The 1000 t.p.h. Triple Larcodem Dense Medium Coal Preparation Plant @ Asfordby Colliery. Designed, manufactured, installed and commissioned by Don Valley Engineering Company Limited for British Coal.

ASFORDBY COAL PREPARATION PLANT.

The Coal Preparation Plant was designed to be capable of handling up to 1000 T.P.H. of R.O.M. from either the shaft skips or the R.O.M. stockpile.

The plant utilised three dense medium Larcodem units and generally followed the design philosophy employed on the Coal Preparation Plant at Rossington Colliery, constructed by Don Valley Engineering Company Limited.

1. R.O.M. Handling

The existing chutes at the head end of the skip conveyors R3, R4 and R5 were modified to feed onto three R.O.M. screens whilst maintaining the existing feed sections onto the discard conveyor S4.

The minus 100mm material passed through the screens to feed onto conveyor R101. The plus 100mm material passing over the screens was delivered onto the picking belt conveyor R102.

Conveyor R102 was equipped with a magnetic separator to remove ferrous metals and a metal detector to facilitate removal of non-ferrous metals from the system. The conveyor passed through an acoustic enclosure where a plant operative removed other tramp materials such as timbers etc. All tramp materials were fed into enclosures at ground level.

Conveyor R102 fed a coal crusher sited over conveyor R103, which reduced the oversize materials to minus 100mm.

Conveyor R101 elevated to feed onto the tail end of conveyor R103. The minus 100mm conveyor R103 discharged into the R.O.M. overspill hopper. A belt weigher was supplied on this conveyor.

A variable speed weigh feeder extracted from the bottom of the overspill hopper at rates up to 1000 T.P.H. for delivery onto conveyor R106. Surplus supplies to the overspill hopper bypassed onto conveyor R104 for transfer to the R.O.M. stockpile area. Reclaimed coal was returned to the overspill hopper by conveyor R105.

Conveyor R106 elevated to feed a variable angle static sieve and was equipped with a magnetic separator over the head end.

DON VALLEY ENGINEERING COMPANY Ltd.

SANDALL STONES ROAD
KIRK SANDALL
DONCASTER
DN3 1QR
ENGLAND

TEL : +44 (0)1302 881188
FAX : +44 (0)1302 881000
EMAIL : sales@donvalleyeng.com
WEB : www.donvalleyeng.com

The static sieve was arranged to extract minus 10mm material at rates up to 200 T.P.H. for collection in an untreated smalls hopper. The plus 10mm material passed into a raw coal hopper.

Excess untreated smalls overflowed into the same raw coal hopper.

A variable speed weigh feeder extracted from the raw coal hopper at rates up to 1000 T.P.H. for delivery onto conveyor R107.

Conveyor R107 elevated to the Coal Preparation Plant Building and was equipped with a magnetic separator, metal detector and belt weigher.

2. Main Washery Building

The main washery building housed three larcodem units and all associated equipment capable of handling a feed rate of 0 to 1000 T.P.H.

a) Materials Flow

Overflow from the untreated small's static sieve was ultimately delivered into conveyor R107 headchute / wetting box. The box was provided with a splitter arrangement to equally divide the feed.

Materials from the headchute / wetting box were flushed to feed the desliming static sieves which assisted in the dewatering and extraction of minus 2 mm material prior to it being received at the desliming screens. Feed received at the screen deck was further dewatered and sprayed prior to being discharged to the larcodems.

Material discharged from the desliming screens was collected by chutework and transferred into the larcodem units. The larcodem units separated the coal and rejects by the use of a dense medium, with each product being delivered to its respective kill box.

Rejects discharges from the larcodem units were collected by individual kill boxes which combined to feed the discard fixed sieve to drain the free medium from the rejects, prior to the product being fed onto the discard screen. This screen served two functions, firstly it drained the free medium from the reject product and secondly it provided a rinsing area for the removal of adhered medium.

Rejects product discharged by the screen was collected via chutework and delivered to the discard conveyor S101.

Clean coal discharged by the larcodem units was collected by individual kill boxes which in turn fed the clean coal static sieves which assisted with the removal of the free medium, prior to the clean coal screens. These screens each served three functions, firstly they drained the free medium from the clean coal product, secondly they provided a rinsing area for the removal of adhered medium and finally they sized the clean coal product, passing the undersize material via an underpan / chute to a small coal centrifuge for further dewatering.

The discharged product from the small coal centrifuges was collected and delivered to the washed small transfer conveyor C104.

