THE UNIVERSITY OF THE WEST INDIES

ST. AUGUSTINE CAMPUS

MANUFACTURING PROFILE 10: MELAMINE

The Development of Project Profiles for the Manufacturing Sector of T&T

ABSTRACT

Melamine is a very important organic chemical used in many applications. T&T is able to provide the major component of melamine for the manufacturing of melamine based products such as adhesives, melamine moulding compounds, laminates and plastics.

ENGINEERING INSTITUTE 2016

The research contained within this document was commissioned by InvesTT Limited and conducted by the UWI, St. Augustine Campus

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1 Description of the Opportunity

1.1 Summary

Melamine is a derivative from gas. Melamine resin is a very durable thermosetting plastic formed by combining melamine with formaldehyde. A thermosetting plastic, is a plastic that can melt and take the shape of a mould but after it is cooled it is virtually unbreakable and dishwasher safe.

Ferrostaal, a Germany based firm partnered with Methanol Holdings Trinidad Limited (MHTL) and constructed a petrochemical plant, the AUM (Ammonium Urea-ammonia-nitrate Melamine) complex. The AUM complex was built in close proximity to the existing plant of MHTL as the idea is to create a cluster within the Point Lisas area. The AUM complex has been producing melamine since 2010 and have markets from as far East as India and China and huge markets in the United States. T&T is one of the world's largest producers/exporters of melamine powder however the downstream industry for melamine does not exist in T&T. Melamine powder could be used in making moulding compound which could then be used in a variety of applications.

T&T has a stable gas supply, stable weather and infrastructure already in place for a melamine downstream industry and there exist opportunities for partnerships or investors to take advantage of the locally produced high quality melamine. This profile consists of the production of melamine moulding compound for various uses. A financial assessment of the activities described in this profile yielded the following results shown in Table 1.

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Table 1: Melamine Summary

SCENARIO	INVESTMENT (IN MILLION USD)	PAYBACK PERIOD	10 YEAR NPV (IN MILLION USD)	IRR (10YR)
Optimistic	6.52l	4 Yrs	4.98	31%
Moderate	6.52	6 Yrs	2.67	23%
Pessimistic	6.52	10 Yrs	0.371	14%

1.2 Product Mix

Melamine moulding compounds, laminates, adhesives, surface coatings, halogen free fire retardants and plasticisers were some of the products being considered for this profile. However, this profile focuses on the production of melamine moulding compounds and high end related products for simplicity. Developing a profile for all the former products would require several different profiles as each product requires different equipment, floor space, workforce etc. and to be produced in its own plant. The possibility of developing downstream industries in all of them remains a desirable possibility, though.

Products made from the high quality melamine powder produced in T&T is however, a definite good fit with the quality of dinnerware in demand by the global restaurant business, from where this venture would achieve the majority of its sales. Sales would also come from institutions such as hospitals, offices and schools which seek robust crockery with the resilient properties and ease of care as high end melamine. Restaurant display and serving items, dinnerware sets, kitchen tools such as tongs, ladles, serving spoons, pot spoons, etc. and popular individual pieces of crockery such plates, cups and tumblers would be the primary products for this enterprise. Sales would be aimed at business markets such as

hotels, restaurants and institutions such as hospitals, but it is predicted that up to 40% of sales would come from consumer markets, through retailers such as department stores.

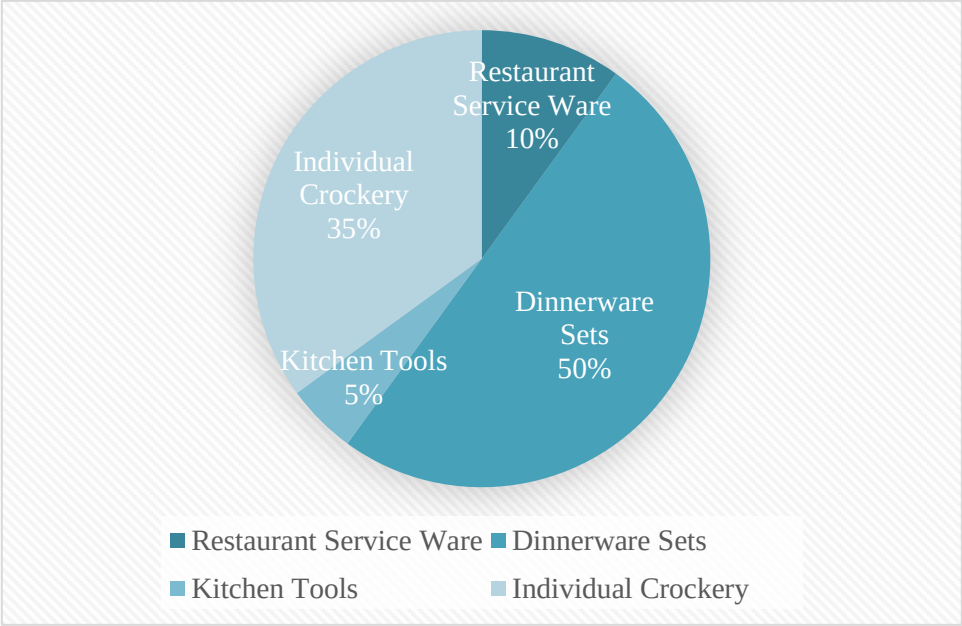

Figure 1: Melamine Product Mix

Table 2: High End Melamine Products

PRODUCT	DESCRIPTION	ESTIMATED % OF SALES
Restaurant Display and Serving Items	White	10%
Dinnerware Sets	White, Solid Coloured, Patterned	50%
Kitchen Tools	White, Solid Coloured, Patterned	5%
Individual Crockery	White, Solid Coloured,	35%

	Patterned	

1.3 Description of Activities

Melamine easily reacts with formaldehyde to yield melamine-formaldehyde (MF) resins which are generally used in various applications such as moulding compounds. A chart showing the activities to produced moulded thermoset plastic products is shown in Figure 2. Compression moulding is the most suitable process for executing the product line as described in Section 1.2 Product Mix.

