To visit our website,**www.flow.co.za**, click here

X-SORTER_SET-UP_3_070727_25.DOC
E:\DOCUMENTS\SERVICE\...
DATE: 2005-03-09
UPDATE: 2007-07-28
sorter manual (master)

Basic Flow Sort Diamond Recovery Machine Set-Up and Diamond Recovery Optimisation Procedure.

It is assumed that the person executing the set-up procedure is has read through the "FLOW SORT DIAMOND SORTER MANUAL" and is fully familiar with the operation of the FLOW SORT DIAMOND RECOVERY MACHINE MODEL to be set up!
It is further assumed that the sorter to be set-up is 100% functional and there is no possibility that the sorter's diamond recovery efficiency may be impaired by faulty components, faulty sub-assembly or simply by a poor general state of sorter due to lack of maintenance.

There are 3 areas that need to be carefully set-up.

The MATERIAL FLOW through the sorter

The WATER-FLOW through the sorter

The LEVEL OF SENSITIVITY of the sorter

1. ADJUSTING THE MATERIAL FLOW (FEED-RATE)

a. **Note: This adjustment must be made for each of the 3 different sorting position i.e. for position 1, for position 2 and for position 3**

b. **The feed control gate gap must be set to 2.5 times the largest particle size (in mm) to be sorted at the selected sorting position.**

c. **The corresponding feed-rate-control dial must be set as high as possible without exceeding the maximum permissible feed-rate for the material size and material type being sorted**

2. **ADJUSTING THE FEED-WATER-FLOW**

    a. **A sorter typically requires 15 litres of water per minute for feeding +2mm -5mm material.**

    b. **As excessive water flow leads to a drop in recovery of small diamonds it is important to adjust the water flow rate that is suitable for the smallest material size fraction to be sorted. The larger size fraction to be sorted at the other two sorting positions will be fed through the sorter with the same amount of water flow.**

    c. **Ensure that the feed water deflector (positioned above the point of transfer of the material from the feeder tray onto the feed-slide) is set to its optimum position**

    d. **For the second stage of a TSXR type sorter follow the rules as set out in paras. 2.a to 2.c above.**

3. **SETTING THE LEVEL OF SENSITIVITY**

    a. **Note: The procedure as described in this section applies for the fist stage of TSXR models as well as second stages of TSXR sorter models. Whatever the final settings are it is important that the sensitivity of a second stage of a TSXR sorter is always set 0.1µA to 0.2µA higher (more sensitive) than the sensitivity setting of the first stage of uch a twin stage sorter!**

    b. **Note: This set-up must be done for each of the 3 sorting positions.**

    c. **Set the CHANNEL SENSITIVITY LEFT AND THE CHANNEL SENSITIVITY RIGHT to give a reading of 0.3 Micro Ampere at the 'OPTICS (µA) meters' for the right channel and left channel respectively.**

    d. **Allow to the sorter to WARM-UP for 10 minutes.**

4. **After this 10 minutes warm-up period re-adjust the two CHANNEL SENSITIVITY readings to 0.3 µA if necessary**

5. **Reset both "EJECTIONS" counters to 0 (zero).**

6. **Now pass 100 (one hundred) FLOW SORT ("MARBLE")-TRACERS, one by one, through the left channel of the sorter.**

7. **If less then 100 Tracers are recovered (the left EJECTIONS counter shows less than 100) increase the CHANNEL SENSITIVITY setting of the left channel by 0.1 uA .**

8. **Repeat step 3 to 6 until all 100 tracers are recovered.**

9. **Follow steps 3 to 6 for the right sorter channel.**

10. **RECORD THE DIAL SETTING OF THE TWO 'CHANNEL SENSITIVITY' POTENTIOMETERS. The setting should be between 5.0 and 7.0 (the lower the better). This is a most important record of the 100% (Marble) Tracer Recovery point (TR100).**

    e. **Such a "TR100" record for instance will look like this:**
        i. **LEFT DIAL SETTING = 4.3 and uA meter = 0.5**
        ii. **RIGHT DIAL SETTING = 4.1 AND uA meter = 0.6**

