

# IDENTIFICATION OF FACTORS AFFECTING INDUSTRIAL GAS AND LIQUID BUSINESS IN SRI LANKA

By

**H. P. R. K. Rupasinghe**

LIBRARY  
UNIVERSITY OF MORATUWA, SRI LANKA  
MORATUWA

The Dissertation was submitted to the Department of Management of Technology of the University of Moratuwa in partial fulfillment of the requirement for the Degree of Master of Business Administration.

**Supervised by : Prof. Ajith de Alwis**

Handwritten notes and signatures in the right margin.

Department of Management of Technology  
University of Moratuwa-Sri Lanka

May 2006

University of Moratuwa



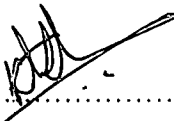
87860

Handwritten number: 87860

87860

## DECLARATION

"I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any University to the best of my knowledge and belief it does not contain any material previously published, written or orally communicated by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organizations"

  
.....  
Signature of the Candidate

28/04/2006  
.....  
Date

To the best of my knowledge, the above particulars are correct.

  
.....  
Supervisor

Professor Ajith de Alwis  
Head of Department of Chemical Engineering  
Department of Chemical Engineering  
University of Moratuwa  
Sri Lanka

## ACKNOWLEDGEMENT

This dissertation was completed with the kind contribution of a lot of people. However I would like to devote very special thanks to a few for their kind valuable contribution extended to me to make this dissertation a success.

First of all, I devote my special thanks to my research supervisor Dr. Ajith de Alwis for his guidance, encouragement and support extended to me to make this research project a success. Also, a sincere gratitude is extended to all the faculty members of the course of Master of Business Administration in the Department of Management of Technology at the University of Moratuwa.

Last but not least, I wish to thank to all the members of various organizations who extended valuable help to me in carrying out my research data collection.



University of Moratuwa, Sri Lanka  
Electronic Theses & Dissertations  
[www.lib.mrt.ac.lk](http://www.lib.mrt.ac.lk)

## ABSTRACT

“Industrial gas companies have played an increasing active role in reducing global dimming. By doing so scientists have discovered that global dimming has been making the true rate of global warming. Can industrial gas companies play a role in reducing global warming? ” The scientists in the environmental fields have asked this question.

Industrial gas and liquid business sector predominantly consider the industrial and medical sector, thereby “supporting life and industry”. Recent figures produced by industrial analysis show that the industrial gas business grew at an estimated rate of 12.5% in 2004 to reach \$ 44.5 billion. Major gas companies are continuing to report strong growth and also announce new major projects across the globe. In globally, the manufacturing and sales volumes of oxygen and nitrogen have become among the first three places of chemical production items. The main reason is, raw material is freely available. But in locally, there are a few companies manufacturing industrial gas and liquid products and these manufacturing and sales volumes of local companies are less compared to global market. Sri Lanka is a less developed country and the local industries use very limited technologies for their production. Even though industrial gas and liquid products can be used to achieve quality advancement and cost effectiveness locally this is not practised.

The research has been carried out as a case study type survey and the research objectives of this study are to identify the factors affecting industrial gas and liquid business and put them in a priority matrix. With the use of priority matrix, the high priority, medium priority and low priority factors can be identified. Then the organization can formulate strategies by considering the priority levels of identified factors to achieve the success of the business.

## TABLE OF CONTENT

Acknowledgement.....	i
Abstract.....	ii
<b>1. Introduction.....</b>	<b>1</b>
1.1 Background.....	1
1.2 Research Topic.....	2
1.3 Research problem.....	2
1.4 Objectives of the study.....	4
1.5 Importance of the study.....	4
1.6 Methodology.....	5
1.7 Limitation of the study.....	7
1.8 Chapter frame work.....	8
<b>2. Literature review.....</b>	<b>10</b>
2.1 Introduction.....	10
2.2 Literature survey.....	10
2.2.1 Industrial gas & liquid business.....	10
2.2.2 Industrial gas & liquid product consuming sectors.....	12
2.2.3 Factors affecting industrial gas & liquid business.....	13
2.2.3.1 Studies carried out in local context.....	13
2.2.3.2 Studies carried out in global context.....	14
2.3 Interview.....	27
2.3.1 Manufacturing products.....	27
2.3.2 Application requires products.....	27
2.3.3 Import products.....	28
2.3.4 Numbers of organizations and organization functioning period.....	28
2.3.5 Annual turn over and economic condition.....	29
2.3.6 Business operation methods.....	29
2.3.7 Sales volume of business channels.....	29
2.3.8 Product transport methods.....	30
2.3.9 Age of Technology used.....	30
2.3.10 Technological assistance paths.....	31
	iii

