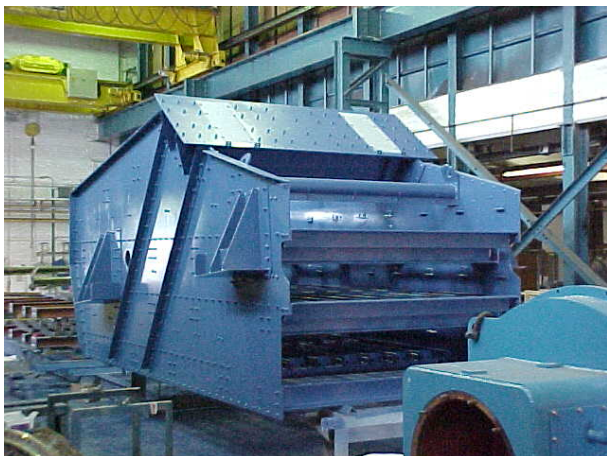


# Building in reliability



**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

**ECIA**

Engineering Construction  
Industry Association

MEMBER OF



BREWING, FOOD & BEVERAGE  
Industry Suppliers Association

A MEMBER OF  
DONCASTER

chamber

Vat No. GB 181493745



CERT. NO 6204

## Building in reliability

In the never ending Drive to increase market share , quarries are constantly looking for ways to reduce the production cost of minerals by building ever larger quarries producing higher and higher tonnages using larger and larger machines. But this is only part of the answer because any kind of stoppage then results in greater tonnage lost for every hour the plant is stood.

For the past 20 years Don Valley Engineering have been meeting the requirements of an ever changing minerals industry by designing and building ever larger screening machines to cater for the ever increasing tonnages being produced. They have supplied the front line machines to virtually all of high capacity plants built in the last 10 years and in doing so have created an unequalled range of bespoke machines for all manner of applications and have gained a wealth of experience in the design of bunker tops that they believe should be considered for all future applications.



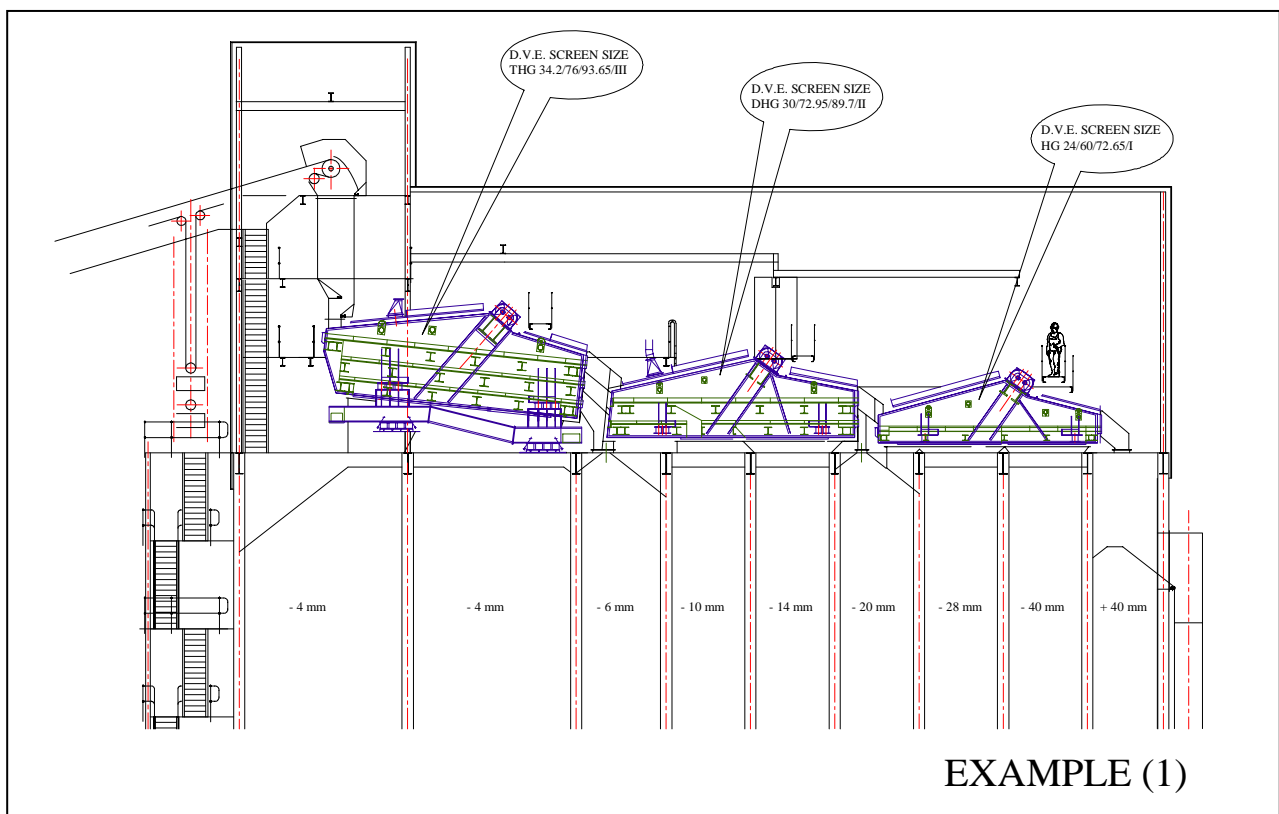
In any minerals handling plant two of the most problematic areas that cause the greatest hardship and down time are transfer points between equipment where spillage, dust emission and build up occur and the drive mechanisms to the various machines where electrical or mechanical failings render the machine inoperable. Whilst we will never be able to achieve the transfer and drive free plant, logic dictates that the nearer we get to achieving it the more reliable a plant will be. To this end any reduction in the number of drives and transfer points is a step in the right direction.

