

DID YOU KNOW THAT?

1. X-ray luminescence based diamond recovery started in South Africa back in 1968.

- 1.1. This is the same time that this technology was introduced by BOUREVESTNIK in Russia
- 1.2. In SA it started by DeBeers approaching SORTEK (GUNSON SA) to assist in developing an X-ray based diamond recovery machine.
- 1.3. Willy Schaub the MD of Sortek in South Africa could not come to terms with the way DeBeers Diamond Research Laboratory (DRL) wanted to develop such a machine and decided to go his own way.
- 1.4. The race between SORTEK and DeBeers to develop the first South African X-ray diamond recovery machine was on!
- 1.5. Sortek won the race and in 1969 when it supplied the first South African made X-ray diamond recovery machines (Model XR11B) to DeBeers diamond mine in Kimberley.
- 1.6. As from 1970 DeBeers (DRL) started various research programs trying to improve on Sortek's technology.
- 1.7. As from 1970 Peter Wolf became the driving force behind further SORTEK developments improving and enhancing SORTEK technology with many new innovations.
- 1.8. In 1971 Peter Wolf founded FLOW ELECTRONICS a company involved in electronic sorting technology from the start.

2. WHY FLOW SORT machines don't use "PULSE-SHAPE" recognition technology.

- 2.1. One DeBeers (DRL) project was to utilise the differences in luminescent signal shapes that exist between luminescent diamonds and other (under x-ray excitation) luminescent minerals.
- 2.2. This project was specifically aimed at differentiating between diamonds and zirconium.
- 2.3. The project was stopped after it became evident that there was an overlap in luminescence signal shapes between diamonds and other minerals. Thus gaining ground on the one side led to diamond losses on the other.

3. WHY FLOW SORT has not opted to develop an OPTICAL diamond recovery machine:

- 3.1. When CDM experienced problems with recovering Type II diamonds with SORTEX X-ray diamond recovery machines they approached SORTEX (UK) to develop an optical diamond recovery machine
 - 3.1.1. Note that in mid-1970 SORTEX X-ray diamond recovery machine models the X-ray exposure time was too short, the optical sensitivity too low and the signal to noise ratio too big to detect low luminescent diamonds such as Type II.
- 3.2. After testing these optical sorters at CDM for over a year this project was abandoned as it became evident that there was too much overlap between optical properties of diamonds and that of other material, especially seashell fragments which are common at CDM.

4. WHY FLOW SORT does not use “PULSED X-RAY” in their sorters:

- 4.1. After having seen that Russian diamond mines use (BOUREVESTNIK) pulsed X-ray excitation technology in their sorters DeBeers (DRL) embarked on a project developing an X-ray diamond recovery machine using pulsed X-ray rather than continuous X-rays.
- 4.2. SORTEX immediately engaged on a parallel development program to ensure it was not left behind in technology advancement.
- 4.3. Both, DeBeers and SORTEX abandoned the concept of using pulsed X-ray technology in their recovery machines as they found that by using this technology the recovery of Type II diamonds dropped significantly.
- 4.4. By the way this technique is still successfully used today at diamond mines in Russia. How come? **There are no Type II diamonds in Russia!**

5. WHY around 1978 the recovery efficiency of SORTEX machines of Type II diamonds improved?

- 5.1. SORTEX, having learned from the shortcomings of pulsed X-ray technology, embarked on the opposite route. Irradiate diamonds for as long as practically possible!

6. Sortex became the leading X-ray diamond recovery machine supplier in the western world.

- 6.1. This became a major concern to DeBeers and after negotiations to buy out Sortex failed, DeBeers decided to stop trading with SORTEX and set up their own manufacturing facility.

7. WHY, after SORTEX had lost DeBeers as a customer, SORTEX sold more X-ray diamond recovery machines in a single year into the NON DeBeers market than it did in the previous eight years put together.

7.1. In 1978 Sortex developed an X-ray diamond recovery machine that could recover diamonds from wet-material.

7.1.1. Drying the material to be sorted was no longer required! A major advantage to any diamond mine. This again put SORTEX in a leading role in diamond recovery technology.

8. Sortex sold its mineral sorting division to Rio Tinto owned Ore Sorters (Photometric Sorters)

8.1. Rio Tinto in turn sold the “old” diamond recovery technology to ELB? Although Peter Wolf supported ELB as a consultant for some time, FLOW ELECTRONICS developed traffic control related electronic equipment, leaving the “sorting-playing-field” for some 10 years pretty much to DeBeers, ULTRA SORT (an Australian company that had based their sorting machine developments on ORE SORTERS technology) and Bourevestnik.

