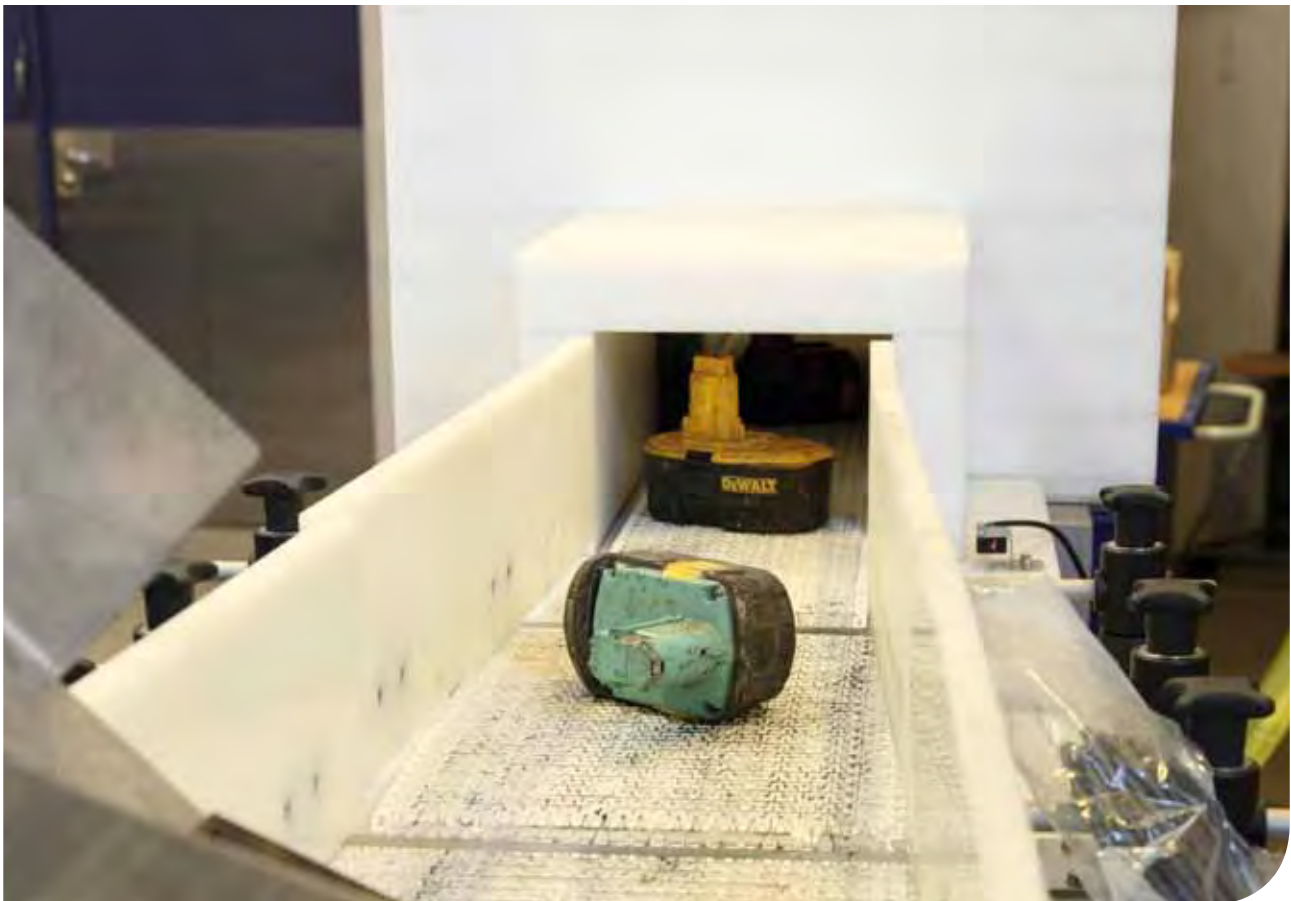


## The NiCd-sorter



### Advantages

Separating NiCd-batteries out from a stream of recycled batteries, not only removes the toxic impurity cadmium from a stream of potentially valuable materials for recycling, it also yields tangible benefits for the environment and moves one's process towards compliance with relevant EU legislation in the area, namely Directive 2006/66/EC on batteries and accumulators.

The NiCd-sorter provides this functionality: the ability to identify NiCd-batteries in a stream of waste batteries. The device, in its current form, is designed for larger battery types such as power tool battery packs, laptop batteries and similar designs, but can be refurbished to accommodate smaller batteries such as D- or C-cells or even smaller form factors.

The device operates without the need for contact, the batteries simply passing through the sensor on a conveyor.

The technology employed (see below) is scalable to a certain degree, meaning that if higher speed/capacity is needed the device can be scaled up to accommodate this need. The same scalability applies for lower speed/capacity.

### Technology

The NiCd-sorter utilises the PGNA technique, or **P**rompt **G**amma **N**eutron **A**ctivation **A**nalysis technique, whereby a radioactive source emits neutrons, which makes the batteries emit a characteristic response which can then be detected and used to identify the elements present.

Cadmium is highly susceptible to this type of measurement, having the dual qualities of being easy to excite into emitting its response and having a highly characteristic response which is easy to detect.

### Detection limits

The sensor detection limit is dependent on conveyor speed and in its current form the limits are:

- AAA-batteries at a maximum conveyor speed of about 0.4 m/s
- AA-batteries at a maximum conveyor speed of about 1 m/s
- For NiCd-batteries weighing more than 100 g (battery weight) the speed of the conveyor can be 10 m/s or even greater

### Capacity

The capacity of the sensor varies with configuration. When sorting the waste batteries into two fractions, where one is made up of large NiCd battery packs, it is more than 5 ton per hour, assuming continuous feeding of batteries (the device operates batch-wise). This is the current configuration of the demonstration facility.

If the sensor is configured for sorting smaller battery packs into several categories of battery chemistry, the capacity is around 500 kg per hour, again assuming continuous operation.

### Radiation safety and regulatory matters

The sensor employs a radioactive source, which of course means that some extra safety aspects must be considered. However, FORCE Technology has more than forty years of experience in successfully designing, constructing, selling and deploying devices employing radioactive sources and the device is constructed to meet all necessary safety requirements.

The presence of a radioactive source also means that approval is needed to import, install and operate such a device. Again FORCE Technology has extensive experience in the field and is able to assist in these matters.

### Main device options

It can be delivered in two main forms:

1. As a more or less complete sorting solution, featuring:
  - Feeder/hopper- Conveyor systems
  - Sensor
  - Ejector mechanism
2. Or simply as a sensor, delivering a signal via an agreed upon interface.



*Photo: The NiCd-sorter demonstration device is mobile, enabling demonstrations performed on site*

Option B leaves integration of the sensor into the process up to the customer, offering a greater degree of flexibility and at cheaper price, while option A has FORCE Technology designing and delivering a complete solution for the customer.

### Alternate versions; other battery types

The PGNAATechnique in general can be used to characterise most elements and is able to discern other types of batteries as well.

### Contact details

For further information please visit our website [elementsort.eu](http://elementsort.eu). It is also possible to visit our demonstration facility at FORCE Technology company headquarters, located near Copenhagen - see address below.

### Further information

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