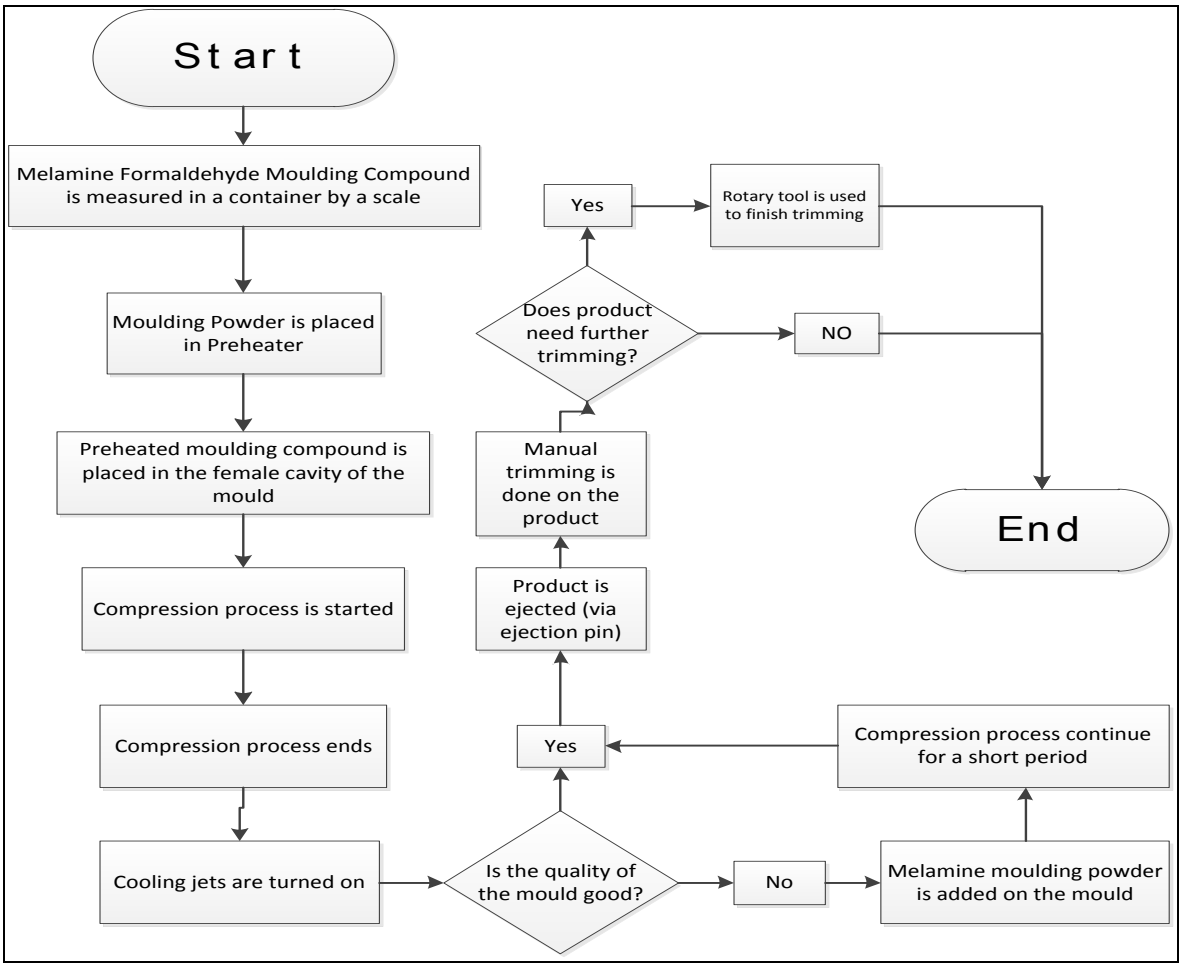

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Figure 2: Description of Activities

Source: *Leanna N. Sutherland (MIC)*

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2 Industry Overview

2.1 Industry Description

Melamine is a very important organic chemical used in many applications such as the manufacturing of laminates and decorative panels. It easily reacts with formaldehyde to yield melamine-formaldehyde (MF) resins which are generally used in various applications such as adhesives, moulding compounds, surface coatings, paper treatments, textiles, and flame retardants. However, the major applications of melamine used worldwide was found to be 29% adhesives, 36% Low Pressure Laminate (LPL), 11% High Pressure Laminate (HPL), 8% Coatings, 8% Moulding Powders and 8% others. On the other hand, for the Americas, the following melamine applications were found; 21% HPL, 29% LPL, 22% Coatings, 8% Adhesives, 4% Moulding Powders and 16% others.

From 2007 to 2010, the worldwide capacity of melamine has increased by 9% and in 2015 it was projected that the market size of melamine should be around 1.663million metric tons internationally. It is projected that from 2015 to 2023, the global melamine market would continue to grow and there would be robust growth in the global building and construction industry.

2.2 Incentives

A number of incentives are available for investors. In addition to general incentives, there are incentives related to manufacturing as well as agro-processing. (All values for incentives are in $TT where US $1. = TT $6.74 on 17 August, 2016)

- ***The Fiscal Incentives Act***, offers a waiver of income tax on dividends or other distributions, other than interest, out of profits derived from manufacture of approved products.
- ***Total Relief from Value Added Tax*** on imports for highly capital intensive enterprises.
- ***The Customs & Excise Act*** offers investors duty free importation of plant, machinery, equipment, components and raw materials, as specified in the Third Schedule of the Customs Tariff.
- ***The Foreign Investment Act*** allows a foreign investor to purchase land not exceeding one acre for residential purposes and five acres for commercial purposes without obtaining a license. In order to purchase land in excess of these amounts, a foreign investor must apply for a license from the Minister of Finance. Additionally, foreign investors are allowed to purchase up to 30 per cent of the cumulative shareholding in a public company.

3 Stakeholder Analysis

The various stakeholders were analysed using Mitchell, Agle and Wood's Power Legitimacy Urgency model. The Power, Legitimacy, Urgency model results in eight different stakeholder groups. These groups are defined by which of the three (3) attributes each individual stakeholder group possesses. Firstly stakeholders were identified as shown in Table 3.