Oversize product discharged by the three clean coal screens was collected by bifurcated chutework and transferred to either the clean coal outloading conveyor C101 or the large coal crusher. The clean coal outloading conveyor C101 exited the main building via a totally enclosed gantry section and delivered to conveyor C102, which in turn fed the large coal bunker for outloading to road transport.

Three large coal crushers reduced the oversize feed to a minus 50mm product and discharged via chutework to the washed smalls transfer conveyor C104.

The washed smalls transfer conveyor C104 was located on the ground floor of the washery building. It derived its feed from the small coal centrifuges and the large coal crushers and delivered via chutework to the clean coal conveyor C105. This total clean coal product fed back to the static sieve house where it was blended with dry fines from beneath the static sieve to form the power station blend which was out loaded to the covered stockpile

Fines treatment of the minus 2mm material extracted by the desliming static sieves and screens consisted of its collection by underpan and transfer via pipework to the slurry sump from where it was pumped by a centrifugal pump to the slurry hydrocyclone system.

Top water from these hydrocyclones was primarily directed to the thickener via pipework. Spigot product from the hydrocyclones was directed via pipework to a primary 2.4m diameter hydrosizer, followed by two further 3.0m dia hydrosizers.

Rejects from the hydrosizers were transferred via pipework to a sieve bend which assisted in the dewatering of the rejects product prior to it being fed onto the fine discard dewatering screen. The discharged product from the screen was directed via chutework and delivered to the reject conveyor S101.

b) Liquids Flow

Correct medium stored in the medium sump was pumped via three centrifuge pumps to three correct medium headboxes which developed the required head for the larcodem operation. Medium from the headtanks was directed via cast basalt pipework to the larcodems as the washing medium, or to a splitter funnel which distributed the feed to either the correct medium sump or as a bleed to the dilute medium sump. Excess medium was returned to the correct medium sump via a castbaslt overflow range.

Dilute medium stored in the medium sump was pumped via a centrifugal pump to the dilute medium distribution headbox from where the dilute medium was directed to either the dilute medium sump as overflow or to the primary magnetic wet drum separators.

Underflow from the primary magnetic wet drum separators was directed via pipework to the dilute medium wing tank. Over dense material from the primary magnetic wet drum separators was directed via pipework to the correct medium sump. Magnetic separator underflow collected in the dilute medium wing tank was pumped via centrifugal pump to a bank of magnetite thickening cyclones. Top water from the magnetite thickening cyclones was delivered via pipework to the primary sprays headbox whereas the spigot product was collected in a launder before being delivered via pipework to the secondary magnetic wet drum separator.

The top water delivered from the magnetite thickening cyclones to the primary sprays headbox would either overflow to the dilute medium sump wing tank or was used as spray water to the rinsing sections of the clean coal and discard drain and rinse screens

Over dense medium from the secondary magnetic wet drum separator was delivered via pipework to the correct medium sump. Underflow from the secondary magnetic wet drum separator was directed via pipework to a splitter funnel which distributed the feed to either return to the dilute medium wing tank or to the slurry sump.

The minus 2mm material extracted by the desliming screen and sieves was collected by underpan and transferred via pipework to the slurry sump from where it was pumped via centrifugal pump to the slurry cyclones.

Top water from these cyclones was collected by launder and transferred to the overflow distribution box, from where it would either be re-circulated or directed to the thickener. The spigot product was collected by a launder and transferred via pipework to a 2.4 metre diameter primary hydrosizer.

Floats from the hydrosizer were directed via pipework to a sieve bend prior to the fine coal dewatering screen. Overflow from the dewatering screen was collected and transferred via pipework to a bank of slurry centrifuges.

Underflow from the sieve bend, dewatering screen and slurry centrifuges was collected and transferred via pipework to the fine coal sump.

Minus 0.5mm material contained in the fine coal sump was pumped, via centrifugal pump, to the fine coal cyclone. Top water from these cyclones was collected by launder and transferred to the overflow distribution box, from where it was either be re-circulated or directed to the thickener. The spigot product was collected by a launder and transferred via pipework to a pair of 3.0m diameter hydrosizers.

Rejects from all hydrosizers were transferred via pipework to a sieve bend which assisted in the dewatering of the reject product prior to it being fed onto the fine discard dewatering screen. The discharged product from the screen was directed via chutework and delivered to the reject conveyor S101. Underflow from both the curved sieve and dewatering screen was collected by underpan and delivered via pipework to the thickener.

