now going up the sinter plant stacks per year. 400 tons of lead at 17¢ represents a gross return of $136,000 - and as this lead is already paid for when it gets to the sintering plant - a substantial portion represents potential profit, presently going up the stacks. Action on this fairly obvious point of loss is indicated.

7. The old bug-a-boo of loss of lead being caused by circulation of lead products through the copper smelter is perhaps being flogged to death. After all, within the limits of weights (or volume) and assays the lead coming into the plant in ores and concentrates, going out in products or slag, or up the stack(s) are known or quantitatively ascertainable. I agree that with the mixture of lead and copper materials starting at the unloading hopper and continuing in various and sundry manners throughout the system that the clear determination of where the lead at any moment came from, is, or where it is going to, is virtually unascertainable. I do suggest that this is not a set of conditions that can be used to brush off "unaccountable losses" for the smelter as a whole. We who have given this matter thought realize that with a set of conditions of this character each section of the smelter can and often does pass the buck, as the precise data for pinning down responsibility is not presently attainable. Nevertheless, the fact seems to me inescapable that overall recovery should not much longer be permitted to remain in the land of mystery. While any section of the smelter or refinery may experience poor recovery and experience losses which that particular section may choose, for the nonce, to designate as "unaccountable", I feel strongly that this does not excuse the top level smelter staff from the responsibility for overall recovery.

8. Such desirable mechanical things as the new (?) lead pocket will, it is hoped, assist in better metallurgical practice and in better recovery, but I fail to see clearly how they should affect "unaccountable losses" over the long term. All of the operating points brought up by Mr. Higgs in Paragraph 3, Page 2, are valid and worth while doing something about, but I still fail to see where lead in the converter feed should be so largely "unaccountable" when it can go only four places:-

(a) through the Cottrells where it is largely recovered (or so I am told) - the balance going up the stack in amounts now determinable;

(b) in converter slag to the reverbs and from the reverbs the lead goes out in reverb slag (weight and assay known) and reverb gas to Cottrells and then back into lead circuit;

(c) lead content of anodes (and blister);

(d) such minor fume losses when charging or pouring converters.

The lead in the converter circuit is undoubtedly unaccountable from the point of view of the lead smelter man as the weights and assays of the product recovered in the Cottrells from the converters is not known and with present set-up in the Cottrells cannot be obtained. But from the plant as a whole the lead is surely to be largely accounted for if really chased down to earth. Again I repeat that the new lead pocket should increase recovery, but unaccountable losses are, to me at least, not logically related to recovery.

9. I do not have to comment on Paragraph 1 of Mr. Hull's memorandum of March 29. The conclusion that is arrived at is frightening when one considers the implications. Even when the new (?) lead pocket is done what steps will be taken to see that lead materials are sent exclusively to where they should go and copper likewise? If the cars are mixed in the first instance no number of pockets will help. (I understand that aggressive steps are in hand to correct this mixup, but follow-up is obviously a necessity.)

10. It is a generally accepted principle that fitting equipment into a plant for the purpose of bettering accountability is, of course, less advisable than fitting better accounting practice into existing plant. But the rule of reason must apply. Weights and assays, for example, entail the furnishing of plant and equipment not entirely used directly in smelting, but largely for the purposes of memorandum accounting which in turn is used for control purposes. Following this line of attack , cannot, for example, By the installation of additional dividing curtains and not too costly materials handling devices, the Cottrell dusts from Po blast furnace and sintering plant, on the one hand, and converters and reverbs on the other, be weighed and assayed? And would this not get things a long ways towards being on the track of meaningful inter-plant accountability?

11. That there is a problem requiring immediate aggressive and resourceful action is evident. The present campaign, it is hoped, will bring results. Let Oroya speak up with what it needs to solve not only overall plant recovery but also better costs and efficiency. Whatever can be justified on a sound orderly business basis will be backed up to the full. Should I fail at this point in getting what is justifiably required then the responsibility will be squarely on me.

12. The matter of lead loss through the vertical charge slots in the blast furnace tops is disturbing, particularly as it is difficult to

estimate it quantitatively. However, lead in the charge should be ascertainable; lead in blast furnace bullion and slag is known; and perhaps some device could be cooked up to measure and sample the flue gases going into Cottrells. By difference, fume losses through the furnace tops could be estimated. If something could be done with the lead Cottrell to separate it from the converter Cottrell then an additional check might become available on top losses.