Table 3: Stakeholder Identification for Melamine

SUPPLIER	TRANSPORT	PROCESSING OF MELAMINE	DISTRIBUTION
MHTL - AUM Complex	MHTL	MHTL	Local hardware
Government Agencies	Government agencies	Public Utilities	Global manufacturers of melamine products
UWI/UTT	Transport contractors	Government Agencies	Furniture industry
Banks/ investors		Processors	Automotive industry
Public utilities			Agriculture industry
			Building and construction industry

Stakeholders taken into consideration in this study were rated on a scale from 1 to 5 for degree of possession of each attribute where 1 was the lowest and 5 was the highest. The result of this preliminary analysis is summarized in Table 4 and Figure 3.

Table 4: Stakeholder Analysis

	STAKEHOLDER	POWER	LEGITIMACY	URGENCY	TOTAL
1	Government Agencies	3	4	3	**10**
2	R&D Institutions	1	1	4	**6**
3	Manufacturers (Local/Foreign)	4	4	4	**12**
4	Wholesalers/Retailers	3	3	3	**9**
5	Agricultural Industry	3	3	3	**9**
6	Automotive Industry	3	3	3	**9**
7	Building and Construction Companies	3	3	3	**9**
8	Fibres, Textiles & Coatings Companies	3	3	3	**9**
9	Local Hardware	3	3	3	**9**
10	MHTL	4	4	4	**12**
11	MIC	4	4	4	**12**
12	UWI/ UTT	2	4	4	**10**
13	Transport Contractors	3	2	2	**7**
14	Banks/ investors	4	3	4	**11**

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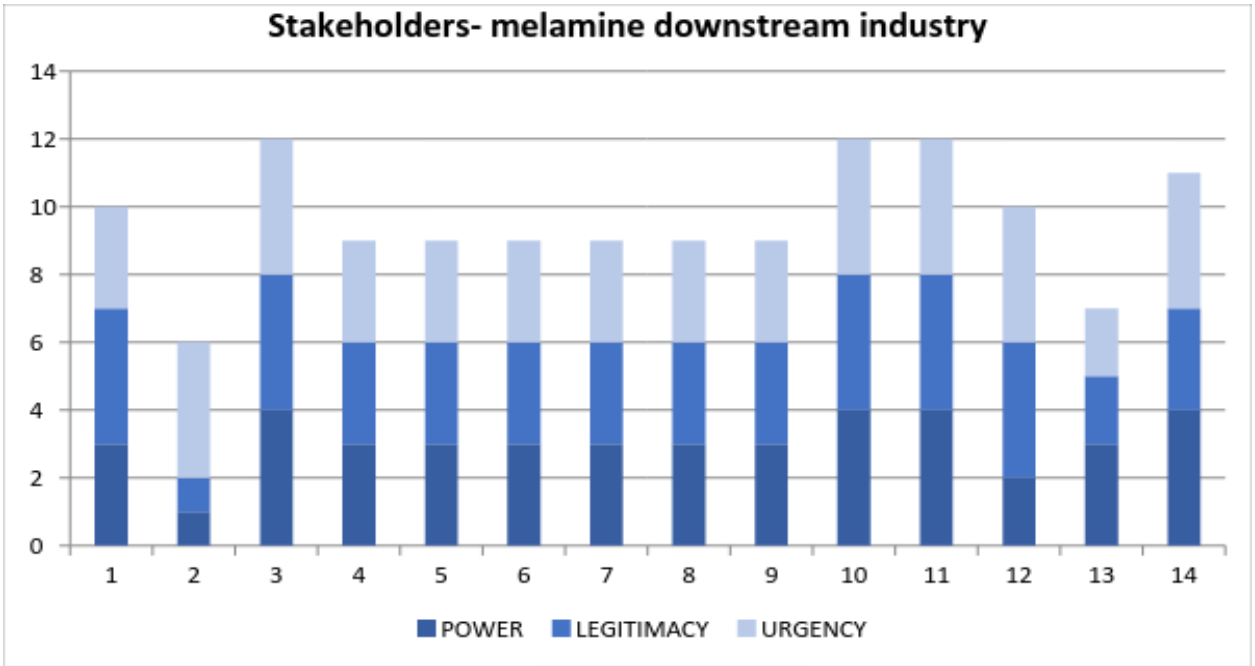

Figure 3: Stakeholders in the Melamine downstream industry

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4 Environmental Scan

4.1 External Analysis

PESTLE

The environmental scan started with an evaluation of the external environment for Melamine. This was done using the PESTLE tool where Political, Economic, Social, Technological, Legal and Environmental (physical) benefits or concerns regarding the venture were identified and their potential impact individually assessed. See Table 5.

Table 5: PESTLE Analysis of Melamine

CATEGORY	SITUATION	POTENTIAL IMPACT
Political	Downstream energy industries are considered desirable by successive administrations which have formed the Government of the Republic of Trinidad and Tobago (GORTT).	This is favourable for the sector since melamine powder can be further developed into various manufactured goods.
Economic	Countries such as China and the U.S. have interest in developing downstream industries such as these and melamine powder is a popular product from the downstream gas industry.	Depending on the areas chosen, there would be a lot of competition from larger, cheaper producers. For example, crockery made from melamine is subject to brutal competition, particularly from China. Melamine powder is also subject to competition, and T&T's melamine powder was recently challenged based on anti-dumping legislation in the United

		States of America.
Social	Melamine is quite versatile and a number of different industries can result from capitalising on its potential, as individuals and industries have accepted its use on a wide scale.	Capitalising on the full potential of melamine could lead to greater profits from diverse product lines as markets increase with wide acceptance of melamine as a substitute product for traditional plastics and other materials.
Technological	The use of modern technology is necessary for the industry to be competitive, however, the technology is moderate by T&T's standards.	More skilled workers will be needed, which directly increases salaries making the industry one that needs high financial investment to function.
Legal	There exist several incentives for investors.	Government incentives are attractive. It is likely that most of the product would be exported so this venture would be able to register under the free trade zone act.
Environmental	Melamine, has been linked to increased risk of kidney cancer[1].	Care must be taken to avoid the leeching of melamine into food via the product line developed.

PORTER'S 5 FORCES

[1]http://www.foodpackagingforum.org/Food-Packaging-Health/Melamine

The second part of the external analysis was an analysis of the competitive environment. For this analysis Porter's 5 Forces (P5F) was used. P5F looks at the rivalry among existing competitors, the threat of new entrants, the threat of substitute products, the bargaining power of suppliers and the bargaining power of customers. Using the P5F tool is superior to simply identifying competitors in the marketplace and assessing their potential threat. This is because this tool also allows for the analysis of threats that may not already exist and be visible or threats from other products or ventures that may not be identical or even operate in the same industry but which are threats, nonetheless. See Table 6.