Floats from the 3.0m hydrosizers were directed via pipework to the fine coal sump wing tank. Minus 0.5mm material contained in the wing tank was pumped, via centrifugal pump, to a bank of thickening cyclones. Top water from these cyclones was collected in the overflow distribution box, from where it was either directed to the wing tank for recirculation or used as flushing water for the spigot product. Spigot product was collected and transferred via pipework to a curved sieve.

Underflow from the curved sieve was collected and transferred via pipework to the wing tank for recirculation. Overflow from the curved sieve was collected and transferred to the fine coal dewatering screen via pipework. Delivery onto the screen was via Don Valley Engineering standard flood box.

Overflow from the dewatering screen was collected and transferred via pipework to the slurry centrifuges.

The clean coal product discharged by the slurry centrifuges was directed via chutework to the collecting conveyor C105.

Tailings from the thickener were discharged via gravity to a buffer tank from where the tailings were pumped via centrifugal pump and pipework to the existing lagoon.

Clarified water from the thickener overflows were fed via pipework to the clarified water sump.

Clarified water from the thickener, along with the lagoon water return and a metered supply of make up water from the reservoir were stored in the clarified water sump from where it was pumped via centrifugal pump to the clarified water headbox. Overflow from the headbox was directed via pipework to the clarified water sump.

Clarified water was used throughout the plant giving controlled feed rates to:

i) Conveyor R107 wetting box
ii) Dilution water to the primary magnetic separators
iii) Secondary spray water to the three clean coal screens and the two discard screens
iv) Upward current water supply to the hydrosizers
v) Fast fill to the thickener, and
vi) Flushing water to the thickener and buffer tank

vii) Desliming screen sprays

Free medium effluent collected by the primary sections of the clean coal screens and discard screens underpans was collected and transferred via pipework to the correct medium sump.

Adhered medium effluent collected by the secondary sections of the clean coal and discard screen underpans was collected and transferred via pipework to the dilute medium sump.

Effluent discharge by the small coal centrifuges was delivered via pipework to the magnetics floor sump and hence to the dilute medium circuit.

Wet fines collected by the desliming screen underpans was transferred via pipework to the slurry pump.

Fresh magnetite was added to the system from a ground floor mixing sump. The magnetite was received from the magnetite store via bobcat. This sump was equipped with a submersible pump and a clarified water supply which was used to pre-mix magnetite prior to its addition to the correct medium sump.

A second ground floor sump was provided within the magnetics floor area. This sump serviced the correct medium sump, and wing tank overflows and was equipped with a submersible pump. This pump delivered to the secondary section of the discard screen from where the medium was re-circulated for the magnetite to be recovered.

A third ground floor sump was provided for the non-magnetics floor area. This sump was equipped with a submersible pump which delivered to the slurry sump.

c) Main Building Ancillaries

To assist in the settling of solids within the thickener, a flocculent mixing system was provided which delivered its product via pipework to a splitter funnel from where it was gravity fed to either the flocculent stock tank as a return or to two points on the thickener feed launders. Dilution water was added to the thickener feed controlled by a manually set valve.

An M.R.D.E. clarometer system was fitted to the thickener to control the flocculent feed rate via the splitter funnel.

An air compressor package provided compressed air for use with the valves and hydrosizers and for the agitation of the correct medium sump, dilute medium sump, wing tank, slurry sump and fine coal sump and fine coal sump wing tank.

Magnetite was stored in an open (uncovered) compound convenient to the main plant.

3. Clean Coal Handling

Conveyor C105 returned clean coal from the coal preparation plant building back to the fixed sieve house delivery onto conveyor C106. A bulk density weigh feeder extracted minus 10mm material from the bottom of the untreated smalls hopper for delivery onto conveyor C106 for blending with the clean coal constituents.

Conveyor C106 entered the sample / transfer house at high level and discharged through a sampling system into a bifurcated chute, which was operated via electric actuator, which directed the feed to either the blend stockout conveyor C107 or the rail bunker feed conveyor C109.

Conveyor C107 transfered the blended coal to the clean coal stockpile area. Reclaimed coal was returned by the reclaim conveyor C108 at 1500 T.P.H. to be fed onto the rail bunker feed conveyor C108 via a surge hopper located in the sample transfer house.

Conveyor C109 rated at 1500 T.P.H. elevated and conveyed the feed to conveyor C110 sited on top of the rail outloading bunker. Conveyor C109 was fitted with a high accuracy belt weigher. This belt weigher was used to batch weigh a designed load of coal into the rail loading bunker.

