

Products & Services

Catalogue 2008





DebTech company profile

“Through research, delivery and support, DebTech provides timeous, cost effective and value adding technology to the De Beers family of companies in the areas of diamond exploration, mining and ore treatment”.

The value proposition of DebTech is to deliver technology that will ensure a sustainable competitive advantage to the Value Centres of the De Beers family of companies. Differentiating knowledge, processes and products are developed by combining our diamond industry knowledge with our technical expertise. An appropriate competency profile is maintained and supplemented with technology partnerships.

DebTech's core functions are aligned with the De Beers strategic drivers and as such, deliver optimum results.

They are:

Process Research and Development

The process R&D function manages the entire DebTech innovation process and is geared at identifying, creating and demonstrating the feasibility of new technologies in order to further the De Beers Exploration and Ore Processing divisions. The acquisition process herein makes use of key technology suppliers in the relevant fields of interest, whilst implementation is done as a collaborative process between DebTech and relevant De Beers business partners.

Product Research and Development and Product Supply and Support

The Product R&D function manages the entire product acquisition process from requirement analysis, concept generation to final design and operates alongside the Product Supply and Support function. Together, these two functions collaborate with internationally recognised technology component suppliers and combine their unique understanding of operational requirements, within the diamond industry, to deliver the products appropriate to meet those unique needs.

DebTech Metallurgical Services

The main service offerings within this function are Ore Dressing Studies (ODS) and Technical Consulting. These services are brought together by the alignment of competencies within the department, which follows the metallurgical flow sheet and include specialist skills in comminution, DMS concentration, final diamond recovery and environmental studies. ODS is targeted at capital projects and aims to deliver optimal conceptual flow sheets as it precedes the engineering process and can influence plant design at the lowest relevant cost. Technical Consulting offers metallurgical plant assessments, operational troubleshooting and equipment evaluation, amongst other services. There is continuous interaction between DebTech departments to ensure that up to date information on service developments and Product Supply and Support machine applications are adequately communicated to the benefit of the De Beers family of companies.

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CDX118CD and CWX118CD

Dual Wavelength X-ray Sorters

Application:

Free fall, X-ray sorter, single pass, single input, Primary and Secondary bulk recovery; Re-concentration; Material size range (-32mm + 1mm) split at appropriate ratio and feedrates. Material feed application wet or dry.

Features and Specifications:

- Eight channel photo multiplier detection system (single or dual wavelength options available)
- Manual or automated inlet chute gate options available
- Robust air ejector system
- Modular, compact, robust, ergonomic design (left and right hand variants available)
- Split cabinet design – heat exchanger cooled X-ray generator and power supply compartment
- Separate control and service panel configuration
- Single network interface for control and information
- Full maintenance support
- User friendly menu driven OTI and HMI
- Tracer catch trays for tracer tests

** For model comparison see page 24.*

Benefits:

- Maximum diamond recovery with minimum gangue material at high feedrates
- Spillage free; low yields
- Self-testing and on-line calibration
- Operator and maintenance friendly
- Complete operator safety due to improved features
- Low operating costs

Compact sorting modules can be configured for higher throughput and / or double pass as required.

Throughput Capacity:

CDX118CD

| Size Range (mm) | Feedrate (Kg / hr) |
|---------------------|--------------------|
| -2 +1 | 825 |
| -4 +2 | 1275 |
| -8 +4 | 2100 |
| -16 +8 | 3450 |
| -32 +16 | 4500 |
| Channel | 8 |
| Material size range | -32mm to +1mm |

Dry process

CWX118CD

| Size Range (mm) | Feedrate (Kg / hr) |
|---------------------|--------------------|
| -2 +1 | 825 |
| -4 +2 | 1275 |
| -8 +4 | 2100 |
| -16 +8 | 3450 |
| -32 +16 | 4500 |
| Channel | 8 |
| Material size range | -32mm to +1mm |

Wet process



CWX118CD machine

CDX116CD Dual Wavelength X-ray Sorter

Application:

Free fall, dry process, X-ray sorter. Single input, single pass 6 channel dual wavelength CARP* machine. Primary, Secondary or Re-concentration applications. Rejects non-diamond luminescent material, Zircon & Ceramic. Materials size range middles and fines, (-8mm +1mm).

Features and Specifications:

- Dual wavelength technology
- Six channel Photo Multiplier detection system (one per gravel channel)
- Six electro-mechanical or air ejectors
- Modular, compact and robust design philosophy
- Split cabinet design – air cooled electronics compartment for operational stability and reliability
- CARP* functions optional:
 - Process cabinet door locks
 - Cabinet door security sensors
 - Surveillance video cameras
 - Wire interfaces to remote security monitoring & control system
- Dual network interface into PSS and SCADA / Plant PLC
- Full maintenance support
- User friendly menu-driven GUI (HMI)
- Dust extraction interfaces
- Tracer catch trays for tracer tests
- Comprehensive sort process data (histograms, background levels, ejection rates etc)
- Comprehensive process monitoring alarms list
- Remote / Local control capability

** For model comparison see page 24.*

Benefits:

- Maximum diamond recovery with minimum gangue material at high feedrates
- Spillage-free; low yields
- No cooling water required – compressed air X-ray cooling
- Self-testing and on-line calibration
- Built in diagnostics radically reduces downtime
- Operator and maintenance friendly
- Complete operator safety due to improved feature
- Low-power consumption, single phase supply
- Low operating costs

Throughput Capacity:

| CDX116CD | |
|-----------------|--------------------|
| Size Range (mm) | Feedrate (Kg / hr) |
| -2 +1 | 400 |
| -4 +2 | 800 |
| -8 +4 | 1700 |

** CARP: Completely Automated Recovery Process*



CDX116CD X-ray Sorter machine

CDX113C and CDX116C Single Wavelength X-ray Sorters

Application:

Free fall, dry process, X-ray sorters, single input, Primary and Secondary Bulk diamond recovery. Coarse and fines feed material applications (CDX113 -32mm +8mm) and (CDX116C -8mm +1mm).