Table 6: Competitive Issues with Melamine

FORCE	DESCRIPTION	THREAT
Existing rivalry	T&T only produces melamine for export, there is no local industry that manufactures products using melamine. However, there are many international manufacturers of melamine products. Thus making the threat of existing rivalry HIGH.	**HIGH**
Threat of new entrant	Depending on the selected product mix, the industry requires a considerable initial capital investment. Thus the threat of new entrants is LOW.	**LOW**
Threat of substitute products	T&T intends to manufacture products that have high end value, such as adhesives and moulding compounds. There may not be as many channels for the high end value added products when compared to low end products like mass produced melamine dishes. The threat from substitute products can range from LOW to MEDIUM.	**LOW TO MEDIUM**
Bargaining	Even though the focus is on high end value added	**MEDIUM**

power of customers	products, customers still have lucrative options, thus the bargaining power of customers is MEDIUM to HIGH.	**TO HIGH**
Bargaining power of suppliers	The raw material needed is high quality melamine powder which is locally manufactured. The supplier is T&T. So as long as the industry can meet the demand for export and home production the bargaining power of the supplier will be MEDIUM.	**MEDIUM**

4.2 Internal Analysis

SWOT

The SWOT tool was used to conduct an Internal Analysis for the venture. The first phase of the SWOT tool identified the Strengths and Weaknesses inherent to the proposed project; and major Opportunities in and Threats to the industry (see Table 7). The second phase recommends how strengths and opportunities can be exploited and threats can be mitigated and weaknesses addressed respectively; this is addressed elsewhere in the report.

Table 7: SWOT Analysis

STRENGTHS	**WEAKNESSES**
• Strong technical capabilities • Availability of main raw materials • Availability of land, port facilities	• Production of these downstream melamine products will be new to T&T • Strong marketing of high value added products would have to be done in an environment of distrust regarding dumped goods • Not vertically integrated
OPPORTUNITIES	**THREATS**
• Opportunity for the creation of sustainable downstream manufacturing industries based on melamine powder. • Proximity of T&T to South and Central America provides a competitive advantage via lower cost of transportation as compared to	• Recession throughout which can lead to reduced demand and/or resulting in low investor/business confidence • Poor public image of melamine mainly because of the misuse in babies' milk and other food products. • Low gas production in T&T could threaten venture

those suppliers out of China. • Increasing demand for melamine products from South and Central America and African markets. • There may be the opportunity to supplement raw material based on gas from nearby Venezuela.	

5 Sub-Sector Assessment

Melamine, was assessed on various criteria including market demand, raw material cost and availability, energy use, investment value, finished product value and availability of labour. This was based on a factor rating method developed by subject-matter experts. On each of the criterion, the venture was given a rating from 1 to 10. These were weighted according to the relative importance of the criteria and a final score calculated. The final score for the Melamine plant was 7.499 out of a possible 10, which was high among the potential investment opportunities. See Table 8.

Table 8: Sub-sector Assessment of Melamine

CRITERION	ASSESSMENT	WEIGHT (%)	RATING (1-10)	SCORE
Demand	High demand for products. Steady growth market and opportunities for diversification.	**19.6%**	**9**	**1.764**
Finished product value	There are both low and high value finished products for the segments in which the venture would operate.	**17.4%**	**7**	**1.218**
Raw material (availability)	The major raw material, melamine, is locally produced by MHTL. Ease of availability of raw materials.	**13.0%**	**9**	**1.17**
Raw material (cost)	The cost of raw material is relatively low, as it is manufactured locally and T&T has low-cost energy to facilitate such operations.	**13.0%**	**8**	**1.04**
Legislation/	Government has selected the area as an	**10.9%**	**7**	**0.763**

regulation/ government focus	area of focus as there are numerous applications melamine can be used for globally.			
Energy	Low usage of energy under normal conditions.	**8.7%**	**7**	**0.609**
Labour market	There is readily available skilled labour because of free tertiary education. Unskilled labour can be developed through continuous training.	**8.7%**	**6**	**0.522**
Investment value	Many opportunities are available and they vary in level of initial investment from high (adhesives) to low (coatings)	**6.5%**	**5**	**0.325**
Technology	There is need for proprietary technology.	**2.2%**	**4**	**0.088**
Job creation	Advanced technology would be required to be competitive, as such, skilled labour is needed. The plan is to create a downstream industry which consists of several different plants, so operators would be needed for each plant. Expected to create jobs for at least 100 persons.	**0.0%**	**5**	**0.00**
TOTAL		**100%**	**67**	**7.499**

6 Identification of Value Added Services

Value stream analysis, VSM has its genesis in the Toyota Production System of Lean Manufacturing. It essentially shows, on a single page, how value is created along the extended value chain from suppliers to customers for a single product type. When the value stream is mapped and assessed, opportunities for improvement may only then be identified. The value stream indicates other services that will be necessary for the successful realization of the venture. See Figure 4.