13. However it be done, the conclusion I reach is that the object is to have both losses and gains within the accepted tolerances of Weight and Assay correction, at first on a plant as a whole basis, and later by departments within the smelter. Elimination of the "unaccounted losses" as an explanation of poor practice - but by no means an excuse - as well as use of the term "Weight and Assay correction" for gains which are above and beyond accepted tolerances is desirable.

Robert P. Koenig

RPK-tg
cc. NYO (6)
(G. Reinberg
(H. D. Starr
(W. C. Smith
(M. B. Littlefield
ARM (6)
(A.H.E.
JDS (2)
(H.A.G.
Lawrence Addicks, Bel Air, Maryland

CERRO DE PASCO COPPER CORPORATION

M E M O R A N D U M

March 31, 1951

To: Mr. R. P. Koenig--Lima & Oroya--/ Enc.

From: A. R. Merz

Subject: February, 1951 Metallurgical Accounts--Lead Recovery

When the metallurgical accounts for February, 1951 became available, with an indicated unaccounted loss of 1,762,915 pounds of lead and a recovery of only 78.13%, a conference was held with Messrs. Merz, Barker, Higgs, Chancellor and R. Gillespie being present.

No positive explanation of the apparent loss and poor recovery figures could be advanced by the staff. The attached memorandum from Mr. Higgs to Mr. Barker dated March 29, points out various possible explanations for losses, and that the year-to-date figures indicate a gain of 140,590 pounds of lead, and a recovery of 91.51%, following a clean-up of the sintering plant in January.

It has long been recognized that segregation of copper and lead receipts is necessary to avoid the losses entailed in lead-bearing material reaching the copper circuit. Until the installation of the lead concentrate receiving pocket is complete, copper and lead materials are unloaded at the same point. The practice pending completion of this installation is to keep supervision on all shifts to be as certain as possible that all clean up from the present unloading pocket goes to the lead beds, and that copper and lead bearing materials are placed on the proper beds.

The last steel required for completion of the lead concentrate pocket is now being fabricated in the shops. Mr. Healy's crew is working on erection of the material and anticipate finishing the job about the end of April. Some effect on the date of completion will be had by the date on which the last steel is available to the Construction Department, of course. Shop work is on a two shift basis to hurry it all possible.

ARM:p

Enclosure

cc: NYO (Plus 1 Encl.) JWH (3) WEC
JDS " " " HAG

(R. 10-20-50)

CERRO DE PASCO COPPER CORPORATION

March 30, 1951.

To: Mr. A. R. Merz.

From: W. E. Chancellor.

Subject: Metallurgical Balances

Reference is made to Mr. Koenig's letter of March 14 to you in which the accuracy of the accounting procedure in metal balances is questioned.

It is customary accounting practice to add new intake and decreases in stocks and call the sum "To account for". The production (refined metals, increases in stocks, slag and stack losses) is "Accounted for". If the "Accounted for" is less than the "To account for" then the difference is then called "Unaccounted for". However, if the "Accounted for" is more than the "To account for", the difference is then called "Weight and assay correction".

(signed)

W. E. Chancellor

WEC/fp.

La Oroya, March 29th, 1951.

To: Mr. I. L. Barker, Asst. Supt., La Oroya.

From: H. W. Higgs, Asst. Supt. Lead Smelting, La Oroya.

Subject: February Lead Loss

Lead losses for February are hard to explain on the basis of that month alone but when consideration is given to results obtained in January, it would appear that January figures were grossly in error and that year to date figures through February should be approximately correct.

On January 1, it was estimated that 150 tons of cleanup were present under the sinter plant. During the month 1770 tons were picked up containing 666 tons of lead and on February 1, it was estimated that 250 tons of cleanup were present. The February 1, estimate should have been a fairly accurate one. This would allow a cleanup gain of only 704 tons of lead or 1,408,000 lbs. instead of the gain of 1,899,625 lbs. actually taken and this before normal unaccountable losses.

Actually all of this pick-up was not gain, a certain amount being normal production. Production for February was 835 tons containing 298 tons of lead and production for March will be approximately 450 tons containing 165 tons of lead. If February and March production are averaged and this figure of 232 tons of lead used for January production, then total gain in January would become 472 tons of lead or 944,000 lbs.

If stack and unaccountable losses over the past four years are averaged, a loss of 270 tons of lead per month is found. Since stack losses for January and February amount to 197 tons, unaccountable losses should be 343 tons for these two months on a projected basis. This amounts to 686,000 lbs. Overall lead recoveries year to date show a gain of 140,590 lbs. of lead through February. This added to the predicted unaccountable loss gives a total 826,590. This figure is within 60 tons of the possible gain in January, and well within the limits of inventory error.