A tripper carriage installed on conveyor C110 traversed the full length of the rail loading bunker with provision for balanced distribution of coal into the bunker. The carriage was hydraulically operated through an “endless” chain and wire rope system.

The rail loading bunker was of mild steel construction, lined to internal surfaces. Coal was discharged from the bunker via two sets of hydraulically operated clam shell doors and outloading equipment.

A J.B. long cross belt clean sweep sampling system was fitted close to the head end of the bunker feed conveyor C109. This sampling system was supplied and installed by British Coal.

The rail loading bunker was complete with two outlets, the first outlet gave a coarse primary fill to the wagons and the second outlet topped up and flood loaded the wagons to give a good distribution throughout their length.

The system was arranged for the information output, ie. wagon type, number and capacity to be entered into the control system by the operative. This information was received and converted into the necessary hydraulic action to operate the clam shell doors and wagon loading equipment.

Connected to each bunker outlet, were hydraulically operated clam shell doors, situated below the clam shell doors were tundish type chutes, the primary chute being used to direct the feed to the wagons to obviate spillage and give an initial 50 – 55% coarse fill, the secondary tundish chute effected a flood feed topping up system.

The design of the wagon loading equipment enabled it to work on suitable trains travelling at a constant speed of 0.5 or 1 m.p.h. without any rollback or stoppage. 1440 tonne trains only were able to load at 0.5 m.p.h. without stopping.

Weighing of empty and full rail wagons was by a “Railweight” system with the control unit and print out facility housed in the control room sited below the bunkers.

4. Large Coal Outloading

The large coal outloading conveyor C101 delivered onto conveyor C102 which elevated to feed a large coal outloading bunker.

The bunker was provided with a cascade chute to minimise degradation of the large coal.

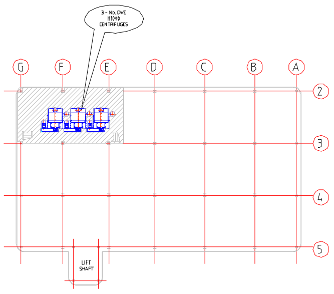
The large coal bunker was provided with a outloading boom loading conveyor C103 to facilitate the loading of road borne wagons.

5. Discard Handling

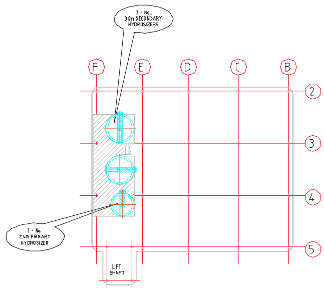
Discard collected in the Coal Preparation Plant Building was transferred back to the existing conveyor S4 in the existing screen house via conveyors S101 and S102. A belt weigher was supplied on conveyor S102.

Asfordby Coal Preparation Plant **Completed - 1995** **Plant Specification**		
Feed Rate to Plant	-	1000 TPH
Material to Plant	-	Minus 100mm Raw Coal
Washing System	-	Triple Stream Larcodem Dense Medium Plant (3 x 270 TPH). Washing -100mm +2mm fraction
Larcodem Capacity	-	810 TPH
Fine Coal Treatment	-	Up to 250 TPH of -2mm material treated in a two stage hydrosizer upward current cleaner system, designed to recover the clean coal fines.
Untreated Fines	-	Up to 200 TPH of -10mm raw coal, for blending.
Products from Plant (max)	- - -	Up to 500 TPH of large coal, -100mm +32mm. Up to 750 TPH of small coal, -32mm. Up to 100 TPH of tailings, -0.1mm.
D.V.E. Scope of Supply	-	Full Turnkey Project Including Process Design, Civil Design, Mechanical Design, Electrical and Control System Design, Manufacture, Installation and Full Commissioning.

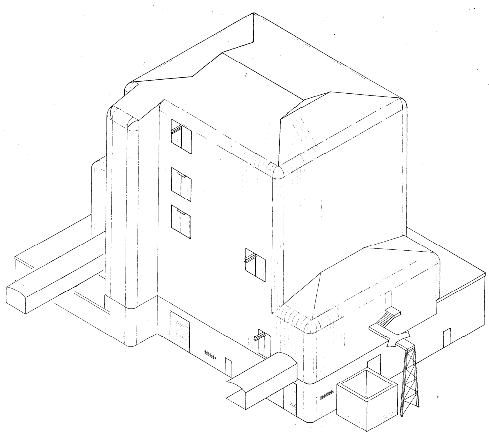
COAL PREPARATION



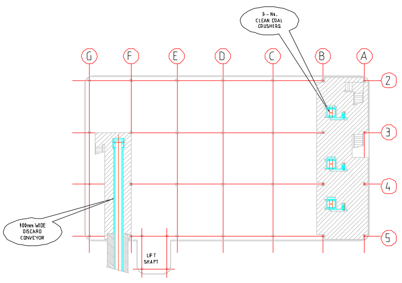
+8.430 lvl.



