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**Nottingham**

**DEVELOPMENT OF A CONTINUOUS  
PNEUMATIC JIG FOR SOLID WASTE  
SEPARATION**

*By*

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## **Abstract**

The work presented in this research is related to the recycling of solid waste material which is currently one of the major issues in the waste management system. The main aim of this study was to develop and establish a continuous solid waste separation technique that utilises the basic principles of jigging.

The initial work has explored the potential application of the constructed batch pneumatic jig on the separation of artificial (density tracers) and real materials (solid wastes). The objective is to discover and understand the underlying principle behind the separation process through experimental works. The results obtained have yielded deeper understanding on the inter-relationship between feed characteristic, airflow conditions, pulse frequency and jig separation efficiency. The knowledge and information gathered from the initial work have been used to construct and develop a new continuous pneumatic jig for the same purpose.

Comparison works of the continuous and batch pneumatic jig has indicated that the results obtained from the separation of shredded electrical cable can be repeatable for the sample with approximately 85:15 percentages by weights of copper wire and rubber insulation at the size range of 1.7-2.36 mm. The separation process through continuous pneumatic jig also has showed separation efficiency can be improved when the system incorporated a vibration effect. Furthermore, the jig has also showed its capability on handling wide range of solid waste material such as compost and WEEE material.

Finally, the study has also revealed some of the pneumatic jig (batch and continuous) limitation that may need to be considered in future

development of this technique. Overall, the work on the continuous pneumatic jig has confirmed that solid waste particles could be separated through careful control of the air flow, pulse rate and vibration during separation process. This also indicates some promising future for the continuous pneumatic jig in the solid waste recycling application.

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## **Nomenclature**

### **Abbreviations**

WEEE	Waste of Electrical and Electronic Equipment
ELV	End of Life Vehicle
CDW	Construction and Demolition Waste
MSW	Municipal Solid Waste
AFR	Africa
EAP	East Asia and Pacific
ECA	Eastern and Central Asia
LAC	Latin America and the Caribbean
MENA	Middle East and North Africa
OECD	Organization for Economic Co-operation and Development
MRF	Material Recovery Facility
PBDDs	Poly-Brominated Dioxins
PBDFs	Furans
EPA	United States Environmental Protection Agency
CRT	Cathode Ray Tube
BNE	Brazil Nuts Effect
DEM	Discrete Element Method
CFD	Computational Fluid Dynamics

PE	Polyethylene
PVC	Polyvinyl Chloride
PLC	Programmable Logic Control
PTFE	Polytetrafluoroethylene
GPR	Ground Penetrating Radar
ROI	Region of Interests
RGB	Red Green and Blue
SPT	Sodium Polytungstate
SEM	Scanning Electron Microscope
PCB	Printed circuit board
NDG	Nucleonic Density Gauge