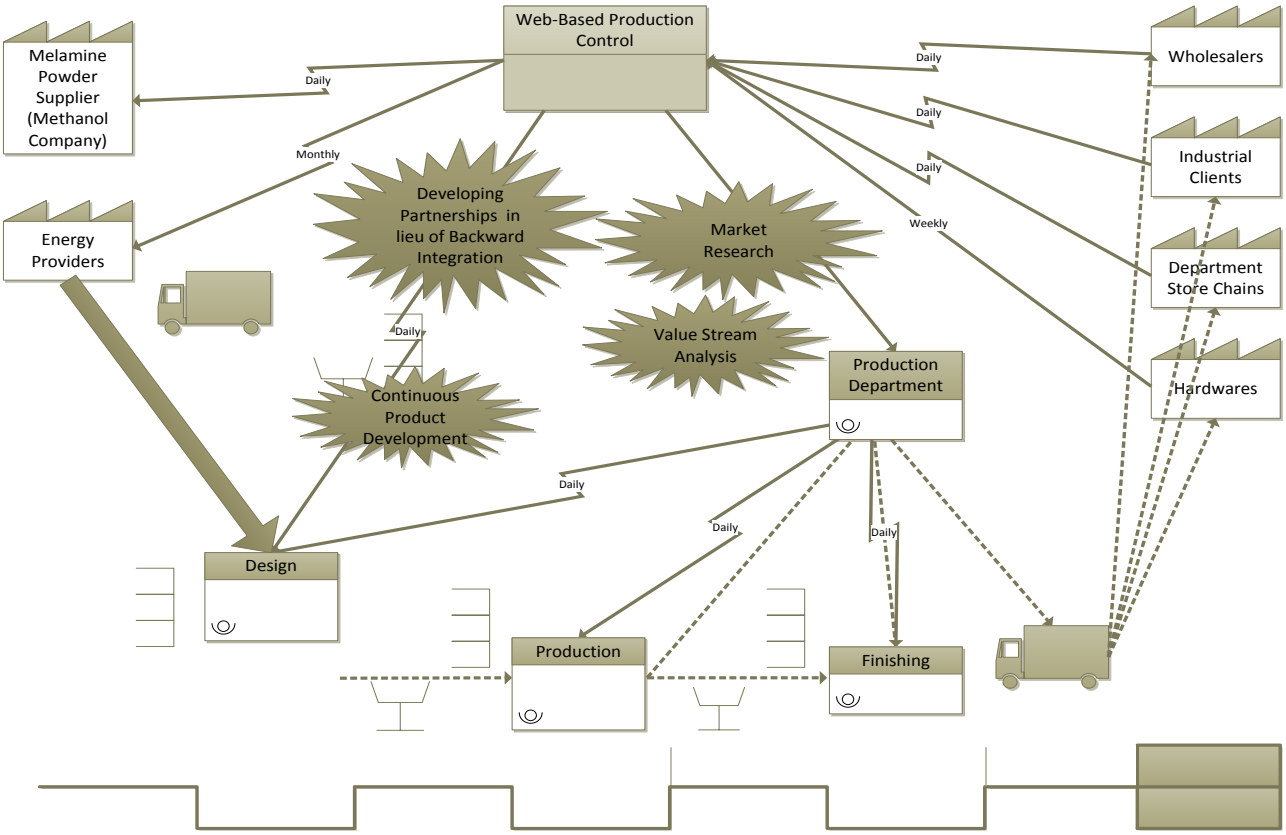


Figure 4: Value Stream Map of Melamine

6.1 Supply Chain Issues

Market Research and Analysis:

For this particular profile to be successful, the customers that need to be courted vary greatly. As can be gleaned from the value stream map above, customers range from government organizations such as hospitals, to private institutions such as restaurants to bulk sale for the sake of attracting public customers. Each group would require specialized marketing plans and liaisons to be successful.

Gas Production:

Melamine is a by-product of the natural gas process. Given that natural gas production in Trinidad and Tobago has been declining, this trend could have a negative effect on the production of melamine, resulting in problems with securing a consistent supply of raw materials. One possible solution to this problem is the importation of melamine from other countries where it is made in bulk and can be sold cheaply, such as China.

Public Image:

Given the events of the Chinese Milk scandal in 2008 (Huang 2014), when children milk products were found to be contaminated with melamine, it is possible that negative image of the product could affect how willing persons are to purchase the products as well as invest in the organization. This can only be combated using Public Relations strategies and public education.

7 Financial Analysis

7.1 Infrastructure

This facility will utilize approximately 15,000 sqft for its operations, at the cost of $1,352,273.00 USD. Preparation cost will be in the vicinity of $400,000 USD, with an additional $20,000.00 USD for the installation of a 48kV electrical kiosk. (See Table 9)

Table 9: Infrastructure Costs

DESCRIPTION	COST (USD)
Purchase of a 15,000sqft warehouse/factory	1,352,273.00
Installation of fire and security systems, air conditioning, plumbing, electrical works etc. to make the building ready of occupation	400,000.00
Cost of installing a 48kV electrical kiosk	20,000.000
TOTAL	**1,772,273.00**

7.2 Annual Utilities Usage

Water and electricity will be important for this venture since heat is extensively used in the process. A generous allocation of Total: **$57,350.00 USD** has been budgeted for the annual utilities usage. Energy saving, sustainable practices are encouraged from inception, however.

7.3 Salaries

Table 10: Summary of Annual Salaries (All currency in USD)

POSITION	NUMBER OF EMPLOYEES	UNIT ANNUAL SALARY (USD)	TOTAL ANNUAL SALARY (USD)
General Manager	1	30,000	30,000
Executive Assistant	1	12,000	12,000
Production Manager	1	24,000	24,000
Marketing Manager	1	24,000	24,000
Admin and Financial Manager	1	24,000	24,000
Admin Assistant	1	9,000	9,000
Accounting Assistant	1	10,000	10,000
Engineer	1	18,000	18,000
Floor Operators	15	9,000	135,000
Maintenance Technician	1	12,000	12,000
Sales Officers	3	18,000	54,000
Sales Assistant	1	9,000	9,000
Merchandisers	3	9,000	27,000
TOTAL	**31**		**388,000**

7.4 Legal/Statutory Fees

Legal/statutory fees were estimated at **$9,000 USD.**

7.5 Base Operational Costs

Estimates of yearly cost were done using a conservative base as shown in Table 11.

Table 11: Summary of Base Operational Costs

COST CENTRE	COST (USD)	DESCRIPTION
Marketing/Promotion/Product Development	205,000.00	Not including salaries/bonuses
Maintenance	40,000	(On Call Service Company/ OEM Representative)
Security	30,000	
Telecommunication	15,000	(Phone and Internet Services)
Miscellaneous	25,000	2% of expected annual income
Vehicle Rentals/Leases	55,000	Delivery Trucks, Material Handling Vehicles e.g. Forklifts
Insurance/ Export	60,000	5% of expected annual income
TOTAL	**430,000.00**	

