COVOL TECHNOLOGIES, INC.™

"Recycling yesterday's waste into tomorrow's resources."™

Utah Department of Natural Resources
Division of Oil, Gas and Mining
Mr. Randy Harden
1594 West Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

RECEIVED
MAY 23 1997
DIV. OF OIL, GAS & MINING

Copy Randy
ACT/007/007 #2

May 21, 1997

Dear Mr. Harden:

Enclosed you will find the detail your department has requested. This information is submitted to you to support our request for a post mining use of the Sunnyside Coal Mine permit ACT/007/007.

Covol Technologies plans to convert the footprint area into an industrial briquetting and iron producing factory. In using the new patented technology, *Covol* will convert iron rich waste material from steel mills and other industries into high quality iron bars for sale to foundries and the steel industry.

THE FOLLOWING EXHIBITS ARE ENCLOSED:

Exhibit A - Written detail of each item which will remain as is and used by *Covol* to be converted into the new iron facility.

Exhibit B - Map indicating location of items, as well as boundary of footprint area requested.

Exhibit C - Drawings of perceived future facility in footprint area.

Exhibit D - Background information on *Covol*.

Exhibit E - Segments of feasibility study, completed by Lockwood - Greene on the Sunnyside facility.

If you have any questions, please feel free to call.

Sincerely,

Russ Madsen

Russ Madsen
Executive Vice President

RM:rl

3280 North Frontage Road • Lehi, Utah 84043 • 801-768-4481 Fax 801-768-4483
1-800-316-6214

EXHIBIT

A

EXHIBIT A

We have identified the facilities or structures our company would like to use, which should be eliminated from the list of reclamation items. Our company will use these items as part of the alternate post mining program. These items were derived from Table 3 of the *DOGM* analysis made to determine the bond requirements. Items on the list which are outside the footprint area are not applicable to the *Covol* request.

1. CLEAN UP - Some general clean up should be done in the footprint area around the lower bench area near the prep plant. All PCB and oil contaminated soils must be removed.

2. POWER LINES - Power poles and light poles should remain.

3. WATER PIPELINES - Water lines around upper area (office, warehouse, maintenance building, and engineering building) should remain. Water lines in lower bench around the wash plant should be removed. Any city water line must remain.

4. PARKING LOT - Leave entire parking lot and concrete sidewalks in place for *Covol.*

5. RAILROAD TRACK - Leave all rail tracks in place.

6. MAIN OFFICE - Leave main office in place.

7. WAREHOUSE - Leave warehouse in place.

8. MAIN CHANGE HOUSE - Leave entire change house in place.

9. TRAINING BUILDING - Leave entire training building.

10. SHOP - Leave entire shop in place.

11. WAREHOUSE ANNEX - Leave entire warehouse annex as is.

12. ENGINEERING OFFICE - Leave entire engineering office in place.

13. BACKFILL BUILDING - Should be removed.

14. PREPARATION PLANT - Must be removed, including underground chemical tanks.

15. CRUSHER -Has been removed.

16. BLENDING BINS - Will probably be removed, however, there is a possibility we may be able to use them. Please notify prior to demolition.

17. CLEAN COAL STOCKPILE BELT - Has been removed.

18. LOAD OUT CONVEYOR - Has been removed.

19. ROTARY CAR DUMP - Has been removed.

20. PREP PLANT OFFICE - Foundation must be removed.

21. PREP PLANT BELT - Remove.

22. MATERIAL FOREMAN'S OFFICE - Remove.

23. HOIST HOUSE - Remove.

24. #3 SLOPE RAMP WALLS - Remove.

25. MANSHAFT BATHHOUSE (2) - Remove.

26. HEAD FRAME MANSHAFT - Remove.

27. BULK ROCK DUST TANK - Has been removed.

28. #3 MINE MILK BUILDING - Remove.

29. GARAGE #2 CANYON - Remove.

30. #2 CANYON TRESTLE BUILDING - Remove.

31. #2 CANYON REPAIR SHOP - Remove.

32. #2 CANYON MATERIAL SHOP - Remove.

33. MANSHAFT MILK BUILDING - Remove.

34. SUBSTATION OUTCROP - N/A

35. SUBSTATION HILLSIDE - Remove.

36. SUBSTATION ROADSIDE - Leave in place.

37. SUBSTATION WHITMORE FAN - N/A

38. SUBSTATION MANSHAFT - Remove.

39. SHOP FAN - Remove.

40. FAN OUTCROP - Remove.

41. FAN WHITMORE CYN - N/A

42. FAN TWIN SHAFTS - Remove.

43. POWER MAGAZINE - Remove.

44. DETONATOR MAGAZINE - Remove.

45. MINE WATER TANKS - Leave in place.

46. SLOPE BELT BUILDING - Not applicable to us.

47. WOOD RETAINING WALLS - Remain as is, however, partial removal or repair may be necessary.

48. BOILER FOUNDATION - Remain as is.

49. DIESEL FUEL STORAGE TANKS - Have been removed.

50. BRIDGE #2 CANYON - N/A

51. UNDERGROUND RAILROAD TUNNEL AT LOAD OUT - Remain as is - will be used as rail thaw shed.

52. THICKENER - Remove.

53. FENCE REMOVAL - Remain as is on *Covol* footprint area. Old, worn-out, or damaged fencing will be replaced with a new fence by *Covol.*