Features and Specifications:

- Six channel Photo Multiplier detection system (*two per gravel channel CDX113*) and (*one per gravel channel CDX116C*)
- Modular, compact and robust design philosophy
- Split cabinet design – air cooled electronics compartment for operational stability and reliability
- CARP* functions optional:
 - Process cabinet door locks
 - Cabinet door security sensors
 - Surveillance video cameras
 - Wire interfaces to remote security monitoring & control system
- Dual network interface into PSS and SCADA / Plant PLC
- Full maintenance support
- User friendly menu-driven GUI (HMI)
- Dust extraction interfaces
- Tracer catch trays for tracer tests
- Comprehensive sort process data (histograms, background levels, ejection rates etc)
- Comprehensive process monitoring alarms list
- Remote / Local control capability

** For model comparison see page 24.*

- Three Electro-mechanical or air ejectors (CDX113C) and Six Electro-mechanical or air ejectors (CDX116C)

Benefits:

- Maximum diamond recovery with minimum gangue material at high feedrates
- Spillage-free; low yields
- No cooling water required – compressed air X-ray cooling
- Self-testing and on-line calibration
- Built in diagnostics radically reduces downtime
- Operator and maintenance friendly
- Complete operator safety due to improved features
- Low-power consumption, single phase supply
- Low operating costs

Throughput Capacity:

| CDX113C | |
|----------------------------|--------------------|
| Size Range (mm) | Feedrate (Kg / hr) |
| -16 +8 | 2500 |
| -32 +16 | 2500 |
| Channel | 3 |
| Coarse material | -32mm +8mm |
| CDX116C | |
| Size Range (mm) | Feedrate (Kg / hr) |
| -2 +1 | 400 |
| -4 +2 | 800 |
| -8 +4 | 1700 |
| Channel | 6 |
| Middles and Fines material | -8mm +1mm |

* CARP: Completely Automated Recovery Process



X-ray Sorter machine

CDX1132C (LARA) X-ray Sorter

Application:

Free fall, dry process, X-ray sorter, single input, 32 channel CARP*. Primary and Secondary Bulk diamond recovery; Middles and Fines material (-8mm +1mm).

Features and Specifications:

- Thirty-two channel optic detector
- Thirty-two robust air ejectors
- Modular, compact and robust design philosophy
- Split cabinet design – air cooled electronics compartment for operational stability and reliability
- CARP* functions optional:
 - Process cabinet door locks
 - Cabinet door security sensors
 - Surveillance video cameras
 - Wire interfaces to remote security monitoring & control system
- Dual network interface into PSS and SCADA / Plant PLC
- Full maintenance support
- User friendly menu-driven GUI (HMI)
- Dust extraction interfaces
- Tracer catch trays for tracer tests
- Comprehensive sort process data (histograms, background levels, ejection rates etc.)
- Comprehensive process monitoring alarms list
- Remote / Local control capability

** For model comparison see page 25.*

Benefits:

- Low operating cost
- Maximum diamond recovery with minimum gangue material at high feedrates
- Spillage-free; low yields
- Self-testing and on-line calibration
- Built in diagnostics radically reduces downtime
- Operator and maintenance friendly
- Complete operator safety due to improved features
- Low operating and maintenance costs

Throughput Capacity:

| CDX1132C (LARA) | |
|-----------------|--------------------|
| Size Range (mm) | Feedrate (Kg / hr) |
| -2 +1 | 400 |
| -4 +2 | 800 |
| -8 +4 | 1100 |

** CARP: Completely Automated Recovery Process*



CDX1132C (LARA) machine

Raven Single Particle Sorter (COARSE and FINE)

Application:

Single Particle Sorting of Diamondiferous material using Laser technology. Depending on feed conditions the diamond by weight of concentrate produced can be in excess of 95%.

Features and Specifications:

- Sealed diamond path with no hang-up or spillage
- Fully automated, hands off
- SCADA interface
- Full Maintenance support
- Material flow path is separate from electronics to enhance security during maintenance

• 99% Diamond Recovery (RAVEN COARSE)*

• 98% -4mm and 99% -8mm Diamond Recovery (RAVEN FINE)*

Benefits:

- Self-testing
- Built-in Diagnostics
- Secure

* 50% Diamond by weight feed at correct size ratio.

Throughput Capacity:

RAVEN COARSE

| Size Range (mm) | Feedrate (Kg / hr) |
|---------------------|--------------------|
| -16 +8 | 5 |
| -32 +16 | 15 |
| Material size range | -32mm to +8mm |

RAVEN FINE

| Size Range (mm) | Feedrate (Kg / hr) |
|---------------------|--------------------|
| -2 +1 | 0.25 |
| -4 +2 | 0.50 |
| -8 +4 | 0.80 |
| Material size range | -8mm to +1mm |



Size Frequency Distribution (VSFD)

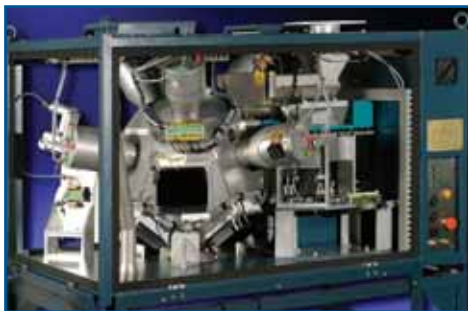
Application:

The Vision Size Frequency Distribution machine (VSFD) is specifically designed to determine accurate weights and shapes of individual diamonds on-line as they are recovered. This unique feature allows precise auditing and accounting of the recovery process in real time, enabling the metallurgist to analyse, optimise and control the process in ways not possible before. Designed to process at a rate fast enough to keep up with the automated single particle sorters, a continuous stream of data is produced as diamonds are recovered.

The process is hands-off, making it possible to automatically package the goods immediately after analysis without any manual intervention or security risk.

Features and Specifications:

- Throughput: 10 - 20 pps for 1mm particles, depending on feedability
- Output information per diamond: Weight, volume, sieve size and calliper size
- Output information for batch of diamond: Number of diamonds per sieve class, diamond weight per sieve class, total number of particles and total weight of batch
- Individual Calliper Accuracy: 2% RMS
- Individual Volume Accuracy: 6% RMS
- Distribution Repeatability: At least as repeatable as sieving



Vision Size Frequency Distribution machine

SCANNEX X-ray Body Scanner

Application:

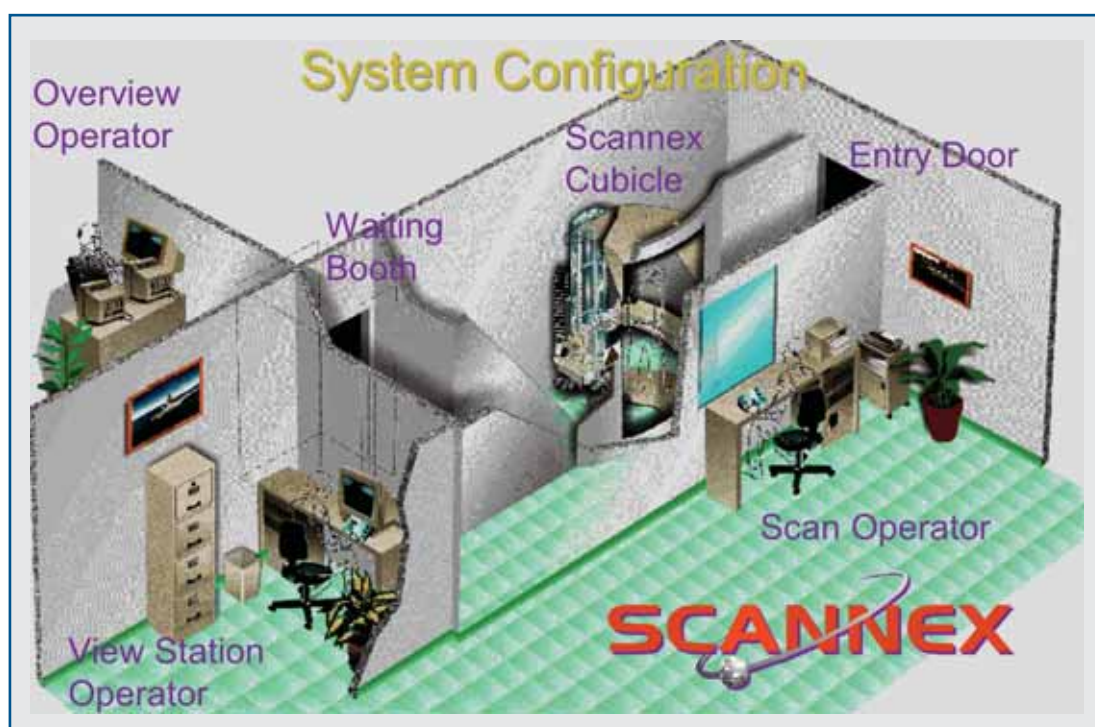
Scannex is a low X-ray dose, full body scanner for the purpose of resource protection. Its primary application is the detection or deterring of illegal diamond trade by personnel at diamond mining operations. The secondary application is in areas of general public access i.e. airports, prisons, etc.

Features and Specifications:

- Scannex images are of high resolution and contrast, such that diamonds as small as 1carat or clusters of smaller stones are able to be detected on or within the human body
- X-ray dose is extremely low, such that each person may be scanned between 185 and 205 times per year
- X-rays are collimated and produced as a narrow fan beam of parallel x-rays to enhance image quality
- Low energy X-rays are filtered, thereby reducing the quantity of x-rays absorbed by the human body. Complete scan within 10 seconds
- Images may be viewed as normal digital images, unsharp masked with sharpened edges or in a 3 dimensional mode with zoom capability
- The colour palette allows the viewer to adjust grey scales as required
- Up to 4 viewers may be connected to a single machine, thereby increasing the rate of persons being scanned
- Approval by the SA Department of Health for its intended use
- Completely safe operation with dual safety interlocks in key areas
- Person being scanned is in no contact with the moving parts of the machine
- Full operational diagnostic capability

Benefits:

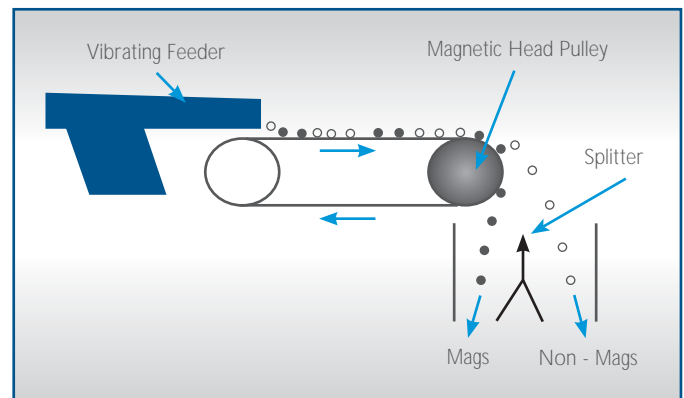
- Powerful deterrent to theft and coercion
- Non-contact, non-invasive technique, safe and efficient means to protect company resources
- Low x-ray dose per scan, thereby resulting in a high number of possible scans per person per year
- Stored images may be reviewed as required
- Fully compatible with an off-the-shelf X-ray dose management system



MagRoll-Single Stage

Principle of operation:

A vibrating feeder draws material from a feed hopper and feeds it at a controlled rate onto a rotating conveyor belt, which passes over a magnetic head pulley. Non-magnetic material follows a trajectory, which is uninfluenced by the magnetic pulley's field, whereas magnetic material is drawn towards the pulley and discharges with a different trajectory. A collection hopper fitted with a splitter blade may be positioned below the conveyor in order to collect the discharging material and to divide it into 'magnetics' and 'non-magnetics' streams.



Application:

Initially developed for the diamond industry the MagRoll has huge potential for use in other mineral processing industries. Many of these industries will already be using similar technology, but it is expected that the MagRoll will introduce a new dimension of performance to these industries as well as enabling some new, or hitherto unsuccessful, applications.

Features and Specifications:

- Fitted with De Beers' unique, high-strength 'SuperRoll', constructed of large diameter rare-earth (Neodymium-Iron-Boron) permanent magnets
- SuperRoll design optimised to suit application requirements using mathematical modelling techniques
- Material path fully enclosed and a dust extraction point provided for connection to an external extraction system
- Conveyor belt constructed of durable material and designed to be self-tracking as well as easy to adjust and replace
- Interchangeable magnetic rolls of different strengths to suit specific applications
- Available in 250mm and 500mm wide versions, each with optional features in terms of control philosophy and types of instrumentation

Benefits:

- Exceptionally strong magnetic forces generated by the SuperRoll, are ideally suited to difficult applications and enable more efficient separations at higher throughputs than conventional magnetic roll and drum separators
- Efficient separations achievable over a wide range of particle sizes from <1mm up to 25mm
- Material, which may be of high value, remains secure within the machine
- Dust is contained and may be easily extracted from the machine via a single connection. Dust build-up on the magnet which, over time, would cause loss of performance and belt tracking problems is minimised
- Long, trouble-free belt life resulting in minimal downtime and low maintenance costs
- The standard MagRoll frame may be fitted with a low strength Barium Ferrite 'scalping' roll to remove strongly magnetic particles prior to further treatment by a second MagRoll fitted with a SuperRoll
- Readily customised to suit exact user requirements



Testwork has proved that throughputs and separation efficiencies achieved by the MagRoll significantly exceed those attainable using currently available competitive products.