Actually we have done very little toward correcting unaccountable losses in the Smelter as a whole, so that I can see little or no reason for expecting that better results should be obtained this year than in the past.

Loss of material through plant cleanup going to the river has largely been eliminated. This loss probably amounted to only about 100 tons of lead per year.

Loss of metal values through the ditch past the casting wheel has been largely stopped. This loss ran up to 60 tons per year.

Loss of metal through dusting of arsenic elimination dusts has been improved by wetting the dust, but operation of the moisturing drum has been very erratic and much improvement must be made before this system can be called satisfactory. It is impossible to estimate how much lead is lost that way.

Loss of metal through the sinter plant stacks has now been determined as amounting to slightly over 400 tons of lead per year. This will involve a major ventilation job to catch this material. Data will be submitted shortly on this problem.

Loss of lead through circulation of lead products through the copper smelter is probably the largest cause of loss we have. During 1950, 680 tons of lead per month entered the roasters above that which could be accounted for in roaster feed and Jan. and Feb. of 1950 show no improvement. The unaccountable caught in the Cottrell is even greater, showing that more lead enters the copper circuit later, probably in the converters as sinter or with the lead matte. This lead must pass through the entire copper circuit where unaccountable losses are certainly high, especially in the converters. It creates an additional dust burden at the Cottrells causing high stack losses. It causes greater dust loss during bedding since more dust is involved and the difficulty of moisturing is increased. It causes additional losses in the sinter plant since more tonnage must be smelted (Dust assay 25% lead against the original concentrate assay of over 50%) and fume and dust production from sinter are much greater where large quantities of dust are being treated. Mr. Hull has just submitted a report, which is very revealing, showing the quantities of lead involved this way. I believe that it will be impossible to correct this condition until the lead pocket is completed and feel that this job should be given all priority possible.

In conclusion I believe it can be said that recoveries appear about normal for the year to date and that January figures were almost certainly in error for some reason not apparent.

H. W. Higgs
Asst. Supt., Lead Smelting

HWH/AF

La Oroya, March 29th, 1951

To: Mr. J. W. Hanley, Superintendent, La Oroya.

From: K. Hull

Subject: Copper Smelter Lead Balance

After following materials thru the copper circuit making a lead balance for each section, I have found that naarly twice as much lead can be accounted for as enters the roaster feed (ores, concentrates and miscellaneous products). Dust put to the copper beds is not taken into account as it is not shown as being collected in the balance, hence a circulating load.

The figures shown, when possible, are from the Monthly Metallurgical Account books. Dust figures have been taken from various Experimental Department reports, while assays are taken from the Monthly Laboratory Reports. Dust produced in the sinter plant has been deducted; however, the lead Blast Furnace Fume is not considered either in the Arsenic Elimination Calcine or the stack loss. Mos of this dust has been saved for future treatment. The exact figures are difficult to separate.

There are several things that should be noted from this study:

1. That lead is consistently entering on the copper beds equivalent to about 30 cars weighing 30/35 tons and containing 65% Pb each month. That "Gringo" supervision might have helped during November as shown by the best results obtained during the year acquired in December. There is no apparent benefit from present supervision.

2. That the apparent loss of lead in the Reverberatories may be due to low matte weight figures as well as low dust tonnages.

3. That in the converters, where greatest unaccounted for loss should occur because of blowing while turning converters and fume leakage around the hoods, shows an excellent balance. Since there is not an apparent unaccounted for loss in this section, lead must be entering the circuit here either from the lead furnaces or sinter thru the belt system put to silica bins.

4. That the dust recovery data determined and reported by the Experimental Department is so erroneous that the values are not useful. This does not apply to the stack loss tests as shown by the new automatic dust tester as sufficient time has not been given for determining the efficiency of this operation nor is there an accurate means of checking the exactness of results found.

The following tabulations are presented to show the lead balance for the roasters, reverberatories, converters, cottrells and a summary of the copper smelter operation.

