Technology Licensing
Opto-Mechatronics Plastic Bottle Sorting System
CONTENT

1. Background of HKPC
2. Opto-Mechatronics Plastic Bottle Sorting System
3. Commercialization Package
4. Q & A
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OPTICS AND OPTO-MECHATRONICS TECHNOLOGY CENTRE

- Provides support and consultancy services to industries in optics design and manufacturing
- One-stop solutions tailored for our client
- Service spans from design and development, prototype and precision mould fabrication to optics inspection
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Typical Sorting Process

1. Ballistics Separators
2. Removal of papers, glass, steel, etc.
3. Ready for polymer segregation
4. Optical methods to identify polymers
5. Separate polymers by air jet ejection nozzles
6. Separated polymers

Reference: http://www.youtube.com/watch?v=gDED4ZKAnd4
Typical Sorting Process

**Overseas**

- Manual Pre-sort – manually remove contamination;
- Automatic Optical Sorting – Infrared sensors and air jets sort plastics.
- Normally 6-10 tons/hr/shift

**Hong Kong**

- Manual sorting of all type of plastics.
- Normally 5 tons per day
The sensor technologies

- **Near Infrared**
  Recognizes materials based on their specific and unique spectral properties of reflected light.

- **Color Recognition**
  Recognizes materials based on their color. Their capabilities go beyond the visible spectrum and include infrared, ultraviolet and other spectra.

- **X-Ray fluorescence technology**
- **X-Ray transmission**
- **Electromagnetic Sensor**
- **Visual Spectrometry**
- ...
Opto-Mechatronics Plastic Bottle Sorting System

- Using NIR sensor to detect the absorption peaks in the NIR response spectrum, thus to identify different types of material.
- Every material (PP, LDPE, ABS, PS, ...) has its own and unique NIR absorption spectrum.
- For example, if the NIR absorption spectrum has a peak value at 1660 nm, the material can be identified as PET.

Typical absorption peaks of infrared for various plastics

- PET: 1660 nm
- HDPE: 1400 nm, 1732 nm, 1214 nm
- PVC: 1196 nm, 1422 nm, 1716 nm

Unsorted Plastic Bottles

1. **NIR sensing**
2. 1660 nm?
   - YES: PET
   - NO: 1214 nm?
3. 1214 nm?
   - YES: HDPE
   - NO: 1716 nm?
4. 1716 nm?
   - YES: PVC
   - NO: Other wastes or materials
Opto-Mechatronics Plastic Bottle Sorting System

NIR Sensing module

NIR Sensing process

Air jet ejection zone

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Outer Dimensions</td>
<td>2010mm (long) x 680mm (width) x 1515mm (height)</td>
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<tr>
<td>Conveyor Speed</td>
<td>~0.34 m/s</td>
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<tr>
<td>Sorting Material</td>
<td>PET</td>
</tr>
<tr>
<td>Power Supply</td>
<td>220V AC</td>
</tr>
<tr>
<td>Software Operation System</td>
<td>Window .NET Framework</td>
</tr>
</tbody>
</table>

Acquisition

Pre-processed Spectral Images

Classification

Data
COMMERCIALIZATION PACKAGE

✓ Part A. System Design Reference
  • System design layout for assembly reference
  • Light source and NIR sensor specification reference
  • NIR Data reference

✓ Part B. System Algorithm
  • Algorithm flow of the system, including the recognition process and the sorting process
  • Recognition algorithm based on NIR technology
  • Control system design, including optimized speed of conveyor and pneumatic system programming

✓ Part C. Technical Support
  • Two-month telephone hotline technical support
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