

**DEVELOPMENT OF A MACHINE ASSISTED
ECCENTRICITY TEST METHOD FOR A TYPE OF
WEIGHING INSTRUMENT USED IN LPG CYLINDER
FILLING MACHINERY**

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Declaration of the candidate and the supervisor

“I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Abstract

Testing is an essential factor in the manufacturing processes. While the relevant standards and specifications govern the scope of a given test procedure, the methods and mechanisms used for the testing strongly depend on the rate of product output, operating environment, technological infrastructure and ergonomic requisites.

This research work is focused on the testing requirements of a weighing instrument module that is used in the liquefied petroleum gas (LPG) cylinder filling industry.

The current testing method involves manual placement of a test weight on predetermined positions on the weighing instrument module, and; recording of the measurement readings, by an operator.

Manual handling of the test weight has led to a constraint on the maximum usable test load as well as the ergonomic concerns related to the repetitive load handling by the operators.

In order to increase the load handling capacity and to eliminate the ergonomic related issues, this dissertation has proposed and developed a machine assisted testing solution, giving due consideration to the relevant industrial norms on the design and development of machinery.

During the course of the research work, the author has developed a simplified pneumatic based positioning strategy that can be used for reliable acquisition of predefined points in space, and; that does not suffer from the nonlinear characteristics of air. This development is an enhancement of a multi- positioning method proposed by a renowned manufacturer of pneumatic solutions, systems and accessories.

Further, the machinery that was developed as a result of the research work was able to deliver an overall enhancement to the focal testing process in terms of operating capacity, safety and ergonomic gain.

A comprehensive verification was done on the results of the research work at the concluding stages and the achievement of the objectives was validated with the supporting evidence.

Dedication

to the *Almighty Father* and to *our Lady - the blessed virgin Mary ...*



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LIST OF ABBREVIATIONS

Abbreviation	Description
CAD	Computer aided design
GUI	Graphical user interface
HMI	Human machine interface
IDM	Impact drive mechanism
ISO	International Organization for Standardization
LPG	Liquefied petroleum gas
OCRA	Occupational repetitive action
OIML	International Organization for Legal Metrology
PWM	Pulse width modulation

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