9. In 1992 Flow Electronics went back into the electronic sorting field developing a radically different X-ray diamond recovery machines that became known as FLOW SORT machines. (also sometimes called “The WOLF machine”)

- 9.1. Sorting wet material. In fact using water as feed transport system.
- 9.2. Using a high speed “intelligent” mechanical diamond ejector system
- 9.3. Optimising X-ray exposure time and linearity across the feed stream
- 9.4. Basing the general sorter construction on a highly flexible modular design

10. Hundreds (over 680) of Flow Sort machines are currently in operation worldwide.

11. Virtually all known “famous” diamonds (which are almost exclusively Type II diamonds) found around the world in the past 15 years or so were indeed recovered by Flow Sort X-ray diamond recovery machines.

11.1. Note that the Type II diamond recovery efficiency of our current sorter models, which recover these precious stones with ease, is substantially higher than in pre 2010 models.

12. In 2010 Flow Electronics developed a new, eight times more sensitive, diamond-luminescence detection system specifically geared to detect low luminescent diamonds.

12.1. This new concept (SA PAT 2011/07547) is now known throughout the industry as “Scanning Optics”. By mid-2014 over 300 of these units have been put into service.

Scanning optics, now standard in all FLOW SORT machines can also be retrofitted to FLOW SORT machines in the field.

- 12.2. FLOW SORT'S scanning optics are designed to detect the luminescence of individual feed particles rather than the luminescence of a group of feed particles as is the case in conventional X-ray diamond recovery machines. This concept allows increasing the sensitivity of a FLOW SORT machine in detecting low luminescent diamonds by a factor of eight without increasing yield!

13.THE TRUTH OF TYPE II DIAMONDS

- 13.1. Rumours had it that FLOW SORT machines can't detect / discover Type II diamonds. This is utter nonsense and furthest from the truth. How come that all "famous" diamonds found in the last 15 years or so have been recovered by FLOW SORT machines! What more proof can one want?

- 13.2. FLOW ELECTRONICS invites anyone to bring any Type II diamond to its test facility in Johannesburg where we shall demonstrate that a FLOW SORT machine, fitted with our unique scanning optic system, indeed does recover such diamonds!

- 13.3. FLOW SORT guarantees to recover, in excess of 98% of all diamonds by number and over 99.9% by value!

- 13.4. That other makes of X-ray based diamond recovery machines can't recover Type II diamonds is another matter!

- 13.4.1. It has been recently reported that a Type II, 232 carat diamond, which had been recovered by a FLOW SORT machine, had been passed twice for test purpose through a Russian made X-ray diamond recovery machine using pulsed X-ray technology which lost it twice!
Every time this diamond was passed through a FLOW SORT machine it was recovered!

- 13.4.2. Not surprising that the manufacturer of this type of equipment recently posted an article in the MINING NEWS magazine under the heading: "New diamond separator technology by Russian group" which at the end says....."the more valuable Type II stones do not respond well to X-rays which requires the use of other technologies such as 'grease technology'....!"

- 13.4.2.1. What is missing in this statement is to mention"especially pulsed X-ray technology.....".

- 13.4.3. Little does this company know about the recovery efficiency of Type II diamonds by FLOW SORT machines which have been specifically designed to recover these valuable stones! And proven over and over again that they really do!

14.USING THE CORRECT DIAMOND SIMULATORS / TRACERS:

15. On occasions competitors of FLOW SORT have launched a smear campaign against our products by trying to discredit the high diamond recovery efficiency of FLOW SORT machines by using diamond tracers containing heavy elements, used to give such tracers the S.G of a diamond.

15.1. Such tracers have very little in common with a “real diamond” as they absorb X-ray magnitudes more than diamonds do and they are also totally opaque. Hence such diamond simulators / tracers are only suitable for evaluating the efficiency of diamond recovery machines that measures only luminescence originating from the surface that is exposed to X-rays!

15.2. FLOW SORT machines are designed to measure overall (surface as well as internal) luminescence in a diamond. And hence such tracers are not suitable for use in FLOW SORT machines!

15.3. On the subject of tracers, it is never mentioned that the shape of tracers is just as important as their luminescent / physical properties. Diamonds come in all shapes.

15.3.1. Tracers of cubic shape are more easily stabilized on a sorters feed transport system than spherical shaped ones.

15.3.2. When using a pneumatic type of ejector, tracers of cubic shape are more easily ejected from the feed stream than for instance spherical or flat shaped ones.

15.4. It is for this reason that FLOW only uses spherical shaped tracers which are most difficult to stabilize.

15.5. The tracer S.G. and shape has no effect on the recovery efficiency of a FLOW SORT machine. FLOW SORT machines use mechanical ejectors which deflect pieces of steel just as easily as diamonds whatever shape and sizes they come in.

16.Peter Wolf estimates that at some 10% to 15% of diamonds are missed by all automated (electronic) sorting machines be they XRF, XRT or Optical, based due to:

16.1. Being operated outside their design parameters

16.2. Being not properly maintained in accordance with manufacturers specifications

16.3. Being operated by insufficiently trained /motivated operators

It is interesting to know that during discussions at the recent 2014 Electra Mining Expo all suppliers of electronic diamond recovery equipment do agree with this estimate!