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Petrography Lab proposal documents
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INTERLAKE, INC.

CAPITAL EXPENDITURE AUTHORIZATION SUMMARY

C.E.A. NO.

TEMP. NO.

DIVISION-PLANT: Corporate

ITEM NO.-CAPITAL PLAN:

PROJECT TITLE: Coal and Coke Process Laboratory

TOTAL CAPITAL AMOUNT IN CAPITAL PLAN:
PROFIT PLAN:
FIRST REVIEW:
SECOND REVIEW:

COMPLETION TIME (MONTHS FROM APPROVAL): 6 months

PROJECT SPONSOR: A. Mertdogan and C. Lin

CAPITAL FUNDS TO BE APPROVED:

Land	$
Buildings	
Equipment	94,655
Less: Cash value of facilities replaced	$
	$ 94,655

TOTAL INVESTMENT:

Capital Funds	$ 94,655
Working capital	
Total	$ 94,655

JUSTIFICATION:

Discounted Cash Flow Return: ____ %

Payback Period: ____

RELATED EXPENSES:

Expense:

Project - Tax	$ 4,740
Start-up	
Total	$ 4,740

DESCRIPTION AND JUSTIFICATION:

In recent years, coal petrography and other bench-scale testings have become recognized as very successful means of evaluating the properties of coal for coke making process. In other words, coking process is no longer a kind of art, it is predictable. Our company uses about 1.3 million tons of coal a year in our coking operations, at a cost of about close to $50 million. However, we neither have any such laboratory facilities, nor spend any money in this field which is very vital to Interlake. We still depend on trial and error method to make our coke.

In addition, the energy crisis has brought in the market place a number of coals that had formerly unknown to public or not been considered suitable for metallurgical use. Coal with good reputation for coke making becomes less and less in quantity, and higher and higher in price. This situation can be expected to continue into foreseeable future. Our company does need a reliable method to evaluate coals before they enter coke oven complex. To set up such a coking process laboratory is both essential and urgent for Interlake. For example, as little as one-half of one percent savings in our coking operations due to better utilization of coals available to us and/or due to improvement of the quality of coke produced can pay for the entire proposed laboratory within a year. In fact, several percentage savings annually is a very conservative estimation.

APPROVED BY

	TITLE	SIGNATURE	DATE
1.	Director Corporate Research		
2.	Director of Engineering and Research		
3.	Vice President Engineering and Research		
4.	President and Chief Operating Officer		
5.	Chairman and Chief Executive Officer		

922-C

INTERLAKE, INC.

EXPENDITURE AUTHORIZATION

SCHEDULE A

DESCRIPTION OF PROJECT AND ALTERNATIVES CONSIDERED

PROJECT NO.	
PROJECT TITLE	DIVISION-PLANT
Coal and Coke Process Laboratory	Corporate
DEPARTMENT OR COST CENTER	BUILDING / FLOOR
Corporate Research	Technical Center /

When evaluating coals or coal blends for coking potential, the plant operator is basically seeking answers to three questions: 1) Will the physical and chemical properties of the coke produced meet the needs of the blast furnace? 2) Will the coking pressure be below the established safety limit? 3) Will there be sufficient contraction, after the completion of the coking process, to allow easy pushing?

Can bench-scale testings provide valuable answers to the above questions? The reply should be "positively". Using bench-scale tests to evaluate possible coking potential is a developing science and somewhat like "weather forecast". We could not get 100 percent correct answer from prediction, but nobody dares to deny the importance of weather forecast. In addition, bench-scale testings are tools for the screening of coals or coal blends, and they can rule out most of the unfavorable combinations. In this way, the real coke oven trial runs may be cut down to a minimum.

The following are the brief descriptions for the proposed equipment.

1. Automatic Microscope

This equipment is for petrographic study only. From petrographic study, we can quantitatively determine the amount of each component in coal. Therefore, we would be able to avoid the weathered coal or coal with undesired constituents, since they never make good coke.