ROASTER LEAD BALANCE

Short tons lead

	IN	OUT			
	Feed	Calcine	Arsenic Cottrell	Gain	% Accounted for
1950					
January	672	983	91	402	160
February	517	1365	90	938	280
March	548	1652	74	1178	316
April	470	1057	61	648	238
May	615	979	61	425	171
June	813	1797	40	1024	226
July	1082	1514	50	482	145
August	1149	1919	50	820	169
September	921	1642	80	801	187
October	921	1683	59	821	190
November	686	1208	74	596	187
December	730	1012	45	327	145
Average	760	1401	65	705	192
1951					
January	716	1279	73	636	189
February	608	1171	66	629	203

REVERBERATORY LEAD BALANCE

Short tons lead

	IN		OUT					
	Calcine	Conv. Slag	Reverb. Matte	Hot R. Cott.	Reverb. Cott.	Slag	Loss	% Accounted for
1950								
January	983	428	671	65	63	223	389	70
February	1365	329	734	34	56	159	711	58
March	1652	369	781	45	57	210	928	54
April	1057	352	715	72	49	174	399	72
May	979	217	914	67	36	176	3	97
June	1797	363	1095	64	40	286	675	71
July	1514	351	1133	60	52	240	380	80
August	1919	385	1256	81	76	346	546	76
September	1642	338	912	86	51	211	720	64
October	1683	389	1162	80	115	294	421	80
November	1208	148	853	83	41	196	183	87
December	1012	254	857	63	27	226	93	93
Average	1401	327	924	67	55	228	454	74
1951								
January	1279	274	780	65	44	277	387	75
February	1171	278	745	66	51	185	402	72

CONVERTER LEAD BALANCE

Short tons lead

	IN		OUT				
	Reverb. Matte	Ore & Pb. Fce.	Conv. Slag	Dust	Mis. Products	Gain	% Accounted for
1950							
January	671	153	428	376	168	148	118
February	734	76	329	630	152	301	137
March	781	81	369	348	153	8	101
April	715	84	352	539	251	343	142
May	914	45	217	417	182	-143	85
June	1095	71	363	554	251	2	100
July	1133	125	351	497	180	-230	82
August	1256	182	385	539	214	-299	79
September	912	187	338	475	330	44	103
October	1162	175	389	459	278	-211	85
November	853	133	148	439	338	- 61	94
December	857	271	254	345	242	-287	75
Average	924	132	326	468	228	- 34	97
1951							
January	780	275	274	506	249	- 27	98
February	745	155	278	469	172	13	101

COTTRELL DUST BALANCE

	Experimental Dept. Data Cottrells									
	Arsenic	H. Reverb	16/21	1/12 Less Sinter	Ars. Elim.	Sinter Deduction	Copper Sect. Dusts	Stack Loss	Gain not Acc. for	% Gain
1950										
Jan.	91	65	63	376	1185	82	1103	78	586	198
Feb.	90	34	56	630	1144	80	1064	103	357	144
Mar.	74	45	57	348	933	92	841	62	379	172
Apr.	61	72	49	539	1304	97	1207	43	529	173
May	61	67	36	417	1029	80	949	47	415	170
June	40	64	40	554	1322	98	1224	78	604	186
July	50	60	52	497	1369	79	1290	95	726	210
Aug.	50	81	76	539	1541	94	1447	94	795	206
Sept.	80	86	51	475	1375	89	1286	71	665	196
Oct.	59	80	115	459	1455	92	1363	96	746	205
Nov.	74	83	41	439	915	74	841	78	282	144
Dec.	45	63	27	345	1127	86	1041	97	658	237
Average	65	67	55	468	1225	87	1138	79	562	186
1951										
Jan.	73	65	44	506	1298	87	1211	128	651	194
Feb.	66	66	51	469	1103	97	1006	69	423	165

SMELTER LEAD BALANCE

Short tons lead

	Smelter Lead Gain			Total Before Dust Correction	Dust Correction (gain)	Copper Smelter Lead Gain
	Roaster	Reverbs	Converters			
1950						
January	402	-299	148	252	586	838
February	938	-711	301	528	357	885
March	1178	-928	8	258	379	637
April	648	-399	343	592	529	1121
May	425	- 3	-143	279	415	694
June	1024	-675	2	351	604	955
July	482	-380	-230	-128	726	598
Aug.	820	-546	-299	- 25	795	770
September	801	-720	44	125	665	790
October	821	-421	-211	189	746	936
November	596	-183	- 61	352	282	634
December	327	- 93	-287	- 53	658	605
Average	705	-446	- 34	226	562	788
1951						
January	636	-387	- 27	222	651	873
February	629	-402	13	240	423	663

K. Hull
Smelter Metallurgist

KH/AF