54. GUARD RAILS - Remain in place.

55. BRIDGE ENGINEERING BUILDING - Remain in place. *Covol* will repair the hole in bridge.

56. MAN TRIP UNDERPASS & ROCKSLOPE - N/A

57. SHOP FAN - Remove.

58. CONCRETE RETAINING WALL - BATHHOUSE - Remain as is.

59. MAINTENANCE WATER TANK - N/A

60. MAN SHIFT PUMP HOUSE - N/A

61. OUTCROP - CONCRETE PAD - N/A

62. TROLLEY WIRE AND SUPPORT STRUCTURES - Remove.

OTHER

1. Grassy Trail Creek should be stabilized. Several areas of the bank need to be stabilized to prevent the river from eroding into the bank. We would not recommend relocation as it would encroach into the road of the lower bench.

2. There are three (3) bridges which give access to our footprint area. We would request that all three be left in place.

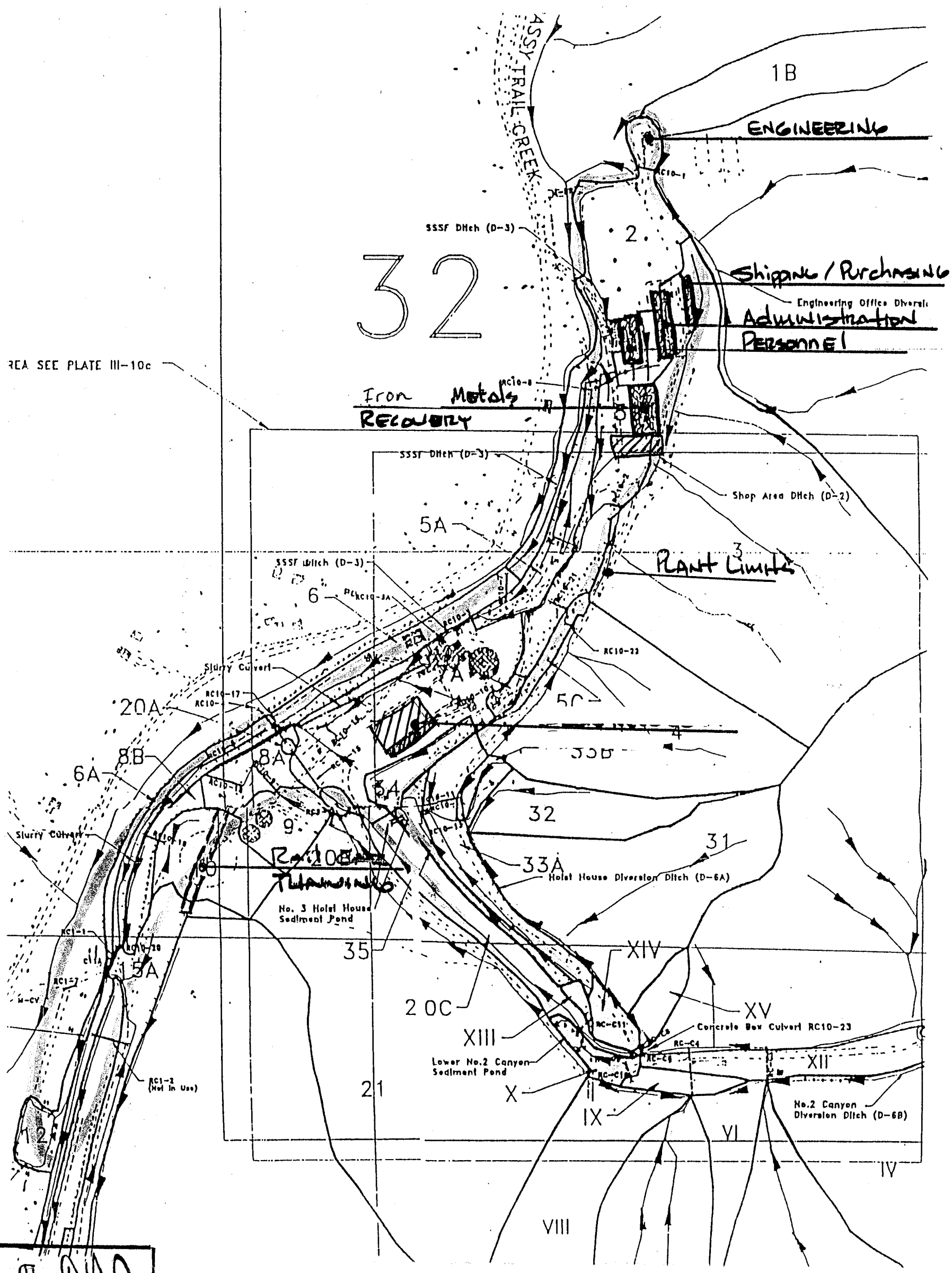
3. Public facilities such as water, gas, and electricity, should remain in place as we recognize the need to continue working with these entities.