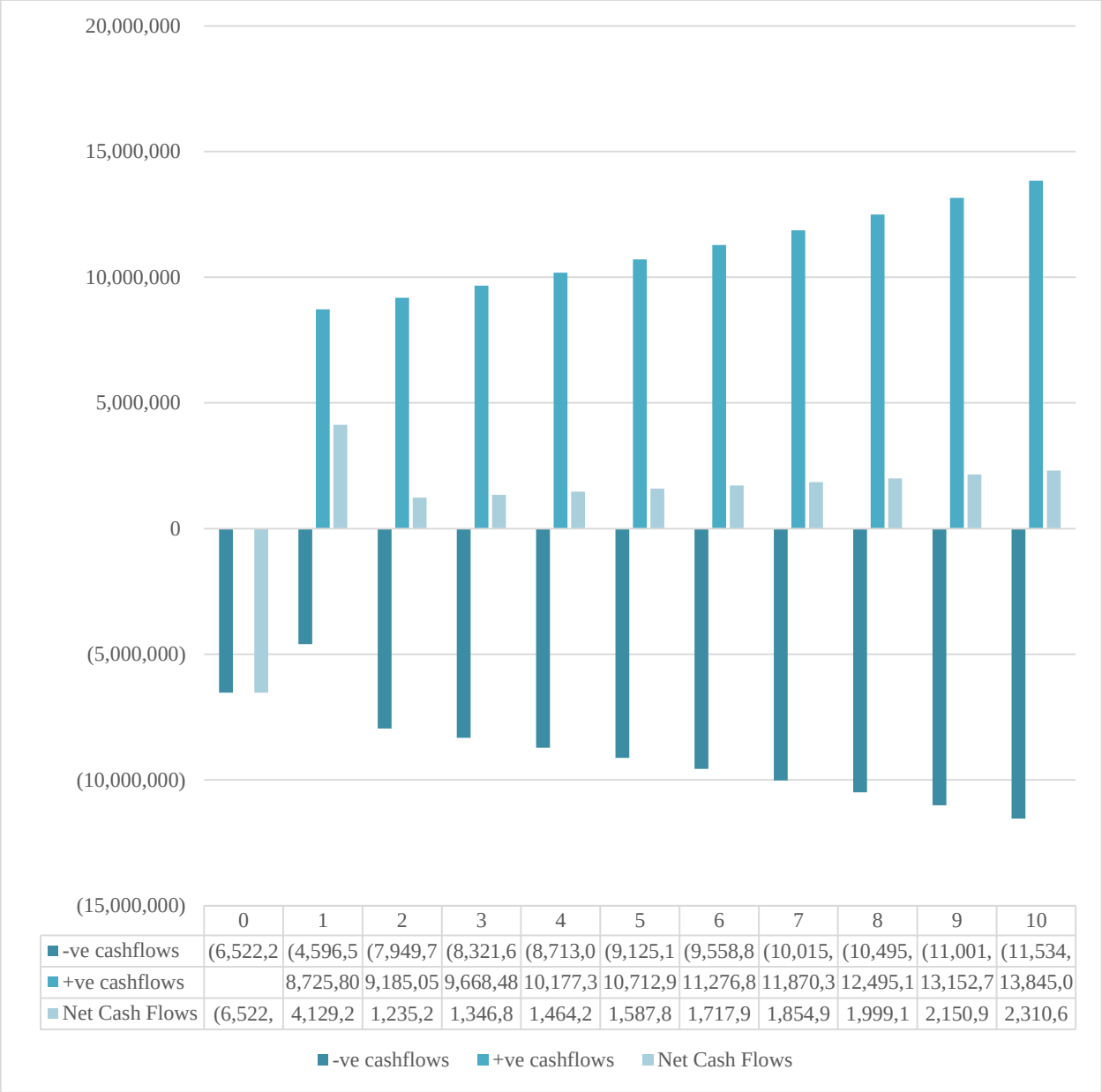
7.5 Equipment

Equipment purchased at the beginning of the project was also estimated to be **US$1,750,000.00** for the following pieces of equipment.

- Compression Moulding Machine
- Moulds
- Preheater Machine
- Trimming Machine
- Air Compressor
- Chiller Tower

7.6 Analysis

This venture was analysed based on optimistic, pessimistic and moderate scenarios. In each case the investment remained the same, however the revenue was manipulated to account for not achieving sales targets of variations in price. Notwithstanding, expenses were held the same in each scenario. The initial investment $6.52mill US and the NPV, IRR and Payback Period was calculated for each scenario as shown in Table 1. Positive and Negative Cash Flows for the 10 Year period under analysis are shown in Figure 5. The figures shown are from the optimistic scenario.



	0	1	2	3	4	5	6	7	8	9	10
-ve cashflows	(6,522,2	(4,596,5	(7,949,7	(8,321,6	(8,713,0	(9,125,1	(9,558,8	(10,015,	(10,495,	(11,001,	(11,534,
+ve cashflows		8,725,80	9,185,05	9,668,48	10,177,3	10,712,9	11,276,8	11,870,3	12,495,1	13,152,7	13,845,0
Net Cash Flows	(6,522,	4,129,2	1,235,2	1,346,8	1,464,2	1,587,8	1,717,9	1,854,9	1,999,1	2,150,9	2,310,6