In the latest plant designs, the bunker top arrangement, attempts to employ this philosophy to the full by utilising the minimum number of machines to achieve the mineral sizing required with transfers being chute work between machines that can be enclosed and sealed. Large

numbers of screens fed by a multitude of conveyors and transfer points are things of the past. They were necessary in times gone by because large screening machines were not available but the machines of today have the size and flexibility to both size and transport material if required.

## Example 1

The diagram in **example 1** shows the result of cooperation between the producer, main contractor and screen supplier from the very inception of the project and illustrates how initial consultation and cooperation between all parties allows the screens and bunker top to be arranged to compliment each other. This arrangement has been used in a number of recent builds in various forms to suit the tonnages and bunker capacities required, but in all respects the philosophy of arranging the screens and bins to compliment each other in order that a minimum number of machines and transfer points are used remains.



*Diagram of the new screen arrangement at Tarmac Northern's Swinden Quarry*

In example 1 the input feed tonnage to the plant is in excess of 1250 tonnes per hour requiring a twin stream arrangement with each stream handling 630 tonnes per hour of minus 100 mm. crusher run and re circulated material. The screens are arranged in the single pass layout developed by DVE to allow the screens to sit sequentially in line directly above the bin top. This involves the extraction of the dust element first followed by the progressively larger size fractions. To achieve this the primary receiving screens are large triple deck units 3.4 M wide by 8.9 M long arranged to size at 10 mm. on the top deck, the underflow of which is then received on to the middle deck arranged to size at 6 mm. before passing its under flow to the 4 mm. bottom deck for the dust extraction into the first bin as underflow. The bottom deck

overs of 4x6 mm. are directed by chute work into the second minus 6mm bin together with further minus 6mm. material derived from the initial section of the second screen bottom deck. The 6x10 mm. middle deck overs are carried by the initial section of the bottom deck of the second screen to be directed into the third minus 10mm, bin.

The plus 10 mm. top deck overflow from the primary triple deck screen passes via chute work, to the top deck of the second screen which is a 3.0 M wide by 8.5 M. long double decked unit arranged to size at 10 mm. on the initial portion of its top deck followed by 20 mm. for the remainder. The bottom deck of this double decked unit consists of a split deck arrangement designed to collect the middle deck overs product from the primary screen and the underflow product from the initial 10 mm. top deck of this second screen and carry the whole forward on a 6 mm, deck to feed the minus 10 mm. bin. The remaining bottom deck is designed to receive the unders from the 20 mm. top deck and size at 14 mm. passing its underflow directly into the bin positioned directly below it. Overs from this bottom deck are carried forward and discharged from the end of the screen directly into the minus 20 mm. product bin.