4. The bench area above and directly south of the blending bins will be used to stockpile material prior to adding to blending bins. We request that the bench be left as is as well as the sediment pond below.

5. The ambulance garage should be left in place at this time.

EXHIBIT

B



Golder Technologies
Summitville Iron Recovery Facility
General Site Drawing
Exhibit "B"

EXHIBIT

C

Intended Use of Exisitng Buildings

Covol Technologies Inc. is working to bring its iron technology to commercial implementation. In order to do this, a pilot facility must be established to demonstrate and refine the process. The envisioned facility will be large enough to be self sufficient. A five ton electric arc furnace will be installed to produce approximately 30,000 tons of high quality iron scrap per year. The furnace will be installed in the existing maintenance building. The office building, the bath house, the residential building and the metal storage building will be utilized for support operations.

Iron bearing materials will be brought on site where they will be processed into iron. The technology involves combining coal fines and iron rich materials in a binding and briquetting process. The briquettes are cured in a low temperature oven after which they are introduced into an arc furnace. The hot metal made in the furnace is then poured into molds and cooled. The resulting iron has a market value of between $165.00 and $185.00 per ton. It is anticipate that approximately 50 people will be employed at the facility.

Pilot Facility Operations and Equipment

raw material drying and conditioning operation and equipment
mixing and briquetting operations and equipment
five ton electric arc furnace and control equipment
pig casting operation and equipment
bag house
water treatment operation and equipment
electrical substation
laboratory and equipment
maintenance operations and equipment
offices