2.3.11	Availability of spare parts.....	31
2.3.12	Purchase of new plant and equipment.....	32
2.3.13	Level of technology.....	32
2.3.14	Product awareness.....	32
2.3.15	Environment standard.....	33
2.3.16	Education level of employees.....	33
2.3.17	Working experience.....	34
2.3.18	Skill level of employees.....	34
<b>3.</b>	<b>Industrial case studies.....</b>	<b>35</b>
3.1	Case 1-Product wise Analysis.....	35
3.2	Case 2-Individual Quick Frozen Technology(IQF).....	40
<b>4.</b>	<b>Framework of the research &amp; operationalization of the methodology.....</b>	<b>54</b>
4.1	Introduction.....	54
4.2	The conceptual model.....	54
4.2.1	Factors identified through literature review(local & global) .....	55
4.2.2	Factors identified through case studies and interviews.....	56
4.2.2.1	Methodology used to develop the questionnaire.....	57
4.3	Operationalization of methodology.....	58
4.4	Data collection methodology.....	59
<b>5.</b>	<b>Result analysis.....</b>	<b>60</b>
5.1	Introduction.....	60
5.2	Identified variables with indicators.....	60
5.2.1	Criticality & occurrence level in indicators of product range variables.....	60
5.2.2	Criticality and occurrence level in indicators of market competition variable.....	61
5.2.3	Criticality and occurrence level in indicators of product availability variable.....	61
5.2.4	Criticality and occurrence level in indicators of product technology.....	62
5.2.5	Criticality and occurrence level in indicators of acquiring new technology.....	62
5.2.6	Criticality and occurrence level in indicators of market growth.....	62
5.2.7	Criticality and occurrence level in indicators of government policy.....	63

5.2.8	Criticality and occurrence level in indicators of human resources	
	Effectiveness.....	63
5.3	New application-Nitrogen Filling in tires.....	64
5.4	Criticality of factors identified.....	65
<b>6.</b>	<b>Issues priority matrix and recommendation.....</b>	<b>68</b>
6.1	Introduction.....	68
6.2	Issues priority matrix.....	68
6.3	Recommendations.....	70
<b>7.</b>	<b>Conclusion and future directions.....</b>	<b>74</b>
7.1	Introduction.....	74
7.2	Conclusion.....	74
7.3	Directions for future research.....	76
<b>Appendix I</b>	<b>-Questionnaire.....</b>	<b>78</b>
<b>Appendix II</b>	<b>-List of organizations studied for research.....</b>	<b>80</b>
<b>Appendix III</b>	<b>- Industrial Gas &amp; Equipment companies web Pages.....</b>	<b>83</b>
<b>References.....</b>		<b>87</b>

## LIST OF TABLES

Table 1	: Product wise analysis-Oxygen.....	36
Table 2	: Product wise analysis-Nitrogen.....	37
Table 3	: Product wise analysis-Carbon dioxide.....	38
Table 4	: Product wise analysis-Helium.....	39
Table 5	: Interview framework of the study.....	56
Table 6	: Operationalization of Methodology.....	58
Table 7	: Criticality of identified factors.....	66





## LIST OF ILLUSTRATIONS

Figure 1	: World Industrial Gas Demand by End-use Market Segment.....2000-2008	2
Figure 2	: Research Approach.....	6
Figure 3	: Total Retail Gas Business.....	12
Figure 4	: New product innovation with technology life cycle.....	17
Figure 5	: Market influence of the Major Gas companies.....	18
Figure 6	: Business Transaction model based on parties involve in transaction...20	
Figure 7	: Whole channel concept for international Market.....	21
Figure 8	: Research Methodology.....	55
Figure 9	: Model used to prepare Questionnaire for the interview.....	57
Figure 10	: Benefits with the use of Nitrogen in tires.....	65
Figure 11	: Issue priority matrix for industrial gas & Liquid business.....	69



University of Moratuwa, Sri Lanka  
Electronic Theses & Dissertations  
[www.lib.mrt.ac.lk](http://www.lib.mrt.ac.lk)