The third screen in the series is a 2.4 M. wide by 7.5 M. long single deck unit which receives its plus 20 mm. feed material as overflow from the top deck of the secondary screen. This screen firstly extracts the 28 mm. product from its feed as an underflow from the first section of deck before extracting the minus 40 mm. product as underflow from the remainder. In both cases the sized products are discharged into the receiving bins which are positioned directly below the screen. The resultant plus 40 mm overs product from this screen is discharged directly from the end of the screen into the overs product bin, again sited directly below the screen.

Once the feed material is delivered onto the receiving area of the primary triple deck machine the screens both size and transport the stone to the respective bins without further mechanical assistance.

It will be appreciated from the compact arrangement which allows screens to be mounted close together and directly onto the bunker tops that a number of other advantages are also gained in pursuit of an efficient and effective plant that allows further reliability to be built in. For instance the chute work transferring mineral between screens, being relatively short, enables the installation of expensive exotic wear resistant liners that might normally be rejected because of their costs. Screens discharging directly into bunkers require no chutes at all, and the whole system is readily dust encapsulated to prevent dust escaping and causing down time due to build up.

There are also commercial advantages to the arrangement for whilst the cost of bespoke screening machines will obviously be more than other more standardised machines their size and flexibility allows fewer machines and drives to achieve what is required often giving overall cost reductions on the total plant cost.

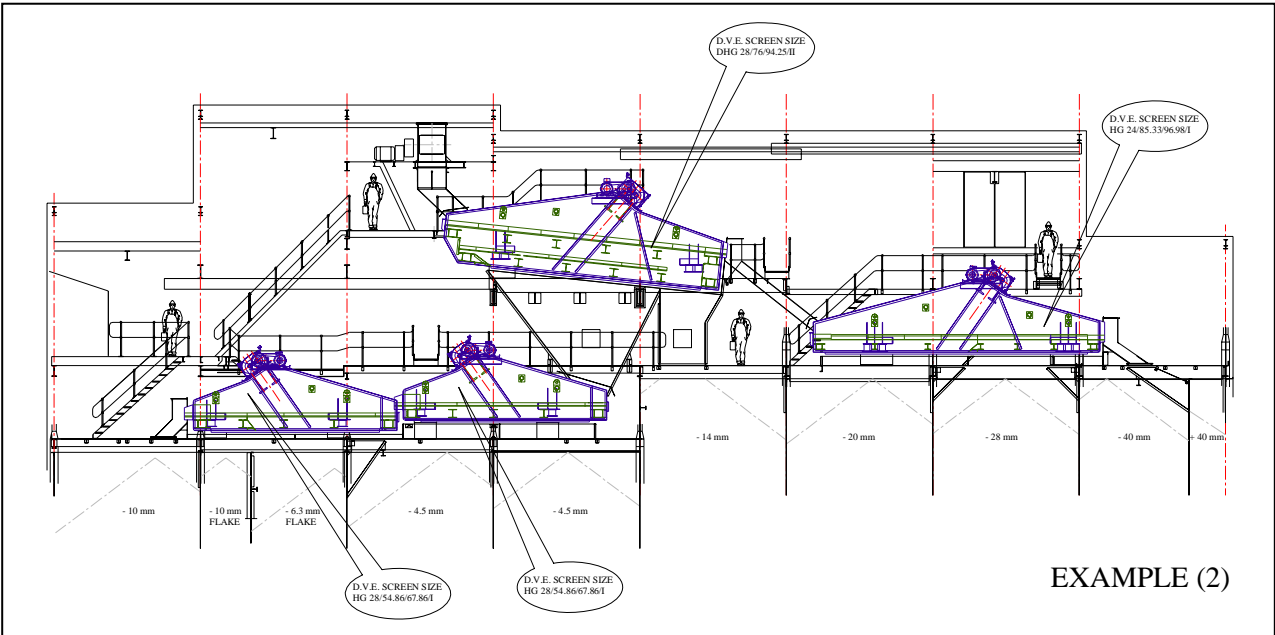
## **Example 2**

Example 2 is a revision to an existing plant where the feed conveyor enters the bunker top housing at 90° to the screens necessitating that a high level splitter screen be used initially.