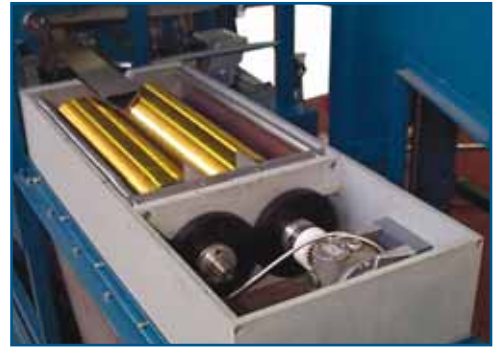
Mid – Point Shape Splitter (MPSS)

Application:

The MPSS separates +4mm flat and long particles from -4mm particles.

Features and Specifications:

- Capacity 20kg maximum
- Process rate 20kg / hour @ 80% flats content
- Weighing accuracy of 0.1% of full bin's capacity
- Separates +4mm flat and long particles from -4mm particles
- Titanium nitride coated for extreme high wear resistance



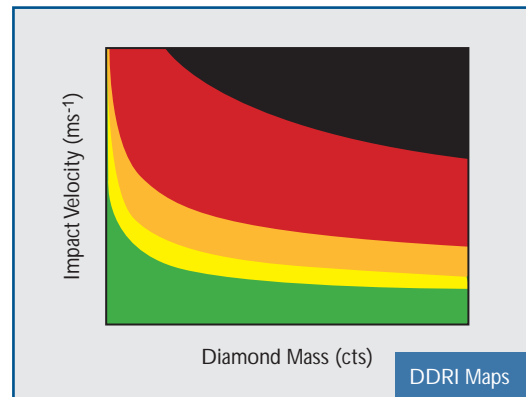
Mid-Point Shape Splitter

Diamond Damage Studies

Process Simulation and Diamond Damage Services

Basic Diamond Damage Risk Assessment

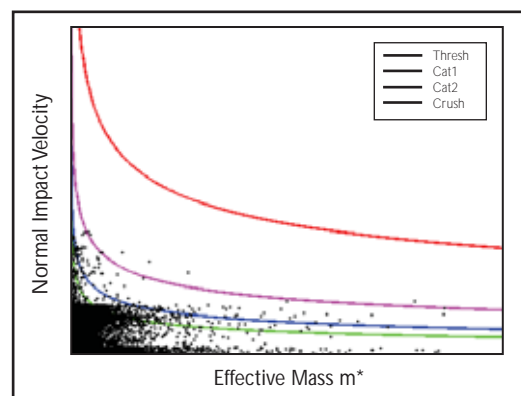
For simple processes or for cases where only an assessment of the risk of diamond damage is required, the diamond damage risk indicator maps (DDRI maps) are employed. These maps were developed within De Beers based on test work and an in-depth understanding of diamond fracture. Maps for all different materials that a diamond may come into contact with can be generated.



Detailed Diamond Damage Estimation

For cases where a detailed estimate of the extent of diamond damage is required, the diamond damage simulator (DDS) is utilised.

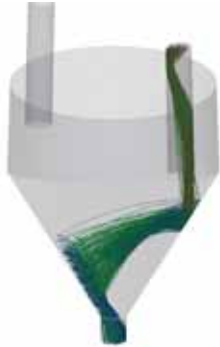
This takes, as input, a detailed description of the process dynamics, achieved by means of Physics-based process simulations (see below), and determines an estimate of the extent of diamond damage. Monte Carlo simulation can be used to determine the confidence in such estimates. If suitable revenue information is available the diamond damage estimate can be converted into a revenue loss estimate.



Diamond Damage Simulator

Process Simulation

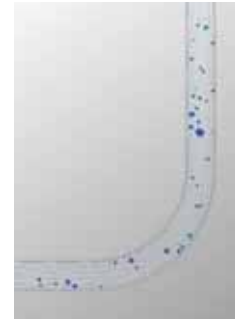
Detailed Physics-based simulations of complex processes enable analysis and visualisation of process dynamics. This can be employed to estimate the extent of diamond damage due to the process (see below). Alternatively such tools can be utilised to optimise the performance of the process of interest. Simulation tools include: CFD (Fluent) DEM (PFC, EDEM).



Gravity Collection



Slurry Pump

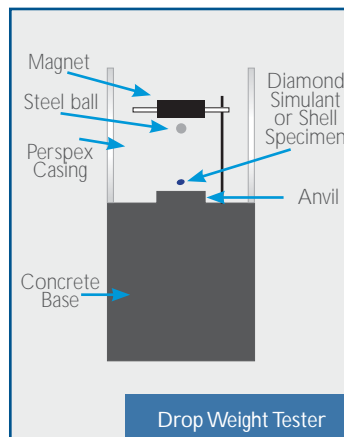


Pneumatic Conveying

In addition to in-house capability we can sub-contract to external service providers and provide technical management and interpretation of results.

Materials Testing and Characterisation

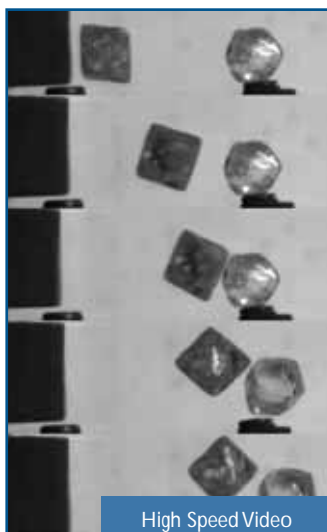
We have access to a range of characterisation and testing equipment (see below), which can be used to conduct highly controlled test programmes. We offer full solutions including test design, performing experimental work, extraction and interpretation of data. All of this is performed to the highest scientific standards to ensure that maximum information is generated.



Drop Weight Tester



Compression Tester



High Speed Video



Pendulum Impact Tester



Particle Shape Characterisation

ProMax

Expert System aimed at online, real time, process optimisation

Application:

ProMax is a software tool that can be applied to any plant process. It interfaces to the existing control system and applies process rules to optimally control plant equipment. Rules are typically obtained from plant experts and are embedded into ProMax. The result is consistent and enables optimal control of plant processes 24 hours a day. With ProMax, plant operators are free to deal with higher level process issues and can spend their time overseeing the plant, rather than micro-managing unit processes.

Features and Specifications:

- System does not interfere with low process interlocking or control, but operates on a supervisory level. With ProMax online, process setpoints are adjusted to ensure optimal process control and management. With ProMax offline, plant control reverts back to the operator. There is thus no downtime risk linked to ProMax availability.
- ProMax can interface with any plant control system. OPC technology allows ProMax to connect to any system and can even connect to databases to provide process data. ProMax can also connect to other ProMax systems to share information.
- The ProMax platform can be expanded, at a low cost, from its installed base by suitably trained plant personnel. There is no limit to the process area that can be brought under ProMax control. This means that, theoretically, one Promax application can optimally control an entire mine.
- ProMax is deployed on standard IT equipment and uses a standard Windows operating system. Apart from the product itself, there are no special hardware or software requirements to implement a ProMax system on site. The maintenance load is thus light compared with other control systems.
- Remote support is available. With the De Beers networking infrastructure, it is possible to have a ProMax expert connecting to the application from almost any De Beers location. The ProMax expert can troubleshoot or even undertake minor development remotely.

Benefits:

- ProMax is a continuous improvement tool and can be tailored to any new process need.
- The technology ProMax employs, is not proprietary to De Beers and is in use all over the world. There are many vendors supporting the same expert system technology.
- ProMax can improve throughputs and efficiencies of most plant processes. In some cases, it has a return of investment in the order of a few days.

SOFTWARE PRODUCTS

X-ray Product Support System (PSS)

Introduction

DebTech engineers have equipment design and application support experience in a wide range of recovery machines and plants. In collaboration with metallurgical personnel from the De Beers Group mines, they have designed a recovery plant Product Support System.

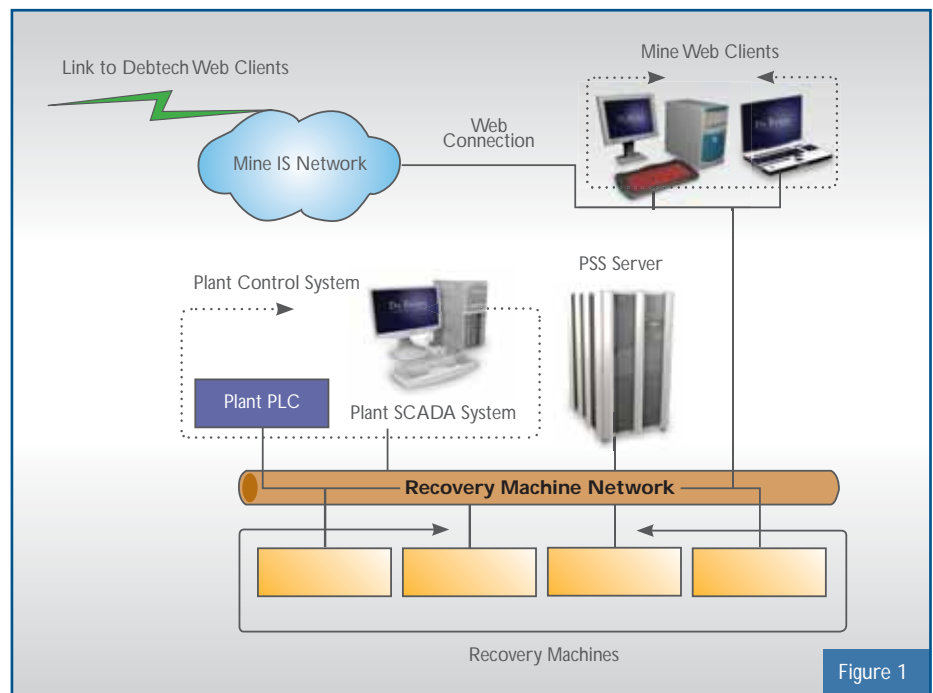
The Product Support System (PSS) is a computerised system that provides critical on-line information on the performance (metallurgical and technical) of DebTech diamond recovery machines. This information allows both metallurgical and engineering personnel to optimise the recovery machines for a specific process function and source being treated, mainly in terms of diamond recovery, yield, feedrate and utilisation.

Since this system is web based, it provides first line support to the operations staff as well as remote support for DebTech technicians, since the server(s) can be linked, via the De Beers Wide Area Network (WAN). The system is configured using standard SCADA software (Citect Version 6.0), operating in a Windows XP / 2000™ environment. The system is customised for each installation (in terms of tag database and plant flow only). The system consists of a real-time data server that obtains information from the sorting machines via the plant network and provides some historical information storage (alarms, process data, events etc). Where applicable, a dedicated historical data server will be included in the design.

The figure below shows a typical recovery plant installation. The sorting machine to plant control system communications contains a limited data set purely for plant control and interlocking purposes.

Figure 1 – Typical Support System Configuration

The sorting machine's internal processors capture large sets of internal and technical data as well as luminescence data of ore being treated. This data is captured by the PSS server and processed to provide valuable information to enhance the equipment, stream and plant performance. The Windows based server is a web server that provides secure network access to any user workstation connected to the network.



Application:

This Product supports the X-ray machines in the Recovery and assists the mine personnel in operating, optimising and maintaining the machines.

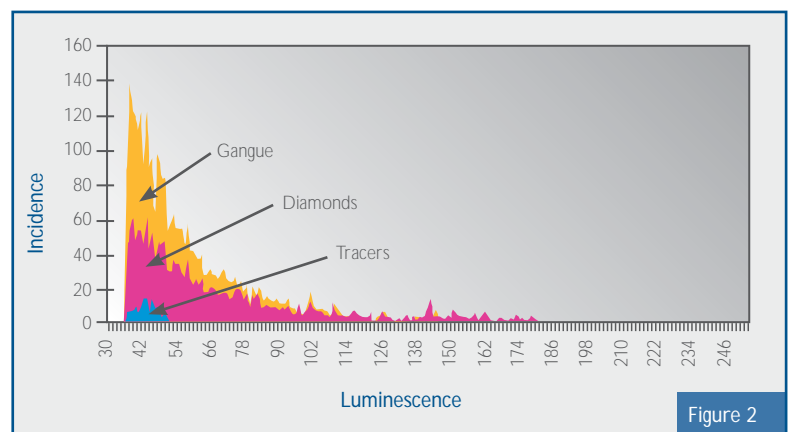


Figure 2 – Typical Fines Feed Characterization

The luminescence histogram is displayed in the PSS to provide the profile of the luminescent intensity of the particles being treated. Average, minimum and maximum peaks are displayed to the user for assistance in optimising the machines. Plants that have more than one machine per stream can compare the histogram profiles for the primary and secondary machines. The user can save the profile(s) of the histograms to Excel for later retrieval and comparison.

Features:

1. Luminescent Histograms

The plant metallurgist needs to understand the luminescent characteristics of both the diamonds and the gangue in the ore being treated to optimise the plant for specific ore sizes and sources being treated. In a typical batch processing plant application, a machine could have a recipe for each source being treated.

There is a trade-off between diamond recovery and yield as shown in Figure 2 on page 15. The metallurgist has the option of filtering out the gangue to achieve good yields at the risk of losing a predictable percentage of low luminescent diamonds. Conversely, increasing the sensitivity would result in higher yields (due to gangue-related ejections) and increased diamond recovery, as long as the process design (sort-house capacity, presence of re-concentration machine down-stream, etc.) allows for it.

Figure 2 on page 15 shows a Fines stream, where the diamonds are mainly of low luminescence. The degree of luminescence overlap tends to be less on the Middles and Coarse stream. The diamond curve shifts right, making the gangue filtering more effective. This allows the metallurgist to select an appropriate cut-off point suited to the plant recovery strategy, which is based on diamond recovery, yield, throughput, grade and value.

2. Ejection Profile

The PSS provides a profile of the ejections of the recovery machines. Percentage calculation per channel relative to the total is also displayed to the user to troubleshoot a 'skew feeder' alarm. As per no. 4.

3. Web Viewing of Information

The PSS Server is web based and thus provides the ability for mine personnel to view the PSS information remotely via an internet browser, typically Internet Explorer 6 or higher, without requiring additional software to be installed on the clients' PC, except for a client Active X object that need only be installed on first interaction with the system. This provides the ideal platform for remote first line support.

4. Plant Advisor

The PSS has a set of rules, which alert the operator if the machine performance drifts from the expected norm. These rules are either developed by the design engineers or derived from the expertise of skilled operations and support staff. Rule-based alarms commonly referred to as "expert alarms", provide early warning signals of performance degradation. The user sets these limits as per the plant flow and material being treated, i.e. customised per site. The plant advisor feature is particularly useful at the plant management level. Performance comparisons can be made between similar machines and streams, as well as against predicted performance limits.

5. Reporting

The PSS provides a wide range of standard reports for the various users, including daily, weekly or monthly Management Reports. This includes summaries of key performance indicators such as:

- Monthly top 10 alarms
- Availability and utilisation figures
- Alarms that contribute to downtime

6. Historical Logging

The PSS logs all critical data and events in a historical database. Metallurgists and technicians can use this data for diagnostic purposes. The SQL database allows unrelated data to be compared, which is useful for analytical purposes as well as performing audit trails. Data is retained on the server, typically for 6 months (or longer, depending on the hardware limitation), although this can be customised to suit the particular customer's needs. The SQL data can be backed up to a plant historian, if available, for longer term storage.

7. Trends

The PSS provides a means to display multiple trends via an analysis tool. Each user can save custom trends to be recalled at a later stage. Trends can be used by personnel to evaluate various data and occurrences in the plant and can be the ideal diagnostic tool to trace errors that occurred in the plant.

Features *continued...*

8. Stream and cross stream analysis

The PSS provides a means to compare both stream and cross stream information for plant and stream optimisation. Histograms and ejector profiles form part of the comparison data.

9. Remote Support

Since the PSS is a web based server, it provides the foundation for remote first line support by DebTech personnel (provided necessary infrastructure is in place). The same applies to client technicians and metallurgists based offsite.

10. Open Communication protocol

The PSS supports open interface protocols like OLE for Process control (OPC). The PSS is an OPC server that can serve any OPC client that wishes to obtain information e.g. plant SCADA.

In Conclusion

The PSS is an integrated management and diagnostic tool. Its power lies in the fact that it is a metallurgical as well as an engineering tool and information on the various recovery machines is available in a single system.

The system's reporting capability provides plant management with diamond recovery, yield, throughput, availability and utilisation measurements that are visible for monitoring and optimisation.

In addition, metallurgists now have information to craft recovery strategies that are based on maximising carat call and value, rather than the old tonnage benchmarks, thus impacting positively on the mine's profitability.

Finally, the web based functions provide the openness for users to easily obtain information from the PSS without having proprietary software installed on their PC's.

Discrete or Continuous Modelling

Simulation of discrete or continuous processes for capacity expansion or throughput enhancement projects.

Application:

The modelling application, once developed, allows an end user to run in-house scenarios on their process. Discrete modelling can be undertaken on processes, such as laboratories or particle sorters. Continuous modelling can be applied to almost any plant area where a continuous stream of product is conveyed. Modelling a process extracts knowledge of capacities, bottlenecks and constraints. It can also provide a platform to extract performance data (throughputs etc.) of a process before it has been built. In this way, designs can be verified and costly construction mistakes avoided.

Features and Specifications:

- There is no cost for the actual modelling software. An executable program can be generated for the end user to experiment with
- Scenarios can be run with almost any combination of process capacities and timing
- Information on maximum capacities (e.g. maximum required stockpile sizes), throughputs (e.g. average samples per day), constraints and bottlenecks can be obtained without actually building the facility
- Designs can be verified and adjusted to utilise the minimum number of resources

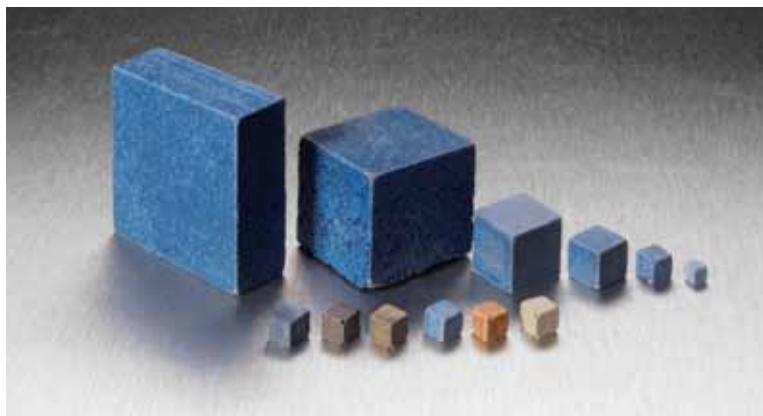
Benefits:

- Cost savings can result where over-design has occurred
- Business cases can be generated by attaching currency values to the model outputs
- Efficiency studies can expose under utilisation of resources
- Throughputs can be improved by learning about the process and upgrading specific areas

Luminescent Tracers

Application:

Tracers are an essential component in setting up X-ray based diamond sorting machines. Through calibration, the machine's detection sensitivity can be adjusted to the most cost effective level, thus maximising diamond recovery and minimising the volume of waste material recovered. To aid this procedure, tracers are manufactured in 6 luminescence intensities and 7 sizes. The luminescence intensities are indicated by different colours, blue, brown, grey, violet and olive.



Ceramic Diamond Simulants

Application:

The use of diamond simulants makes it possible for the management at mining sites, and particularly at diamond separation and recovery plants, to identify the stages in ore handling or subsequent processing, where stones may be trapped or damaged in order to take corrective action.

Benefits:

The financial benefits to the mine of eliminating and avoiding hang-up or damage are considerable.

Without the use of simulants, it would be virtually impossible to quantify accurately the losses attributable to avoidable diamond damage.

Diamond damage generally occurs most frequently at:

- DMS cyclone feed pumps
- Concentrate transfer pumps
- Pneumatic transfer into bins
- Other transfer points

The simulants are available in a range of colours, i.e. white, red, blue & green and sizes 4mm, 6mm, 8mm, 12mm, 16mm, 20mm and 25mm. All simulants, except 4mm, have luminescence intensities above 8 Volt and can therefore be recovered by X-ray technology.



Dense Medium Controllers (DMC)



DMC Unit

Application:

The function of the DMC is to measure and automatically control the Ferrosilicon circuit density in Dense Medium Separation Plants.

Features and Specifications:

- Continuous real-time density display; password protected set points and other parameters
- Robust and weatherproof design and construction
- Density range of 1,8 to 3,7 SGU
- Accuracy of ± 0.05 SG from setpoint
- 4-20mA or 0-10V output signal for remote density indication and recording
- Fully automatic operation
- The DMC Unit is currently available in 4 different Transducer pipe sizes viz. 50mm, 75mm, 110mm and 160mm outside diameters

Benefits:

- Operator and maintenance friendly
- Rapid and reliable data entry
- The DMC improves process plant stability and overall efficiency
- Optimal efficiency at all times gives better recovery efficiency
- Mine personnel can carry out site installation and commissioning , and also calibrate the units

Docklock System

Application:

The Docklock system is designed to facilitate the secure transfer and transportation of dry concentrate between processing stations in the process. The Docklock system comprises of two basic units namely a Docklock Station and a Docklock Canister. The Stations are attached to fixed processing equipment in the plant and are used for filling and emptying the Docklock Canister.

Features and Specifications:

- The Docklock Canisters are software coded and can be activated only by a specific Docklock Station
- The system has a "Moby E" Transponder, which stores and provides information electronically pertaining to the location and contents of the canister
- The system has an optional Microwave level detector, which communicates with the User Control System to automatically stop the concentrate flow, to prevent the can from overfilling. This feature can only be applied in product that is dust free

Benefits:

- Prevents spillage of material during transfer
- Installation and commissioning of the system can be carried out by mine personnel
- Ensures security of the material during transfer from the processing plant into the predefined containers and vice-versa
- Store and provide information electronically on a "Moby E" Transponder pertaining to the location and content of the canister
- Prevents the material from being discharged out of the processing plant into anything other than predefined containers and vice-versa



Docklock System

Metallurgical Services

| (ODS) ORE Dressing Studies | |
|----------------------------|--|
| Due Diligence ODS | Using a minimal quantity of sample, this study provides information on potentially problematic treatment areas of an ore body. Typically used prior to purchase of an ore body or Joint Venture partnership. |
| Conceptual ODS | Uses drill core samples from each major ore facie to determine comminution, concentration, recovery and tailings disposal information. Provides possible treatment flowsheet alternatives for new or existing ore sources. |
| Evaluation ODS | This study generally builds on from the conceptual study and would need additional drill core, some bulk, diamond and water samples. The purpose of the study is to begin defining the treatment flowsheet design. |
| Feasibility ODS | This study validates the flowsheet design derived during the evaluation study. Additional samples might be needed to confirm areas of doubt for the flowsheet design. This would be by means of pilot test work with key equipment suppliers. |
| ODS Technical Consultation | Used for the acquisition of data from geological samples processed either through the GMDL or through worldwide Bulk Sample Plants, as well as limited tests on samples taken from the BSP. Provides a preliminary understanding of the processing requirements for a future production plant. |

| (SS) Supporting Services | |
|--|--|
| Liberation Equipment Selection | Equipment is recommended after examining ore specific responses, which is also aimed at the long term. |
| DMS Equipment Selection | Sizing of equipment for new applications can be conducted. This includes all process equipment required for the DMS operating plant. |
| X-ray Sorters and Magnetic Separator Equipment Selection | After the technology has been identified within the flow-sheet, identification of specific units may be required. Comparison between suppliers and the suitability of the unit is done based on factual information. |
| Recovery Flowsheet Design | Directly applied assistance to technology identification and unit identification with the consideration of diamond and ore specificity, process performance, throughputs and future of the technology in all areas of Recovery design. |

| (TC) Technical Consulting | |
|-----------------------------------|---|
| Liberation Circuit Design Input | A circuit with the lowest operating cost, optimum liberation and process flexibility is sought, holistically. |
| Liberation Equipment Evaluation | Technical and financial evaluations are needed for comminution and related devices which include: HPRC, rolls crushers, Autogenous / Ball / Rod mills, Scrubbers, Jaw and Cone Crushers, Vertical Roller Mills and IPC Jaw Crushers. These are usually ore, site and location specific evaluations. Evaluations are aimed at quantifying the ranges of comminution, liberation and diamond damage response. |
| Lock-up Evaluation | These are mainly financial evaluations requiring close examination of diamond recovery & pricing. This is done in combination with MRM department. |
| Technical Inspection | Inspections are carried out to assure clients that their equipment is operating optimally. |
| DMS FeSi Analysis | Analysis of reference samples as dictated by the mines as well as samples received from the mines in circuit medium. |
| Densimetric Analysis | Analysis of samples as supplied by the mines at the specified densities. |
| Equipment Evaluation | Process equipment used in the DMS operating plant can be audited to determine the metallurgical efficiency of the units. The size of the units will be compared to design specifications for the process feed / flow rates. |
| DMS Technical Inspection | A technical inspection can be conducted on the DMS processing plant highlighting areas of possible process inefficiencies and losses. |
| DMS Grade Audit | Assess efficiencies of DMS plant. Is used when a mine suspects a problem, is not making call, needs justification for changes or to show quantitative support for responsible management of the plant. |
| 3-Curve Efficiency Evaluation | Samples are collected from the cyclone feed and products. These samples are processed through the densimetric laboratory. From the results obtained, the efficiency of separation can be determined. This includes actual gravel separation density, module feedrates and yields. |
| Recovery X-ray Machine Evaluation | New models and new technology types of X-ray machines may require a metallurgical specification verification, where the whole unit is assessed from the performance point of view. This includes the recovery efficiency according to a base standard, machine sensitivity range, reliability, ease of operation, maintainability, physical aspects, and other aspects, which may be required. The machine's operating limits are also verified and determined. The evaluation serves as a starting point for machine operation / optimisation. |
| Magnetic Separator Evaluation | New models and new technology types of Recovery magnetic separators may require metallurgical specification verification, where the whole unit is assessed from a performance point of view. This includes the recovery efficiency according to a base standard, determination of the magnetic profile, and therefore its cut-point at specific settings, reliability, ease of operation, maintainability, physical aspects, and other aspects, which may be required. The machine's operating limits are also verified and determined. The evaluation serves as a starting point for machine operation / optimisation. |

| | |
|--|---|
| X-ray Machine Optimisation | The X-ray machine may not necessarily be operating under optimal conditions, in comparison to their initial set-up, as the source (diamonds and ore) variability may require fine-tuning of the machines over time. This is done in combination with Product Supply and Support function. |
| Magnetic Separator Optimisation | The Recovery magnetic separators may not necessarily be operating under optimal conditions, in comparison to their initial set-up, as the source (diamonds and ore) variability may require fine-tuning of the machines over time. |
| Recovery Plant Audit | Assess efficiencies of recovery plant and is used when the client suspects a problem with the operation, is not making their call, needs justification for changes, or to show quantitative support for responsible management of the plant. |
| Recovery Technical Inspection | Occasionally, the client may require an independent technical opinion to his / her operation. The inspection provides a quick snapshot view of the technical state of the plant. Recommendations are usually made from such an inspection for future improvements. |
| Total Plant Assessment | This can be extended to include the complete metallurgical plant from front end comminution to final recovery. |
| Water and Environmental | |
| Slimes Treatment Circuit Optimisation | Assess efficiency of slimes treatment (thickener) process when problems are experienced with overflow clarity or unacceptable underflow density achievement, i.e. too high water losses from thickeners to slimes dam. Assessment of thickener control strategy is included. |
| Slimes Treatment Equipment Evaluation | New technology assessment and comparisons with current technology suite understanding. |
| Slimes Treatment Concepts Exploration | Investigations into the appropriateness of slimes treatment and thickener underflow handling alternatives. |
| Process Water Corrosion Assessments | Determination of the potential effects of process water quality on pipes and equipment and the possible recommendations towards prolonging plant life. |
| Process Effluents Environmental Evaluations | Auditing of process and effluent streams for potential environmental damage. e.g. Tailings dump effluent analysis and appropriate treatment solution exploration. |
| Ore Characterisation Environmental | Predicting the potential environmental hazards emanating from the inherent nature of a new or current operation's future ore body / type via appropriate environmentally orientated ore characterisation procedure. Recommendations and solutions towards environmental and / or health and safety protection can be provided from such an investigation. |
| Thickener Underflow Rheological Investigations | These investigations are conducted in combination with external laboratories and relevant consulting companies. |

* Confidentiality: All client samples and information, as well as reports issued, are treated with the strictest confidence.

Specification Sheet

| Model | CDX118CD / CWX118CD | CDX116CD | CDX116CD Re-concentration | CDX116C |
|------------------------------|---------------------|----------|---------------------------|---------|
| Page no. | 4 | 5 | 5 | 6 |
| X-Ray Technology | ✓ | ✓ | ✓ | ✓ |
| Laser technology | | | | |
| Concentration | ✓ | ✓ | | ✓ |
| Reconcentration | ✓ | ✓ | ✓ | |
| Single Particle Sorting | | | | |
| Dry Feed | ✓ | ✓ | ✓ | ✓ |
| Wet Feed | ✓ | | | |
| Capacity (kg / h) | | | | |
| -2 + 1 mm | 825 | 400 | 7.5 | 400 |
| -4 + 2 mm | 1275 | 800 | 15 | 800 |
| -8 + 4 mm | 2100 | 1700 | 30 | 1700 |
| -16 + 8 mm | 3450 | | | |
| -32 + 16 mm | 4500 | | | |
| Dry weight (kg) | 850 | 1500 | 1500 | 1500 |
| Dimensions | | | | |
| Length (m) | 1.950 | 1.828 | 1.828 | 1.828 |
| Width (m) | 0.754 | 1.206 | 1.206 | 1.206 |
| Height (m) | 1.461 | 1.860 | 1.860 | 1.860 |
| Area required to open covers | | | | |
| Length (m) | 2.568 | 3.108 | 3.108 | 3.108 |
| Width (m) | 1.242 | 2.758 | 2.758 | 2.758 |
| Height (m) | 1.802 | 1.860 | 1.860 | 1.860 |

* Specifications may change.



CWX118CD machine



CDX116CD X-ray Sorter machine



CDX1132C (LARA) machine

| Model | CDX113C | CDX1132C LARA | Raven Coarse | Raven Fine |
|------------------------------|---------|---------------|--------------------------|--------------------------|
| Page no. | 6 | 7 | 8 | 8 |
| X-Ray Technology | ✓ | ✓ | | |
| Laser technology | | | ✓ | ✓ |
| Concentration | ✓ | ✓ | | |
| Reconcentration | | | | |
| Single Particle Sorting | | | ✓ | ✓ |
| Dry Feed | ✓ | ✓ | ✓ | ✓ |
| Wet Feed | | | | |
| Capacity (kg / h) | | | | |
| -2 + 1 mm | | 400 | | 0.25 |
| -4 + 2 mm | | 800 | | 0.5 |
| -8 +4 mm | | 1700 | | 0.8 |
| -16 + 8 mm | 2500 | | 5 | |
| -32 + 16 mm | 2500 | | 15 | |
| Dry weight (kg) | 1500 | 1000 | 320 incl. PC & Trolley | 226 incl. PC & Trolley |
| Dimensions | | | | |
| Length (m) | 1.833 | 2.004 | 1.480 | 1.415 |
| Width (m) | 1.206 | 1.394 | 0.768 | 0.55 |
| Height (m) | 1.860 | 1.895 | 0.855 | 0.655 |
| Area required to open covers | | | On trolley + PC assembly | On trolley + PC assembly |
| Length m) | 3.108 | 3.006 | 2.124 | 2.059 |
| Width (m) | 2.758 | 3.263 | 3.006 | 0.55 |
| Height (m) | 1.860 | 1.895 | 3.006 | 1.844 |

* Specifications may change.



Raven Fine machine (Covers Removed)



Raven Coarse machine

For more information contact:



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