Figure 5: Estimated Cash Flows for Years 0 to 10 Optimistic Scenario

8 Human Resources

8.1 Organisation Chart

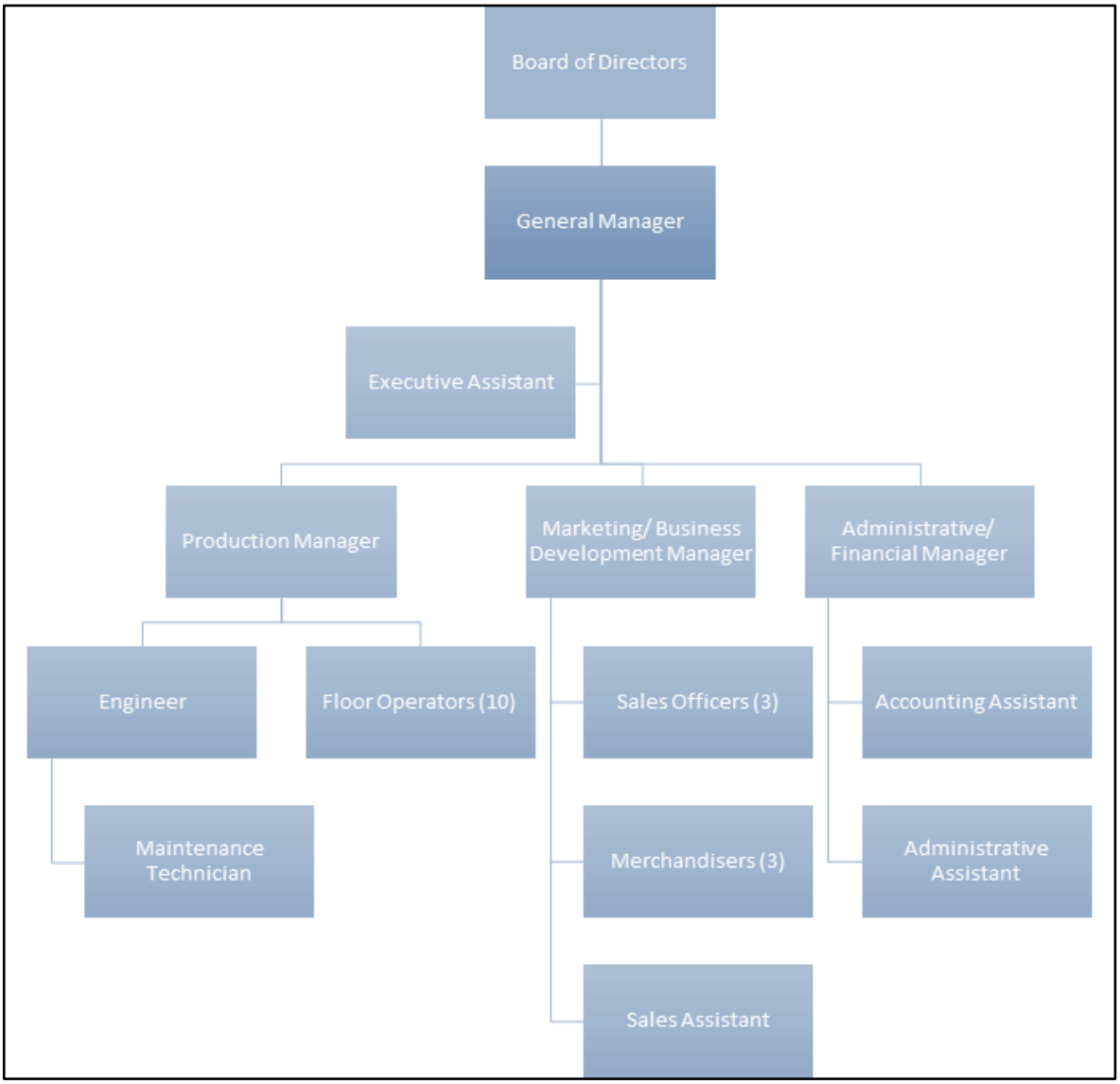


Figure 6: Organizational Chart for Melamine Products

8.2 Job Descriptions for Key Positions

Table 12: Job Descriptions

POSITION	RESPONSIBILITY
Board of Directors (BOD)	The Board of Directors will involve the Chairperson who is very knowledgeable in Materials, in the Manufacturing sector, Secretary/Financial Controller, Engineer, Legal Advisor, a Business Development/Marketing Professional and a Major Investor.
General Manager	The General Manager will report to the BOD and will assume overall responsibility for the management and operations of the organization. Included would be product development, business development, operations, production, financial control, quality control, and training of employees in all aspects of the operation.
Executive Assistant	The Executive Assistant reports to the General Manager and performs general administrative duties essential to the efficient running of the organization. He/she handles communication from the company, manages the office, schedules and keeps records of major meetings. The Executive Assistant is also responsible for record keeping throughout the company, orders office consumables and manages contractors for cleaning and other similar services.
Finance/ Admin Manager	The Finance/Admin Manager is accountable for Human Resource Management as well as controlling the company's finances. Also, he/she is responsible for reporting to the board any variances from the targets established. The

	Finance/ Admin Manager will produce regular Management and Financial Reports and will perform internal audits on the company's operations on a regular basis. He/she will ensure that any/all statutory requirements are met and hold responsibility for the warehouse and stores.
Accounting Assistant	The Accounting Assistant job is to process all bills, invoices, accounts payable and receivable and others along with the preparation of the payroll and reports as necessary.
Admin Assistant	The Administrative Assistant reports to the Finance and Admin Manager and is responsible for general administrative duties related to purchasing, and warehouse/stock control, respectively.
Marketing & Business Development Manager	The Marketing & Business Development Manager (MBDM) is responsible for promoting the product and for the actual online and physical sales of the product into new and existing markets. The MBDM will also contribute to new product development based on feedback from the market and for using all forms of media to assist in the promotion and sales of the product. The MBDM is responsible for planning, advertising, public relations, product development and distribution.
Sales Officers	The Local, Regional and International Sales Officers are required to execute sales according to targets and to establish and maintain strong relationships with major customers. They also participate in New Business and New Product Development based on feedback from customers.
Merchandisers	The merchandisers generally complete the sales of products to the various clients in conjunction with the rest of the marketing and sales team. Their duties are to ensure that the

	accurate documentation is prepared and where necessary, the physical delivery of products to the client, ports, or couriers.
Sales Assistant	The Sales Assistant main job is to co-ordinate the orders in the department and prepare any necessary documentation for sharing with the customer, internal parties and the warehouse.
Production Manager	The Production Manager (PM) duty is to ensure proper production planning is on par with demand and runs the plant ensuring there is adequate raw material, the finished product is of good quality, and production quantity is met. The PM is also involved in the development of manufacturing new product. The PM is champion of safety and quality and is involved in selection, installation and maintenance of all equipment. The Engineer and Floor Operators report to the PM.
Engineer	The Engineer is accountable for the health, safety and quality control of the plant on a daily basis. The Engineer is also responsible for ensuring that all the equipment is kept in good condition and for allocating responsibilities to the Maintenance Technician.
Maintenance Technician	The Maintenance Technician duty is to work alongside with the engineer and ensure 100% availability of equipment, when required. The Maintenance Technician will execute preventative measures together with troubleshoot processes and diagnose mechanical, hydraulic and pneumatic problems associated with process equipment.
Floor Operators	The Floor Operators operate the machines to make the specific product. They also ensure smooth operation by

	performing duties such as cleaning, packing, driving forklifts, storage, etc. Their span of duties ranges from the shop floor to the warehouse.