Originally the screen house on top of the bunker had housed a large number of screens and conveyors collecting material and transporting it to the next sizing stage or into the relevant bunker. The aim in revising the plant was to replace the aging equipment, increase the plant capacity and increase the plant reliability by removing as many drives as possible.

Shoe horning larger machines into existing plants is not an easy operation but if you have control over how the machines are designed and made there is usually a bespoke solution that will achieve the desired result. In this example for instance the primary splitter screen is a double deck unit with an elongated top deck to assist in the feed of the overs to the large stone classifying screen. It makes for a longer screen but in return it allows the large stone classifying screen to be mounted directly over the existing reception bunkers, allows material to be transferred from one screen to the other by a chute instead of a conveyor and thus gives an overall cost reduction on the installation whilst providing a better arrangement.



*Diagram of the upgraded screen arrangement at Tarmac Northern's Barrasford Quarry*

The two underflow products from the splitter screen are also fed via enclosed chute work to their destinations. In the case of the 10x14 mm. product directly into the bunker, and in the case of the minus 10 mm. material to the fine stone classifying screens for the sizing of the dust to 10 mm fractions. Making these units bespoke allows deck lengths to be tweaked to assist in the delivery of the various fraction sizes to the correct bunkers or as in this case to produce specialist flaked material.

The whole installation met the clients requirement of replacement and increased tonnage whilst simplifying the sizing process and creating a more reliable plant with fewer machines requiring maintenance.

In attempting to build reliability into plants the one thing you can rely on is that the mineral being processed will wear the plant out, the only question is when.

Screen manufacturers, by their use of "G" force to effect the means of separation and sizing aid and abet this process by applying 4 to 5 "G" to each particle 900 times per minute as it makes its way along the deck which gives high impact forces and enhanced deck wear. To overcome this many exotic deck materials have been developed from hard faced steel plates



to resilient rubber and polyurethane materials. Probably the most significant in the last 20 years has been the development of the polyurethane modular system. The modular system is compatible with most screening machines and has proved to be a robust installation capable of high performances under the most arduous of conditions. The flat screening surface, coupled with the inherent self-cleaning nature of the high quality polyurethane materials, guarantees maximum screening efficiency with minimum risk from 'blinding' and 'pegging'.

Since the first use of PU decks, their suppliers have maintained continuous development program to increase both the durability and availability of all manner of materials and apertures to meet the ever increasing market demand. The result is a reduction in lost time due to deck maintenance and replacement whilst maintaining the required specifications for longer. Today's polyether based elastomer materials have excellent resistance to abrasion, corrosion, and water hydrolysis. They may be more expensive than some of the cheaper alternatives but their extended life, flexibility and performance make them cost effective by a considerable margin.



Reliability is an unusual characteristic to quantify. If you have an unreliable plant you know how much it is costing you because you know how long you have been stood and how much production you have lost but if your plant is reliable and does what it should, when it should, it is very difficult to quantify how much that is actually worth. It is clearly worth something and it is probably quite substantial, but how do you factor that value into a budget evaluation for a plant particularly when your budget strategy calls for a pay back in a given time or else it is not approved. It is a dilemma many engineers face each day when trying to balance the scheme that is correct for the plant against what the company budget restrictions will actually allow. All too often the scheme is compromised to make it fit an arbitrary budget figure rather than considered against realistic whole life costs and returns.



The purpose of this article is to give a brief indication of the type and range of bespoke screening machines available, the advantages they give and to make the argument for more flexibility when considering the initial design and budgeting of a new plant. Reliability, longevity and ease of operation are ideals which may be hard to quantify but they should never the less be at the top of every plant designers wish list because they are worth paying for.