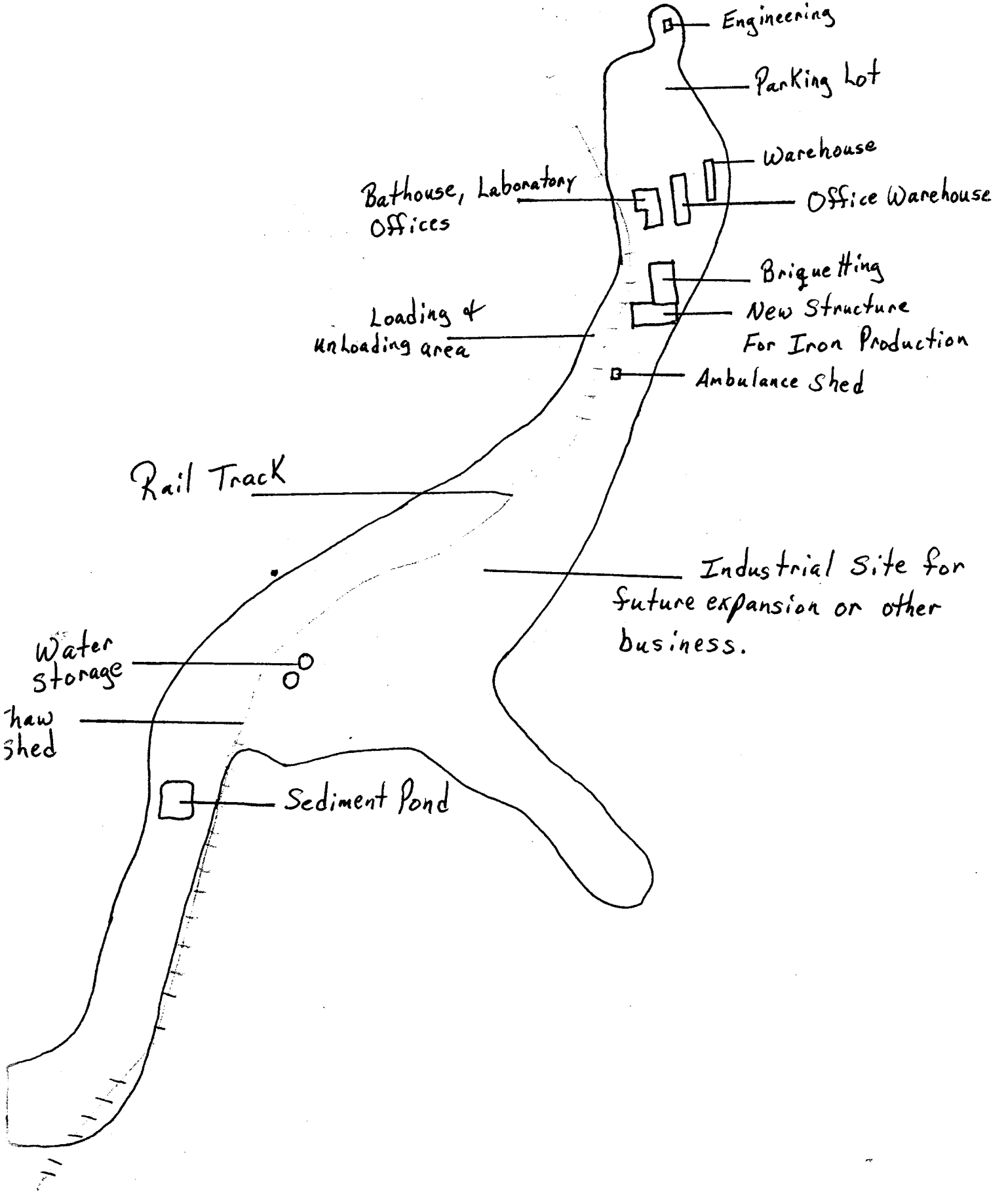
Process Detail

Iron rich materials such and mill scale, blast furnace sludge, grinding swarf and baghouse dust are dried and cleaned by adding cleaning agents and then introducing them into a rotary kiln. The kiln heats the iron rich material to a temperature high enough to dry and clean the material. The conditioned iron rich materials are mixed with coal fines, flux materials such as lime and Covol's binding system. The combined materials are run through a briquetter to form the materials into solid shapes. The briquettes are then cured in an oven at approximately 300 degrees Fahrenheit until they are dry. The dried briquettes are placed in an electric arc furnace where an electric

current is introduced through two carbon rods that are partially submerged in the briquettes and liquid metal remaining in the bottom of the furnace. The electric current produces sufficient heat to cause the coal to heat and remove the oxygen from the iron rich material. The liquid iron is then poured into forms to cause the metal to form a shape as it cools. After the iron is cooled, it is ready to be shipped to iron and steel producers.

The by-products generated from the iron making operations will be bag house dust and slag. The slag can be broken to recover the imbedded iron and then sold to the mine as road base. The bag house dust will be recycled into the process to recover the carbon and iron contained in the dust.

COVOL SITE PLAN



COVOL TECHNOLOGIES, INC.

CORPORATE DATA

1. Exact name of the issuer: Covol Technologies, Inc.

2. Address of its principal executive office:

   Covol Technologies, Inc.
   3280 North Frontage Road
   Lehi, UT 84043

3. State and date of Incorporation: Delaware, August 8, 1995

4. Exact title and class of security: Common

5. Par Value and number of shares authorized: The company has authorized 25,000,000 shares of common voting stock of $.001 par value.

6. Total number of shares outstanding as of February 21, 1997: 7.9 Million

7. Listings: Standard and Poors, OTC Bulletin Board Symbol: CVOL

8. Transfer Agent: Atlas Stock Transfer
   5899 South State
   Salt Lake City, UT 84107
   Name of Contact: David Sorenson
   Phone: (801) 266-7151
   Fax: (801) 262-0907

9. Main Market Maker: Alpine Securities Corporation
   440 East 400 South
   Salt Lake City, UT 84111
   Name of Contact: Michael Vanderhoof
   Phone: (800) 521-5588
   (801) 355-5588
   Fax: (801) 355-0136

EXHIBIT

D

COMPANY BACKGROUND

COMPANY OVERVIEW

Covol Technologies, Inc., ("Covol" or the "Company"), is a Delaware corporation with headquarters in Lehi, Utah. Covol is a technology development and environmental engineering company that has developed and patented processes and techniques to recycle industrial wastes such as coal fines, coke breeze, bag house dust, mill scale and other iron rich waste materials into useable feedstocks for the electric and steel industries. Covol has a staff of 15 management and engineering employees at its headquarters. Approximately 25 additional employees are located either at Covol's test facility in Price, Utah or at its commercial extruding facility, Utah Synfuel 1, in Wellington, Utah.

The Company's core business focus' on recovering resources from industrial waste materials. Waste materials in the form of dust and sludge from steel making processes are converted into solid shapes that can be introduced into an electric arc furnace to yield high quality iron. This iron can then be sold to industry for use in their furnaces to make steel. The Company's coal processing technology utilizes waste coal dust to make solid synthetic fuel.