Coke should be strong enough for use in the blast furnace. Coking pressure should not exceed the safety limit of coke oven. Coke stability and peak coking pressure can be predicted within fair accuracy on the basis of the information gathered through microscopic investigation of the coal blend.

2. Sole-Heated Oven

A right combination of coal blend should have enough contraction after the completion of the coking process to allow easy push. Usually, the more the volatile matter is, the more is the contraction. The Sole-Heated Oven provides information on the expansion or contraction of a coal blend under specified carbonization conditions.

3. Gieseler Plastometer

Gieseler Plastometer can determine the relative plastic behavior of a coal blend when heated under prescribed conditions in the absence of air. It helps us to select compatible coals for blending and optimum proportioning of coals in blend for the production of good blast furnace coke. It can also predict coke stability.

4. Apparatus for Free-Swelling Index

Coal is heated in a crucible under specified conditions. The shape of the coke button that forms indicate the caking and free swelling characteristics of a coal blend.

5. Grindability Tester

Usually, the finer the coal particle is, the higher is the stability of coke produced. The grindability tester determines the relative grindability or ease of pulverization of a coal in comparison with coals chosen as standard.

6. Calorimeter

With calorimeter, we can measure the heating value of coals and coke. We can also figure out the heating value of coal-oil slurry, fuel oil or other injectants that we use in our blast furnaces.

The proposed laboratory which is estimated at $99,395 would include almost all of the apparatus necessary for a coal and coke process laboratory except an 18-inch test oven.

18-inch test oven can be considered as a pilot plant bridging the laboratory scale apparatus and the commercial coke ovens. It is the most expensive and the most useful equipment in this field. It provides information of real coking process for a specific coal blend, except in a small scale. The preliminary estimate for 18-inch test oven, a new building to house it, and other related expenses is $166,650. The 18-inch test oven would comprise second stage of the coal and coke laboratory. A formal proposal will be prepared for an 18-inch test oven in the future.

At present, there is no alternative way for us to determine the coking characteristics of coals and physical properties of coke produced from these coal blends reliably and promptly.

It is true that the Illinois State Geological survey has a fully equipped coal and coke process laboratory. However, the Geological Survey is interested in promoting use of raw materials produced in Illinois. Therefore, as long as, we have Illinois Coal in our coking coal blend, we may receive their services, otherwise their services may be denied to us. Another disadvantage of using services of the Geological Survey is that there are considerable delays involved in performing tests requested by Interlake on account of their busy schedule.

Another alternative would be to use the services of commercial testing laboratories. However, the bench-scale laboratory tests performed by these laboratories are restricted and comprise only fluidity tests and calorimeter tests. The fees charged for these tests are not excessive. However, the reliability of the test results and the promptness in providing answers to pressing questions seem to favor setting up of our own coal and coke process laboratory.

Therefore, with the help of the first stage laboratory, we would be able to screen most of the unfavorable coal combinations, and meanwhile, depend on the outside sources for 18-inch oven tests.

In summary, a coal and coke laboratory is both essential and urgent to Interlake. The cost of the entire laboratory is expected to be paid back within a short time, probably less than a year.

INTERLAKE, INC.

EXPENDITURE AUTHORIZATION

SCHEDULE B

CALCULATION OF EXPENDITURE REQUIRED AND EXPENDITURE PAYOUT PERIOD

PROJECT NO.

PROJECT TITLE: Coal and Coke Process Laboratory

DIVISION-PLANT: Corporate

SUB-ACCOUNT NUMBER	CHECK DIGIT NUMBER*	DESCRIPTION	EXPENDITURE AMOUNT CAPITAL	EXPENDITURE AMOUNT EXPENSE	ACCOUNT DISTRIBUTION
		First Stage (1)			
001		Automatic Microscope (Zeiss)	$ 25,000		
002		Sole-Heated Oven (To be Built By Res. Dept.)	20,000		
003		Gieseler Plastometer (Commercial Testing Eng.)	24,000		
004		Apparatus for Free Swelling Index	200		
005		Grindability Tester (Preiser Scientific Corp.)	3,850		
006		Calorimeter (Sergent-Welch)	13,000		
007		Contingency (10% of above)	8,605		
008		Tax		$ 4,740	
		Total	$ 94,655	$ 4,740	

Payout Period: 1st and 2nd Quarters of 1977.

(1) Basis of Estimates

The prices were obtained through telephone conversations, and are subject to change.

*To be filled in after

INTERLAKE, INC.

EXPENDITURE AUTHORIZATION

SCHEDULE B

CALCULATION OF EXPENDITURE REQUIRED AND EXPENDITURE PAYOUT PERIOD

PROJECT NO.

PROJECT TITLE: Coal and Coke Process Laboratory

DIVISION-PLANT: Corporate

SUB-ACCOUNT NUMBER	CHECK DIGIT NUMBER*	DESCRIPTION	EXPENDITURE AMOUNT CAPITAL	EXPENDITURE AMOUNT EXPENSE	ACCOUNT DISTRIBUTION
		Tentative Proposal for Second Stage (2)			
009		18-inch Test Oven (To be Built up by Res. Dept.)	$100,000		
010		New Building	40,000		
011		Office Supplies	2,000		
012		Other Laboratory Supplies - Balances, Pans, Ovens	9,000		
013		Contingency (10% of above)	15,100		
014		Tax		$ 550	
		Total	$166,100	$ 550	

(2) Basis of Estimates

These prices are rough estimations, and will be reestimated more closely at the time a formal proposal is presented for the second stage of the coal and coke process laboratory.

*To be filled in after approval

15-3924-A

INTERLAKE INC.

EXPENDITURE AUTHORIZATION
SCHEDULE C
PROJECT JUSTIFICATION

PROJECT NO.	

PROJECT TITLE	DIVISION-PLANT	
Coal and Coke Process Laboratory	Corporate	
DEPARTMENT OR COST CENTER	BUILDING	FLOOR
Corporate Research Department	Technical Center	

The need for cheap and better quality coke is becoming more and more important with the increasing emphasis on lower coke rates, higher blast furnace production rates, and low-quality coals. To meet the future demands, a sufficient knowledge should be acquired of the properties of raw materials used in coke making, as well as the coking process itself. Actually, our company is completely lack of this type of research at this moment, and ten to fifteen years behind the iron and steel industry. It is now the time to set-up such laboratory facilites.

At present there is no alternative way to provide the necessary information on coal and coal blends reliably and promptly.

The proposed first stage laboratory facilities encompass minimum apparatus to do the screening work. After ruling out most of the unfavorable combinations, we can depend on the outside sources for 18-inch oven test. This way we would have a chance to improve our coking process and quality of coke produced.

We believe the potential savings that are achievable from the selection and best use of the coals available to us would amply justify to proceed with the first stage laboratory immediately and with the second stage laboratory in the near future.

7-17-74

TO : J. DUNCAN

FROM : R. SPAETH

SUBJECT : COAL TESTING LABORATORY

THE COST TO SET UP A COAL TESTING LABORATORY IS ESTIMATED AS $339,112.00 IN SPITE OF THE ADVANTAGES QUICKER RESULTS AND CONTROL OF TESTING PRIORITY, IT IS MY OPINION THAT THE COST FOR RUNNING 2-8 COAL SAMPLES COULD NOT BE JUSTIFIED. IT IS, OF COURSE, POSSIBLE THAT THE WORK COULD BE DONE AT THE TECH CENTER IF THE EQUIPMENT IS PURCHASED. THE COST OF THIS OPTION EXCLUSIVE OF LABOR AND INSTALLATION IS ABOUT $212,985.00

MR. NAGAN HAS SEEN THE NEED FOR BETTER PROCESS CONTROL ANALYSIS. IF HIS REQUEST IS JOINED WITH THE COAL TESTING LAB REQUIREMENTS A LABORATORY MIGHT BE JUSTIFIED. IF WE ASSUME THAT FUTURE POLLUTION CONTROL AND HEALTH STANDARDS WILL BECOME STRICTER AND THAT SAMPLE COLLECTION AND ANALYSIS WILL BE MORE THAN THE TECH CENTER COULD HANDLE THEN A NEW LAB MUST BE STARTED AS SOON AS POSSIBLE.

ATTACHED IS A LIST OF TESTING REQUIREMENTS IN THE ORDER OF MR. MYHRE'S PRIORITY.

THE EQUIPMENT, ESTIMATED COST, TEST TIME AND MAN-POWER REQUIREMENTS, SPACE AND UTILITY REQUIREMENTS FOR EACH TEST IS LISTED. NOTE THAT SOME EQUIPMENT, MANPOWER AND SPACE IS DUPLICATED AS ADDITIONAL TESTS ARE SELECTED. PAY RATES ARE THOSE EFFECTIVE 8-1-73. LABORATORY FT² COSTS WERE ESTIMATED AT $45/FT² AND SAMPLE ROOM COSTS AT $30/FT². SUPERVISOR COST USED WAS $15,000/YR. INSTALLATION COSTS ARE NOT INCLUDED IN THE COSTS.

TOTAL MANPOWER REQUIREMENTS:

1 SAMPLER J.C. 7, 2 CHEMISTS J.C. 15 AND ONE SUPERVISOR. THE SAMPLER COULD BE ELIMINATED BY HAVING A CHEMIST DO HIS WORK. COST $35,400

TOTAL SPACE REQUIREMENTS:

120 SQ. FT. SAMPLER SPACE @ $30/FT² = $3600

1745 " " CHEMIST " @ $45/FT² = $78,525

TOTAL 1865 " " $82,125

TOTAL EQUIPMENT COST: $717,985

THE DIFFERENCE BETWEEN THE SUM OF THE TOTALS HERE AND THE LAB COST ON THE FIRST PAGE IS $85580, THE WAGES OF A SAMPLER.

SOME COMMENTS ON THE OVENS AND THE PRICES GIVEN: THE SOLE HEATED OVEN PRICE IS FROM A VENDOR. ANOTHER SOURCE SAYS THAT THE OVEN CAN BE HOMEMADE FOR ABOUT $15,000. THE SAME SOURCE SAYS $100,000 IS A HIGH SIDE ESTIMATE OF BUILDING A MOVABLE [illegible] OVEN.

PRIORITY TEST

1 BULK DENSITY – SHOVEL* ~ $10, CONE* ~ $150, CUBIC FOOT* ~ $50,
PLATFORM SCALE* ~ $500 TOTAL $1010
SPACE 40 FT.² COST $1200
TEST TIME – 15 MINUTES
MANPOWER – 1 SAMPLER J.C.7 + 1 SUPERVISOR ~ $2355
TOTAL COST ~ $25790 + SUPERVISORS OFFICE

X 2 PROXIMATE ANALYSIS – DRYING OVEN* ~ $100, BALANCE* ~ $1000, VOLATILE MUFFLE*
~ $250, POTENTIOMETER* ~ $500, 2 COAL CRUSHERS*
E $2000, THERMOCOUPLES* $50, ASH MUFFLE ~ $250,
Chicago Plant has it! 2 TEMPCOMETERS* $300, CRUCIBLES* ~ $100, DESICCATOR* ~ $100,
EITHER ① PLATINUM CRUCIBLES + CHEMICALS ~ $1000 OR
LECO FURNACE + TITRATOR ~ $3500 OR BOTH ~ $4500
MISC. LIGHTING, HOODS, GAS, OXYGEN, ELECTRICITY,
DISTILLED WATER TOTAL $5550, 8150, 9150
SPACE 225 FT.² COST $10,125
TEST TIME 5-8 HRS - OVERNIGHT
MANPOWER – 1 CHEMIST J.C. 15 + 1 SUPERVISOR ~ $25,211
MAINTENANCE ~ 1 DAY/6 MONTHS
TOTAL COST $44,456. LESS PRIOR PUBLICATION $21,956

3 FREE SWELLING INDEX – FURNACE* $750, BALANCE* ~ $1000 ✓, 500g WEIGHT*
~ $15 ✓, 2 COAL CRUSHERS* E $2000 ✓, SCREENS* ~ $75
TOTAL ~ $3840 LESS PRIOR PUBLICATION ~ $825
SPACE 30 FT.² ✓ COST $1350

TEST TIME - 20 MINUTES

MANPOWER - 1 CHEMIST J.C. 15✓ + 1 SUPERVISOR✓ ~ $25,211

MISC - ELECTRICITY REQUIRED✓

TOTAL COST $30,401 LESS PRIOR DUPLICATION $825

X 4 SCREEN TEST

LARGE DRYING OVEN* E $2500, PANS* ~ $300, BALANCE* ~ $200

WHEEL BARROW* ~ $75, SHOVEL* ~ $10✓, BROOM* ~ $15, SCREENS* ~ $300 TOTAL ~ $3400

Tech. Center has it!

SPACE 100 FT² COST $3000 LESS PRIOR DUP - $1800

TEST TIME - 4HRS

MANPOWER - 1 SAMPLER J.C. 7✓ + 1 SUPERVISOR✓ ~ $23580/YR

MISC. LIGHTING, ELECTRICITY, DUST HOOD

TOTAL COST $29980 LESS PRIOR DUPLICATION $5200

X 5 TUMBLER TEST

SCREENS* ~ $300✓, WHEEL BARROW* ~ $75✓, PANS* ~ $300✓

BALANCE* ~ $200✓, BROOM* ~ $15✓, SHOVEL* ~ $10✓,

Tech. Center has it

TUMBLER* $4480, OVEN* E $2500✓, TOTAL ~ $7880

LESS PRIOR DUPLICATION $4480

SPACE 100 FT²✓ COST $3000 LESS DUP $600

TEST TIME - 1½ HRS

MANPOWER - 1 SAMPLER J.C. 7✓, 1 SUPERVISOR✓ ~ $23580/

MISC. LIGHTING, ELECTRICITY.

TOTAL COST $34,460 LESS PRIOR DUP. $5080

X 6 TRACE ANALYSIS OF ASH

Chicago plant has it

ATOMIC ABSORPTION* $11,835, HOT PLATES* $200,

MISC. GASES, AIR, DISTILLED WATER✓ OR

TRIPLE MAN HOURS, HOT PLATES $200, DOUBLE SPAC

MISC CHEMICALS + EQUIPMENT, HOODS

COST $12,035

SPACE - 200 FT² OR 400 FT² COST $9000 OR $18,000

MANPOWER - 1 CHEMIST J.C. 15 ✓, 1 SUPERVISOR ✓, ~ $25,211

TEST TIME - 8 HRS OR 24 HRS

TOTAL COST $46,246 LESS PRIOR DUP. $21,035

7. SOLE-HEATED OVEN

OVEN $70,000, HAMMER MILL $3655, CONE* ~$150 ✓,

DRYING OVEN* E $2500 ✓, VIBRATOR + SCREENS ~ $450,

MISC. LIGHTING, SHOVELS, HOODS, 440 ELECTRIC, BRUSHES,

COST $76,755 LESS PRIOR DUP. $74,105

SPACE - 400 FT² COST $18,000

MAN POWER - 1 CHEMIST J.C. 15 ✓, 1 SUPERVISOR ✓, ~ $25,211

TEST TIME 8 HRS.

MAINTENANCE - 1 DAY / 2 WEEKS

TOTAL COST $119,966 LESS PRIOR DUP. $52,105

8 GIESELER

GIESELER PLASTOMETER $5800, RIFFLE* ~$150, GAUGE* $

SCREENS* ~ $300 ✓, MISC. ELECTRICITY, LIGHTING, HOOD.