8.3 Labour Availability

Table 13: Potential labour pools for proposed positions

CATEGORY	UNEMPLOYED	EMPLOYED	POTENTIAL EMPLOYMENT POOL
Professionals • Engineer • Sales Assistant • Admin Assistant • Accounting Assistant • Executive Assistant	900	36700	Graduates from any of the sixteen (16) Universities of the West Indies Open Campus locations in the Caribbean, and/or any of UTT campuses in Trinidad.
Legislators, senior officials, managers • Board of Directors • General Manager • Production Manager • Finance/ Admin Manager • Business Development &	400	61300	Sourced from the existing pool of unemployed and employed persons through interviews and the subsequent process of filtering.

Marketing Manager			
Clerks • Sales Officer • Merchandiser	5100	67100	Can be sourced from several training centres in Trinidad registered under the Accreditation Council of Trinidad and Tobago (ACTT) E.g. Crane Safe Technical Institute, Advanced Solutions Technical Institute and Technical Institute for Learning, just to list a few.
Technicians • Maintenance Technician	1500	69300	
Floor Operators	600	57700	

9 Location

Point Lisas Industrial Estate because of proximity to the Port and sources of raw material. Otherwise, the melamine powder could be transported to any other suitable industrial estate for further processing. The assessment of the most suitable locations for the establishment of the proposed facility, was determined using a factor rating method. Fourteen (14) rating criteria were used in this particular instance. These criteria can be found in the first column of the Table 13.

Table 14: A general assessment of locations in T&T

	Weight	Trincity	Aranguez	Central	Diego Martin	South	Arima	Tobago			
Availability of services and supplies	0.048	80	80	80	80	80	80	60		540	0.078763
Environmental considerations	0.010	75	75	75	75	75	75	90		540	0.078763
Infrastructure - land availability	0.095	65	70	90	60	60	75	60		480	0.070012
Infrastructure - land/construction costs	0.105	60	60	80	50	60	60	40		410	0.059802
Infrastructure - roadways/access	0.124	80	80	60	70	70	80	50		490	0.07147
Labor availability experience/skills	0.067	90	70	75	75	80	80	60		530	0.077305
Labour cost	0.048	75	75	75	75	75	75	65		515	0.075117
Proximity to emergency services	0.000									0	0
Proximity to port	0.086	80	80	80	80	70	75	60		525	0.076575
Proximity to raw materials	0.057	80	80	80	60	60	60	50		470	0.068553
Utilities - electricity	0.105	90	90	90	90	90	90	90		630	0.09189
Utilities - gas	0.086	90	90	90	90	90	90	80		620	0.090432
Utilities - telecom	0.086	90	90	90	90	90	90	90		630	0.09189
Utilities - water	0.086	75	75	70	60	75	70	50		475	0.069282
Total	1.000	1030	1015	1035	955	975	1000	845		6856	

The locations considered were those that have previously been identified for national economic development, i.e., key economic zones. These locations were considered as they are well positioned for the establishment of new businesses. Accordingly, access to the necessary infrastructure, services and other critical resources would be more readily available, as compared to most other locations across the country.

As in other similar assessments, the results of the assessment indicate that the seven locations in Trinidad are all relatively well positioned to setup the proposed manufacturing facilities.

Best Locations based on rankings

1) Central Trinidad: 1035
2) Trincity: 1030
3) Aranguez: 1015
4) Arima: 1000
5) South: 975
6) Diego Martin: 955
7) Tobago: 845

10 List of Potential Investors and Partners

Table 14 gives a list of potential investors and partners, together with contact information. The list is not exhaustive.

Table 15: Potential Investors and Partners

POTENTIAL INVESTOR/ PARTNERS	CONTACT INFORMATION
OCI Nitrogen	Mijnweg 1 P.O. Box 601 6160 AP Geleen The Netherlands Telephone: +31 46 7020 111 (General) Fax: +31 46 7020 192 E-Mail: info.melamine@ocinitrogen.com
FormaCare Sector Group	Tel.: +32 2 676 72 30 Fax : +32 2 676 73 59 E-mail: formacare@cefic.be
Methanol Holdings Trinidad Ltd.	Atlantic Avenue Point Lisas Industrial Estate Couva Trinidad W.I. Telephone: 1-868-636-2906 Fax: 1-868-636-4501 E-mail: http://ttmethanol.com
MIC Institute of Technology	5A Century Drive, Trincity Business Park, Macoya Telephone: +1 (868) 663-4MIC (4642) Fax: 663-6055 E-mail: info@mic.co.tt

Borealis AG	IZD Tower Wagramer Strasse 17-19 1220 Vienna Austria Tel: +43 1 22 400 300 Fax: +43 1 22 400 333 Email: info@borealisgroup.com

11 Concluding Remarks

Diverse opportunities exist to further process the high quality melamine powder produced by T&T process plants in Point Lisas Industrial Estate. These include adhesives, coatings and dinnerware. Before products such as dinnerware could be produced, however, melamine moulding compound would have to be produced and this venture would have to consider producing it or have a partnership with an investor who can fund its start-up services.

12 References

Ilter, Osman. 2010. "Use of Pumice in Mortar and Rendering for Lightweight Building Blocks." http://i-rep.emu.edu.tr:8080/jspui/bitstream/11129/268/1/Ilter.pdf

Merchant Research & Consulting. 2014. "Situation in World Melamine Market is Steadily Improving." https://mcgroup.co.uk/news/20140821/situation-melamine-market-steadily-improving.html

Ministry of Trade, Industry, Investment and Communications. 2015. "Compendium of Investment Incentives in Trinidad and Tobago for the Non-Energy Sector." Accessed December 15, 2015. http://tradeind.gov.tt/wp-content/uploads/2016/02/2015-Compendium-of-Incentives.pdf

Neptune, Peter. 2009. "Trinidad is Ferrostaal's regional Headquarters." http://www.guardian.co.tt/archives/business/business-guardian/2009/12/10/trinidad-ferrostaal-s-regional-headquarters-bg

PR. Newswire. 2015. "Melamine Market for Adhesives & Sealants, Laminates, Molding Compounds, Paints & Coatings, and Other", PR Newswire, Dec 30 2015 Issue

Sutherland, Leanna. 2015. "Process Flow Diagram." *Metal Industries Company Ltd.*