COMPANY HISTORY

The Company started as a shell corporation and has evolved into the technology development company that exists today as Covol. Prior to August, 1995, the Company was called Environmental Technologies Group International. The company's initial product was Clean Coal, a solid synthetic fuel that was made from waste coal fines, briquetted and sold for home heating in fireplaces. It was determined that the industrial market was better suited for this product. Efforts were directed to developing products using this concept that were suitable for industrial use. It was discovered that there were tax credits available for production of synthetic fuels made from waste coal fines. Efforts were directed to obtaining a private letter ruling indicating that the solid synthetic fuel made with Covol technology qualified for these tax credits. A private letter ruling was obtained in September 1995. Significant effort has been made to complete contracts that take advantage of the position of Covol's solid synthetic fuel product. Covol currently has several plants under contract for completion by June 1998. The tax code states that manufacturing facilities that are in operation by that date qualify for the tax credit.

In the early stages of Covol's growth, queries were made to steel industry leaders to determine the applicability of Covol's binding technology for use with steel mill by-products. Many of the by-product dusts and sludges contain high quantities of iron. These iron rich materials ("IRM") are generated as a normal part of the steel making process. Industry analysts estimate that between four and six million tons of this IRM are generated each year. This IRM is currently either land filled or piled around steel mills, sometimes for decades.

The primary source of high quality iron today is the blast furnace. The blast furnace is smoke stack facility that presents substantial environmental problems. As the demand for high quality iron increases, new and environmentally sound means of producing iron must be developed. Covol has developed technology that addresses the problem of steel mill dusts and sludges. Proprietary and patented binding technology is utilized to re-form the IRM into solid shapes that can be introduced into current iron and steel making equipment. The resulting iron product recovered from the IRM is high quality and has an increasing demand in a worldwide market place.

THE AGGLOMERATION TECHNOLOGY

The adhesive agents that have historically been used in the agglomeration (briquetting, extruding, pelletizing) process do not have sufficient strength to prevent degradation of the briquettes during shipment or thermal integrity to withstand high temperature environments when burned as fuel or used in resource recovery. Therefore, commercial production of IRM briquettes has been limited to date. The Company has developed special binding agents and processes, which allow for the production of high-grade agglomerations that withstand degradation both during shipment and high temperature conditions.

The agglomeration process involves several steps. The material to be agglomerated is mixed with the binding agent and conveyed to an agglomerator, which utilizes pressure to compress the feed material into a agglomerations having the desired shape, size and density. During this process, the binding agents chemically react with the feed materials and change the molecular structure so that the materials bind together without adhesive. The agglomerations are then cured to achieve maximum physical strength. Broken agglomerations and loose briquetted feed material discharged from the agglomerator and conveyor belts are also recaptured and recycled through the agglomerator. Cured agglomerations leave the curing oven on a continuous belt for handling and storage prior to shipment. The agglomerating process takes approximately two hours to complete.

The Agglomeration Technology employs pressure and chemical agents to bind carbon and IRM into

agglomerations. The IRM agglomerations produced through use of the Agglomeration Technology are further processed in high temperature furnaces to reclaim the iron. The IRM processed through use of the Agglomeration Technology becomes a scrap iron substitute. Scrap iron is a common raw material consisting of recycled iron and steel products such as old car bodies and appliances used by the steel-making industry (as opposed to newly-mined iron ore). The Company believes that its reclaimed iron can be produced and marketed at prices which are competitive with newly-produced and traditional scrap iron costs. Moreover, the Company believes that the Agglomeration Technology will be attractive to steel producers in addressing the environmental issues surrounding disposal of the by-products generated in the production process.

CURRENT OPERATIONS

In 1992, the Company built a prototype briquetting facility in Price, Utah in which it has produced commercial quantities of coal briquettes. The Company's fundamental business strategy has been to commercialize the Agglomeration Technology through joint ventures, licenses and collaborative arrangements with steel, coke and coal producers or investors.

In May 1995, the Company entered into a collaborative agreement with Geneva Steel Company to build and operate a commercial briquetting plant in Vineyard, Utah. The Company has equipped the building to serve as a coal, coke and revert material briquetting plant which commenced producing IRM briquettes in November of 1995. The the plant's initial capacity is 15 tons of briquettes per hour or approximately 100,000 tons per year. Geneva provides the Company with IRM and coke breeze and the Company produces and delivers to Geneva briquettes conforming to agreed-upon specifications and quantities. In September of 1996, the operations at Geneva were discontinued. Geneva indicated that they had sufficient IRM for use in current operations. Covol elected not to renew the contract December 1996. The Company had excessive demand on resources relating to the coal agglomeration technology. A decision was made that any further efforts to work with Geneva on IRM would have to be discontinued until the time limits imposed by Section 29 relating to syncoal production facilities could be met.

