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HOW THE USE OF A SPECTRAL FILTER AFFECTS THE SET-UP OF A FLOW SORT X-RAY DIAMOND RECOVERY MACHINE.

This write-up is not intended to explain and reason WHY and WHEN a FLOW SORT X-RAY DIAMOND RECOVERY MACHINE should be fitted with an optical band-pass filter such as our K45 or our K42.

The following is intended to explain and quantify the effects that such filters have on the set-up of our sorters.

A FLOW SORT TRACER-MARBLE typically produces a luminescence level of 2.5 μlm (micro-lumen) when it passes through the X-ray beam of a Flow Sort machine. (Note that only a small portion of this luminescence actually reaches the PM-tube, without any optical filter fitted!)

This amount of luminescence will generate, depending on how sensitive the PM-tube is set, a signal of say 1.5 μA (note that a signal $> 1.0 \mu\text{A}$ is required to trigger the sorters ejector).

If we install, in front of the PM-tube, a “broad-band” K42 filter, the PM-tube only receives only 50% of the amount of luminescence it receives without the filter.

This means, that without increasing the PM-tubes sensitivity, a marble tracer will only generate a 0.75 μA signal.

To compensate for this loss in light reaching the PM-tube, the sensitivity of the PM-tube has to be doubled.

This means that if 100% tracer recovery (without filter) was obtained with a channel sensitivity (PM-tube sensitivity) dial setting of 4.2, the dial setting needs to be increased to approximately 4.7 to maintain a 100% tracer recovery.

If we install, in front of the PM-tube, a “narrow-band” K45 filter, the PM-tube only receives only 50% of the amount of luminescence it receives without the filter.

This means, that without increasing the PM-tubes sensitivity, a marble tracer will only generate a 0.35 μ A signal.

To compensate for this loss in signal amplitude (loss of light) the sensitivity of the PM-tube has to be increased four fold (4x). (Typically this translates to a PM-tube sensitivity dial setting change from, say 4.2 to 5.1.

This adjustment assumes that a 100% marble tracer recovery was achieved by the sorter at a setting of 4.2 before filters were installed!

Important: The figures quoted above must only be taken as a “proportional” guideline and NOT as absolute values. Actual dial settings depend entirely on the characteristic of the PM-tube used. There are hardly any two PM-tubes that are exactly the same!

To summarize: After fitting K42 filters to a FLOW SORT machine it is necessary to double (increase 2x) the sensitivity of the PM-tubes (channel sensitivity) to obtain the same FLOW SORT “MARBLE” TRACER RECOVERY figure that was achieved by the sorter without any optical filters.

As a ballpark figure (guide-line) this translates for a PM-tube with “average sensitivity” to a PM-tube sensitivity (channel sensitivity) dial adjustment from say 4.2 to 4.7.

After fitting K45 filters to a FLOW SORT machine it is necessary to quadruple (increase 4x) the sensitivity of the PM-tubes to obtain the same FLOW SORT “MARBLE” TRACER RECOVERY figure that was achieved by the sorter without any optical filters.

As a ballpark figure (guide-line) this translates for a PM-tube with “average sensitivity” to a PM-tube sensitivity dial adjustment from say 4.2 to 5.1.

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