11. **Now whilst keeping the sorter set at TR100, switch on the feeder and adjust the feed rate to the required throughput for the feed material size being passed through the sorter. DO NOT EXCEED THE MAXIMUM PERMISSIBLE FEED RATE. REFER TO THE RELEVANT SORTER SPECIFICATION TO CALCULATE THIS MAXIMUM THROUGHPUT FIGURE. (If possible use feed material that does not contain any diamonds)**

12. **Record the number of ejections over a period of 5 minutes at this feed rate setting for the left channel and for the right channel and calculate the respective ejection average per minute. After every test-run CHECK THE CONCENTRATE and deduct the number of diamond recovered from the ejection / minute / channel figure!**

    f. **If the number of ejections per channel per minute is less then 10 (ten) the TR100 setting is to be used as the PSS (Preferred Sensitivity Setting). THIS IS THE IDEAL SETTING!**

    g. **If the number of ejections per channel per minute averages above 10 (ten), reduce the 'CHANNEL SENSITIVITY' (of either both left and right channels or of the one channel that produces excessive ejections) by 0.1 uA and repeat step 10 until the condition as per Para 10a. is met.**

    h. **Record the final setting(s) as required to stop the 'feed test run' at Para 10 a. i.e. both channels do not produce more than an average of 10 ejections per minute. Let us refer to this setting as the ASS (Acceptable Sensitivity Setting).**

13. **In cases where the ASS setting is below the TR100 setting a new (repeat) tracer recovery test has to conducted, following the procedure as per step 3 and 4, and the actual tracer recovery (for each channel) at this ASS level must be established.**

    i. **If this tracer recovery figure, at this setting, is below 75% there is a strong possibility that the actual diamond recovery at this setting is going to be below 98% ! This 'reduced' recovery efficiency can either be accepted and the sorter operated at its maximum throughput or…**

j. the 'MAXIMUM THROUGHPUT' as per Para 9. must be reduced by 25 % and the test procedure from Para 9 to Para 10c. must be repeated.

k. This procedure must be repeated until a ASS setting is reached at which the tracer recovery is better than 75%. As explained above, this is a (ASS) setting at which the average ejection count per minute per channel is less then approximately 10 (ten) and at which a tracer recovery of better than 75% is achieved **.

14. From the above it is obvious that an acceptable sensitivity setting (ASS) for any sorter application must be found.
Such a setting is often a compromise between diamond recovery, yield and maximum permissible feed rate!

l. In cases were there are little or no fluorescent particles in the material to be sorted it is possible to keep the ASS (actual sensitivity setting) the same as the TR100 (100% tracer recovery) setting which is the PSS (preferred sensitivity setting)! This is without doubt the ideal situation.

m. There are however cases were a large amount of fluorescent particles, other then diamonds, are present in the material to be sorted.

n. Some of these 'interference' particles do fluoresce (under X-ray) as intense at the same wavelength (colour) as diamonds. Such fluorescent particles will report to the concentrate the same way as fluorescent diamonds.

o. Setting the CHANNEL SENSITIVITY lower does indeed reduce the number of these 'interference' particles that are ejected into the concentrate chute. However, the probability of 'weakly' fluorescent diamonds reporting undetected to the tailings chute does increase at the same time!

15. Many of the 'interference' particles however fluoresce at different wavelength (colour) to that of a diamond.

p. The difference in colour can be exploited by fitting optical filters to a sorters optic, that selectively allow the wavelength (colour) of a fluorescent diamond to pass but drastically attenuate the light from other fluorescent (interference) particles.

q. If after following the SENSITIVITY SET UP procedure as per Para 2 to Para 13 a sorters yield is deemed to be to high then the optic pox should be fitted with FLOW SORT K45 filters and the SENSITIVITY SET-UP procedure must be repeated starting at Para. 2.

r. In cases of high yield consider the possibility to re-sort (re-concentrate) the concentrate obtained, at a very low feed-rate, thus substantially reducing the final yield! The tailings of such a re-

concentration run is typically returned to the head-feed of the next run.

FOR FLOW SORT (PTY) LTD
Peter Wolf

****As the fluorescence properties of diamonds as found indifferent areas and diamonds of different types have vastly different fluorescence properties we highly recommend that in all 'critical cases' FLOW SORT TRACER are correlated to ACTUAL DIAMONDS. This is the only way a minimum tracer recovery figure can be established**