The current focus of the Company is to optimize the Section 29 Tax Credits for Producing Fuel From Nonconventional Sources which are available under the Internal Revenue Code of 1986 as amended. The tax credit applies to qualified fuels that are produced in a plant placed in service prior to June 30, 1998 pursuant to a binding contract effective prior to January 1, 1997. The qualified product will be entitled to tax credits until December 31, 2007. The Company has received a private letter ruling from the IRS indicating that the coal product produced by the Company qualifies for tax credits under

Section 29. The tax credit is based on the BTU's (British Thermal Units) generated by the syncoal product during combustion.

The Company has completed the first phase of construction on a coal production facility in Wellington, Utah. The first phase has a production capacity of 360,000 tons of coal per year. The plant is now is startup operation with commercial quantities of coal now being produced. In April of 1997, construction of phase two began. The second phase will add an additional 360,000 tons per year capacity.

The short time constraints on the Section 29 tax credits have forced the Company to direct all of its energies to completing the coal agglomeration contracts by the end of 1996. Once the facilities are completed and the tax credits are being generated, the Company's focus will change to monetize Section 29 tax credits associated with the Company's syncoal product. The Company along with its investment banker estimates that a 1 million ton coal facility will have a net present value of over $100 million per plant. The cash generated by the sale of the net present value of tax credits and operating cash flows from these coal processing plants will be used to finance the Company's next technology application, production of iron from IRM agglomerations.

RESEARCH AND DEVELOPMENT

Over the past four years, the Company has focused its research and development on improving its binding technology and processes as applied to recycling and resource recovery of by-products produced by coal and steel industries. Additional research is being directed to applying the technology to other by-products. This will enable the Company to tap into the enormous market for recovering and recycling resources from by-products. The Company anticipates that there are several by-products that can be recycled with the application of its technology.

Recycling Waste Oxides Using The Covol Briquetting/Binding System

Richard Lambert

Covol Technologies is a technology development company focusing on resource recovery. We are publicly traded with headquarters in Lehi, Utah. We have developed technology that upgrades low value waste materials to make high quality products. We are presently concentrating our efforts on utilizing waste materials from the coal and steel industries.

The steel industry has been looking for ways to reclaim the iron units from its waste stream. Several methods have been tried in the last few years with varying degrees of success. Covol Technologies has been working on a unique way of binding the waste materials so that they can be added back into the iron production stream to recover the iron units contained in the materials.

In October of 1995, we presented a paper at the AISE annual convention in Pittsburgh, Pennsylvania. At that time the name of the company was Environmental Technologies Group International. We have changed our name in order to avoid confusion with all the environmental companies that have come on the scene. Covol seemed like a good name because no one can figure out what it means.

At that time, we reported utilizing Covol's unique binding technology to agglomerate waste revert materials. We used a combination of mill scale and blast furnace sludge with coke breeze as the carbon source in those reported tests. The waste materials were introduced into a small arc furnace and iron recovered. The conclusions reached from those tests indicated that we could recover 94% of the contained iron units. The iron recovered was 96% Fe and 1.6% carbon. It was also determined that fairly low quality coke breeze could be used as a sole source of carbon with no adverse affects.

In the time since that data was reported, Covol has continued to test various materials through its small furnace. We have used a wide variety of materials including mill scale, grinding swarf, blast furnace sludge, iron ore fines, BOF sludge, magnetite, and coal to recover iron units. Utilizing our

technology, we bind these materiasl together with carbon from either coal fines or coke breeze and reduce them in our arc furnace. We have had similar results with all of these different materials.

We realized that because our furnace is not well instrumented, that the next step would be to use a more instrumented furnace set up. We found that the Department of Energy operates a small, well instrumented arc furnace at its Albany Research Center in Albany, Oregon. We ran a series of tests in that facility that I would like to review with you.

The equipment consisted of a 1.2 MW, three phase AC electric arc furnace. The dedicated air pollution control system included a cyclone and a baghouse with no secondary combustion chamber, which limited processing rates due to excessive CO generation during the reduction operation. Off gas was sampled using a gas chromatograph with a sample port located immediately after the cyclone approximately 25 downstream from the furnace. Power was measured with an electric power analyzer at one minute intervals. The tests were conducted at night to avoid excess electrical demand charges from the power company. There was a series of three heats conducted over two nights.

The furnace was preheated with a propane torch for approximately 10 hours prior to the test. A refractory wall temperature of roughly 700 degrees Celsius was measured prior to removing the torch. The initial charge included 250 pounds of briquettes, 12.5 pounds of silica, and 250 pounds of pig iron. The briquettes and silica were loaded first, with the pigs placed on top of the briquette pile to provide a conductive path for the electrodes. The furnace was run in the manual mode doe about 40 minutes until the pig iron was molten and a stable pool was established. Materials were fed to the furnace at varying rates but at constant compositions. No additional pig iron was used for heats two and three. These heats were started by bottoming out the electrodes on the metal heel remaining in the furnace from the previous heat.