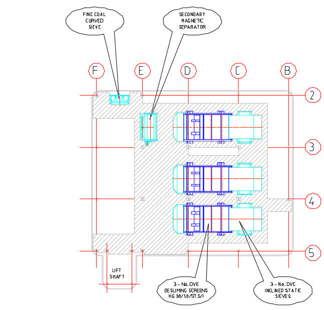
+20.340 lvl.



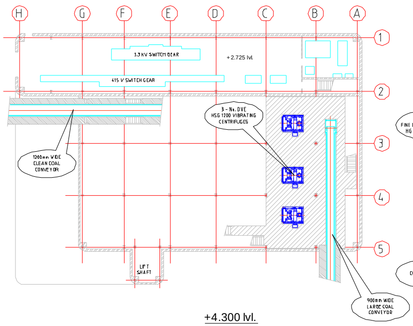
ISOMETRIC VIEW ON 1000 t.p.h. COAL PREPARATION PLANT



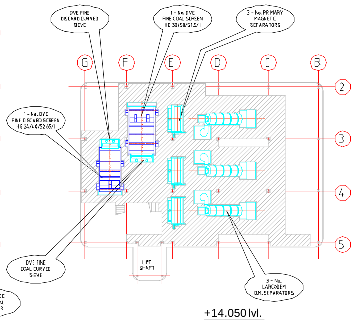
+6.800 lvl.



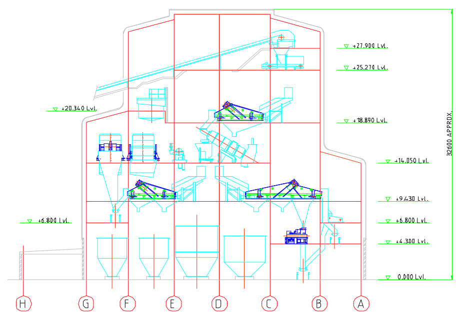
+18.890 lvl.



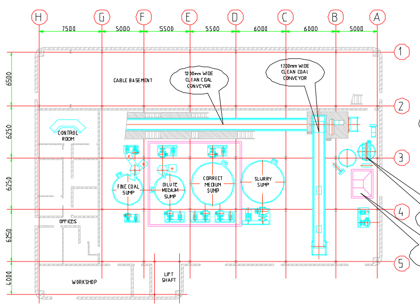
+4.300 lvl.



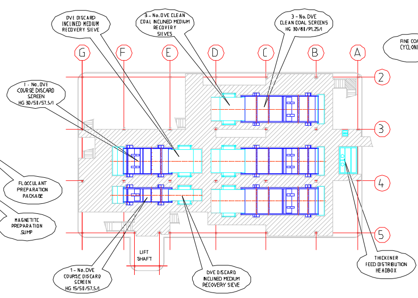
+14.050 lvl.



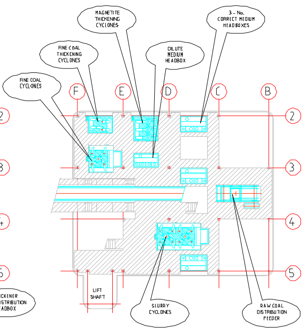
ELEVATION ON COLUMN LINE "4"



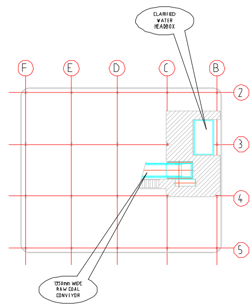
Plan at Ground Floor +0.000 lvl.



+9.4300 lvl.



+25.270 lvl.



+27.900 lvl.

Layout of 1000 t.p.h. Triple Stream Larcodem C.P.P.
Utilising DON VALLEY Screens and Centrifuges

THE TOTAL SOLUTION

Designed, built and commissioned by DON VALLEY ENG. Co. Ltd.

DVE