COST $7010 LESS PRIOR DUP. ~ $5980

SPACE 20 FT² COST $900

MANPOWER - 1 CHEMIST J.C. 15 ✓, 1 SUPERVISOR ✓, ~ $25,211

TEST TIME 5-8 HRS

TOTAL COST $33,121 LESS PRIOR DUP. $6580

9 MOVEABLE WALL OVEN — OVEN – E $100,000, MIXER E $2000, HAMMER MILL $3655,

SHOVEL – $10 ✓, SCREENS – $300 ✓, DRYING OVEN E $2500

COST $108,465 LESS PRIOR DUP. $102,000

SPACE 900 FT² COST $40,500

MANPOWER – 2 CHEMISTS J.C. 15, 1 SUPERVISOR ✓,

COST ~ $35,922 LESS PRIOR DUP. ~ $10,211

TEST TIME 8 HRS · OVERNIGHT

MAINTENANCE – 1 DAY / 2 WEEKS

TOTAL COST $184,387 LESS PRIOR DUP $152,711

✓ MEANS DUPLICATE ITEM OCCURS IN A HIGHER PRIORITY.

E " ESTIMATED COST FROM OLD PRICES

~ " " " " PRICES WITHIN 2 YEARS

NO QUALIFICATION MEANS A RECENT QUOTE

* MEANS EQUIPMENT ON HAND AT CHICAGO FURNACE.

① THERE MAY WELL BE REASON TO RUN SULFURS BY BOTH LECO AND A.S.T.M. METHODS. IF ONE METHOD ONLY IS REQUIRED SOME COST COULD BE SAVED.

March 3, 1977

Mr. Edward Wade
Colonial East Apts. S-D
1433 East Walnut St.
Carbondale, Ill. 62901

Dear Mr. Wade:

Thank you very much for your letter and you resume. I am sorry for my belated response.

Our planning Coal and Coke Processing Laboratory, which involved more than quarter million dollar Capital spending, has just being turned down by the plant. However, we are still fighting for it.

At this moment, I could not tell

you anything definite. I wish you good luck somewhere else.

Sincerely yours,

C. Lin
Senior Research Engineer.

Engineer C. Lin

Date March 3 1977

PHONE CALL AND VISIT
REPORT

Called
Visited Mr. Raymond Zimmerman Title Vice President, Paul Weir Co.

Title

Title

Representing

Project to be charged D1-006-000

Purpose of ~~Visit~~ Call To get more information about the Value of a petrographic laboratory for coal

Accomplished by ~~Visit~~ Call

Unfortunately, Mr Zimmerman was out of town. He would be back next week. However, I obtained a copy of his manuscript which he presented ~~at~~ on Feb 2 A.I.M.E. Meeting from his secretary. That manuscript would be very helpful if we have the chance to have our own petrographic laboratory.

Future Action

I will call him again this coming Tuesday.

Engineer C. Lin

Date March 11, 1977

cc: A. Medlegan

PHONE CALL AND VISIT REPORT

Called ~~Visitors~~ Mr. ~~Zimmerman~~ Title Vice President

Title Weir Paul Co.

Title

Representing

Project to be charged D1-006-000

Purpose of ~~Visit~~ Call To get additional information about how to set up a petrographic laboratory after reading this manuscript used on Feb. 2 AIME Meeting

Accomplished by ~~Visit~~ Call I asked him:

(1) What is Composition - Balance Index?

(2) What is Strength Index?

Where can I get these information, or Computer programs..?

(3) Do you have, and can you send me some of the other paper you present somewhere else?

He told me.

I can get these information from a paper called "Use of Petrographic study for Coke Stability".

1976, R G Moses

Published by Bituminous Coal Research Inc.

350 Hochberg Road.

Monroeville Pa.

~~Future Action~~