The high carbon content and carbonates in the briquettes produced a foamy slag that required frequent rabbling of the bath. The feed rate for heat number one averaged over the 3.5 hours

melting time was 521 pounds per hour. We attempted to increase the feed rate, but excessive CO generation at feed rates above 500 pounds per hour increased the off gas temperature in the ductwork downstream from the furnace, as evidenced by the glow of the stainless steel duct, and forced slowing the rate back to 500 pounds per hour. The melting practices established in the first test were repeated for tests two and three.

We determined metal recovery by first calculation the total iron available in the furnace feed, including metallic iron in the briquettes, FeO and Fe2O3 in the briquettes, and the pig iron used to initiate the arc in the furnace. The final figure for iron in the briquettes was 38.85 percent (1602.56 pounds) and 91.4 percent (228.50 pounds) in the pig iron. We recovered 1653 pounds of metal from the operation, which represents an 88.02 percent Fe recovery. The iron produced was 96 percent Fe with 2.5 percent carbon.

The extremely low silicon content of the metal is an indication that the excess carbon in the feed was not utilized for reduction. This is evidence that fixed carbon can be reduced in future briquette formulations. The metal off gassed during pouring. In future tests the off gas will be killed by addition of ferrosilicon and ferroaluminum. This will produce more uniform pigs, and reduce the volatility of the metal during the pour.

The energy consumption was .54 kWh/pound. This included the high power output required to start the furnace and form a bath from the pig iron. Attempts to increase the feed rate caused power spikes and lower than anticipated feed rates cause the power usage to higher than projected. We feel that continuous operation and feed rates would significantly lower the power consumption and increase energy efficiency.

An interesting observation was made during the calculation of the individual components. The analysis of the individual components in the raw material compared with the briquetted materials indicated a significant chemical change had occurred primarily in the iron chemistry. The individual component feed indicated 11.9 percent FeO, 33.6 percent Fe2O3, and 8.9 percent metallic iron. The analysis of the final briquettes showed 43.1 percent FeO, 9.6 percent Fe2O3,

and 1.3 percent FeO. The finely divided metallic Fe in the briquettes had been oxidized to FeO. But oxidation of the metallic Fe alone cannot explain the radical increase in the FeO and the decrease in Fe2O3. Reduction of over 70 percent of the Fe2O3 to FeO and metallic Fe, followed by oxidation of the metallic Fe to additional FeO would explain the final briquette composition. We are currently determining ways to confirm the results and describe the reduction reaction.

The results of these tests are cosisitent with the tests we have run at our own facility. Covol has determined that the use of its technology provides a viable method of recovering iron units from steel mill revert materials.

EXHIBIT

E

Study Overview

Covol Technologies, Inc. is a technology development company with the motto "RECYCLING YESTERDAY'S WASTE INTO TOMORROW'S RESOURCES". Founded in 1987 and headquartered in Lehi, Utah, Covol is a public company employing 40 full time employees. The company operates through five wholly owned subsidiaries in industrial construction and maintenance, quarrying and sales of limestone products and reclamation of waste materials from the mining and metals industry.

The Covol Industrial Division has developed technology to address the environmental problems of waste materials generated from heavy industry. Utilization of Covol's patented technology in conjunction with a new and innovative briquetting process has made it possible and profitable to reclaim waste materials from the mining and metals industries.

Covol's industrial division has been actively pursing application for its binding technology. In 1993 during interviews with industry leaders in the steelmaking sector, it was learned that there was a need to manage waste materials generated during the steelmaking process. Steel industry analysts estimate that there are between four and six million tons of waste material produced each year by steel mills in the United States. These waste materials such as mill scale, baghouse dust, and blast furnace sludge are currently being buried in landfills or piled on the ground around steel mill sites. Some of this waste material has been stacked around steel mills for decades, polluting both air and water supplies.

Steel industry leaders are aware of the amount of iron oxide contained in the waste materials created during the steelmaking process and have made many attempts over the last several years to utilize these wastes. They have found very little success. These wastes can't be used in the form of dust or sludge. They must be processed in order to use them in the steelmaking process. Molasses, cement, and tar have been used in the past to bind the waste materials into briquettes blow apart, revert to dust form and are blown out of the steelmaking furnaces to once again become waste material. The Covol

technology utilizes an entirely different approach which give the briquettes the thermal integrity to stay together until the iron oxide reduces to metallic iron.

Covol's Industrial Division has developed technology that permits the waste materials to be reclaimed in the steelmaking production stream. The materials are formed into briquettes with the use of Covol's binding system that holds the material together to more than 2000 degrees Fahrenheit enabling the iron oxide to be reduced to metallic iron. In this manner, the briquettes can be directly reduced down to a low residual pig iron. The binding system is unique and is currently the subject of patent application.

Covol has been operating a pilot plant in Price, Utah to demonstrate the process. Many test runs using various feed stocks, have been made which have proven the basic technology.

With the success of the early pilot plant tests, Covol intends to continue testing the process in order to make improvements on efficiency and cost reductions.

Covol is planning a full scale commercial plant to produce 220,000 tons per year iron product. Lockwood Greene has reviewed the pilot plant data and made calculations for the commercial plant extrapolating the test data.

Certain improvements to the basic process are expected to be made in a commercial plant. These improvements will be tested in a small size commercial furnace.

Process Description

Covol Technologies has been conducting pilot plant tests in their Price, Utah, facility. The pilot plant uses a 10 inch diameter crucible which produces iron pigs from 10 pounds to 50 pounds weight.

The raw materials used in the pilot plant contain iron in the form of iron oxides, which must be reduced to form iron. Covol Technologies has developed the process to convert the iron oxides to iron using an electric arc furnace.

The feed to the crucible is briquettes manufactured in a similar manner with the same type of feed raw material as the proposed full scale production plant,. The briquettes use coal dust and lime with a binder, added to the iron oxide containing feed material.

The raw material consisting of

- Mill Scale,or
- BOF and Blast Furnace Sludge, or
- Baghouse Dust, or
- Precipitator Dust

is dried in a kiln and screened .

This material is mixed with carbon dust in the form of coal or coke breeze and combined with suitable binders. This mixture is briquetted and dried in a Drying Oven. These briquettes are fed to the pilot furnace by hand.

The test runs have been conducted by employees of Covol, with compositions analyzed by outside laboratories.

The pilot plant has a fume collection system with an industrial type baghouse to collect the dust generated from the crucible while testing.

Some typical results are included in this report.

The purpose of the initial test runs was to prove that the process works as expected. The results of the pilot plant tests indicate the basic process works.

In the pilot plant runs silica and lime were used as the primary fluxes. In the early tests, large amounts of silica were used to expedite the experiments. The large amount of silica and other flux material also contribute to the high electrical energy requirements. Later test runs have been made using less silica and more lime as flux with reduced amounts of both. Future testing is planned to reduce the flux requirements which will reduce the electrical power requirements of the process.

The existing pilot plant is limited somewhat by the electrical power source. The pilot plant uses an electrical generator at 480 volts to a transformer with taps at 90 volts to about 130 volts. The low voltage tap is used to prevent overloading the generator.

It is expected that testing in a small industrial type electric arc furnace will futher prove the viability of the Covol process, and the variables can be optimized. Installation of a small prototype furnace is planned for the near future.

The basis for design of a full scale industrial plant is raw material feed consisting of 75 weight percent iron content, lime, and coal dust in briquette form. The tests and design calculations indicate that using raw material with lower concentrations of iron require considerable more electrical energy.

The proposed full scale plant to produce 220,000 tons per year of iron will consist of:

- Briquetting Plant
- Two (2) 40 Ton Electric Arc Furnaces, tapping 30 Ton Heats
- Pig Caster
- Baghouse
- Ladles
- Ladle Preheaters
- Ladle Rebuild Stations
- Water Treatment Plant with Two (2) Cooling Towers

- Electrical Sub-station
- Laboratory
- Process Building
- Maintenance Building
- Offices

The raw material consisting of

- Mill Scale
- BOF and Blast Furnace Sludge
- Baghouse Dust

will be dried in a rotary kiln, screened and stored in bins.

This material will be mixed with carbon dust in the form of coal or coke breeze and combined with suitable binders. This mixture is briquetted and dried in a Drying Oven. These hot briquettes will be stored in a bin above the Electric Arc Furnace.

The briquettes in the storage bins are further heated with hot process gas.

The hot briquettes are fed to the Electric Arc Furnace where the iron oxides in the raw materials are melted and converted to iron.

The Electric Arc Furnaces are designed to hold 40 tons of liquid steel. 30 tons of liquid steel are tapped into a ladle.

The liquid steel in the ladle is poured into the pig caster tundish to be fed to the pig molds. The molds are cooled and the pigs drop off the end of the caster for pick up and subsequent shipment to the customer.

The Electric Arc Furnace walls and roof are cooled by water panels. The hot process gases from the furnace are used to preheat the briquettes in order to reduce the electrical power requirements.

Refer to Drawing 4152-9001 and 9002, Process Flow Diagrams in Section 13.

Document Information Form

Mine Number: C/007/007

File Name: Incoming Sunnyside

To: Randy Harden

From:

Person Russ Madsen

Company Covol

Date Received: May 23, 1997

Explanation: Map - Mountain Property

cc: