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2013

# Internship Report

## On

### **EVALUATION OF IMPORTED RAW MATERIALS BASED ON THE COUNTRY OF ORIGIN**

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# EVALUATION OF IMPORTED RAW MATERIALS BASED ON THE COUNTRY OF ORIGIN

## SALEBRIDGE CORPORATION

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**Submitted To:**

Mr. Tamzidul Islam  
Senior Lecturer  
BRAC Business School  
BRAC University

**Submitted By:**

Name: Mahathir Mohammad Ayan  
ID No. 09104132  
Course: Internship (Bus 400)  
BRAC Business School  
BRAC University

**Date of Submission:** June 20, 2013.

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## LETTER OF TRANSMITTAL

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June 20, 2013

Mr. Tamzidul Islam

Senior Lecturer

BRAC Business School

BRAC University

66, Mohakhali,

Dhaka-1212, Bangladesh

**Subject:** Submission of Internship Report on Customer Satisfaction Level Regarding Imported Raw Materials based on country of origin.

Dear Sir,

This is my pleasure to present my internship report that I have completed as part of fulfilling the requirement for the Internship (BUS 400) course from BRAC Business School. I have completed my internship program from Sale Bridge Corporation. I have tried my best to make an effective and credible Internship Report.

The report contains a comprehensive study on customer satisfaction level (regarding raw materials country of origin) and operating process of Sale Bridge Corporation. It was a great delight for me to have the opportunity to work on the above-mentioned subject.

I believe that the knowledge and experience I gathered during the internship period will be helpful in my future professional life. I will be grateful to you if you accept the report.

Thank you.

Sincerely yours,

Name: Mahathir Mohammad Ayan -----

ID No. : 09104132

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## **ACKNOWLEDGEMENT**

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At first, I like to thank Carrere Service Office, BRAC University and SaleBridge Corporation for giving me the opportunity to undergo the internship program. The successful completion of this Internship Report has made me grateful to a number of persons, especially those who took time to share ideas and views to prepare an effective report. For the successful completion of my report I would like to thank and convey my sincere gratitude to my respected academic Supervisor, Mr. Tamzidul Islam, Senior Lecturer, BRAC Business School, BRAC University, for giving valuable advice, suggestion and inspiration to complete the report in an appropriate manner and I would also like to express my sincere appreciation for his wholehearted support and guidance.

At the same time I am also grateful to my organizational Supervisor, Mr. Kamaluddin, Chairman, SaleBridge Corporation, for his spontaneous support, supervision, suggestions and providing me valuable information that was very much needed for the completion of this report. I also thankful to Mr. Arif Chowdhury, CEO, for his kind co-operation.

Finally, I would also like to take the opportunity to express my appreciation to my family, friends, near and dear ones who helped me to make this report a comprehensive one.

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## EXECUTIVE SUMMARY

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There is a phrase, that your customer is always right. This single line helps to understand the value of customer and their satisfaction toward an organization. By inspiring with this, I have made an internship report titled as customer satisfaction level (regarding raw materials country of origin) and operating process of SaleBridge Corporation. To give an ample outlook the report, is segmented into five chapters. It starts with the chapter one covering the background of the study, objectives, scope and the limitation of the report. Then the second chapter describes the organization part it includes the overview, features and main functions of SaleBridge Corporation where I pursue the internship period. The next chapter of this report titled as 'Product Knowledge' which contains comprehensive description of the products that local firms import for their smooth production. I have described it elaborately as these products are not familiar to mass people. The next phrase contains our client's overview. All our clients are well recognized and they make purchase in huge volume. The last part of my report is "analysis and findings". Here I have described about managers opinion about importing raw materials regarding country of origin. Based on their opinion I have drawn a conclusion.

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***CHAPTER: ONE***

***INTRODUCTION***

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## **1.1 INTRODUCTION:**

This Internship report is the output of my three months internship as a partial requirement of graduation. It comes to me with a great opportunity -to be introduced with practical job field. To prepare this report I have to make connection my academic knowledge and internship experience. Here, I go through the operating process and the customer mentality regarding country of origin while purchasing raw materials for their firm. As realizing the importance of country of origin of a raw material and the disciplined operating process I chose the topic to give an intense look on that.

There are many arguments on what causes customer satisfaction. Various theories on customer satisfaction have been developed, presented, and ultimately have been either supported or questioned by others in the field. Traditional theories have contended that customer satisfaction and dissatisfaction share a single continuum; certain factors create feelings of satisfaction when they are present and feelings of dissatisfaction when they are absent.

Traditionalists have claimed that both intrinsic and extrinsic factors have the capacity to create satisfaction or dissatisfaction. Intrinsic factors include credibility, image and reputation. Extrinsic factors of the customer satisfaction include behavior of employees, product variety, cost of service and technological excellence.

Customer satisfaction (raw materials country of origin) is the fact where an organization can access to where customer is looking for where they are satisfied. They can make feel them more pleasant in those areas where they find satisfaction.

In my report I tried to find out, what criteria companies focus while importing raw materials. Managers are influence by several factors while making decision. First they think about the creditability of indenters. Another important factor is raw materials country of origin along with price and some other parameters which will be described elaborately in this paper.



### **1.2 ORIGINE OF THE REPORT:**

Internship Program is a requirement for the Graduation of the BBA students, which is also a requirement of the Internship program of BBA curriculum. The main purpose of internship is to get the student exposed to the job world. Being an intern, the main challenge was to translate and apply the learned theoretical concepts into real life experience and in the practical working field. The internship program and the study have purposes which are as follows-

- ✓ To get and organize detail knowledge on the job responsibility.
- ✓ To experience the real business world.
- ✓ To compare the real scenario with the lessons learned in the University
- ✓ To fulfill the requirement of BBA Program.

To accomplish the internship, I was placed at, SaleBrige Corporation, fakirapool, under the guidance of **Mr. Tamzidul Islam, Senior Lecturer with BRAC Business School, BRAC University**. The report topic was approved by the faculty supervisor to satisfy the organizational requirements and fulfillment of the internship program. As a requirement of the completion of the internship program, I had to submit this report, which includes an overview of the organization and a research and analysis part.

### **1.3 OBJECTIVE OF THE REPORT:**

Objective of the report can be divided into two parts. These are:

- ✓ General objective
- ✓ Specific objective

#### ***General objective***

The general objective of the report is to gain insights and understanding the daily working situation of indenting business. To gain orders how they communicate with their clients, how they collect information & negotiated with them.

### *Specific objective*

The specific objective of this report is to find out on which criteria managers take decision while making a purchase. In our whole report, we will thoroughly discuss about customers of SaleBridge Corporation and their tendency regarding raw materials country of origin. We will also try to find out what are the effective sides and limitations of Salebridge Corporation.

### **1.4 SCOPE & IMPORTANCE**

#### **Scope:**

In my whole report, I will focus on customer satisfaction regarding “country of origin” and operating process of SaleBridge Corporation. What are the reasons which make them satisfied and what are the barriers they find out. To complete a reflective and informative report I have observed 10 customers opinion. I communicate with them regularly and gathered relevant information about their concept of raw materials country of origin. Moreover, I have been experienced with practical job done by me at that Office. I also get to know about their operating process by having several discussions with officials of Salebridge Corporation.

#### **Importance:**

Here, I try to find out customer satisfaction (origin of product) level of Salebrodge Corporation by using different factors like personnel, service, cost and operating process. If, any organization have familiar with their customer satisfaction level, it helps them to take initiatives where they have lacking and on the other hand they take competitive advantage by knowing their strengths. Customer satisfaction level also creates the brand image of Organization. If, customers are satisfied then it helps to build up credibility of the bank. A good brand image is helpful for organization to sustain in a long run strongly. As we know customer is the main fuel which runs the organization. Moreover I took a close observation and took part on operating process of Salebridge Corporation in my Internship period, and in my report I try to make some comments based on my experience.

### **1.5 METHODOLOGY:**

The task of data collection begins after the research problem has been defined and research design chalked out. While deciding the method of data collection to be used for the study, the researcher should keep in mind two types of data. They are given below:

1. Primary and
2. Secondary data.

#### **Primary:** Survey

The number of customers of Salebridge Corporation is around twenty five. Among them, I talked almost all of them. I collect information by face to face interview.

#### **Secondary:** Internet, textbooks, Journals, Articles etc

The relevant information was obtained from the Internet and the textbook. For the secondary data, I had to rely mainly on the different books of management, articles on job satisfaction, online journals and different websites. Unfortunately, there were not enough sources to obtain secondary information which was one of my limitations.

### **1.6 TYPES OF DATA:**

#### **Quantitative/Qualitative:**

Basically the questions I ask to our customers all are qualitative question. Qualitative data is extremely varied in nature. It includes virtually any information that can be captured that is not numerical in nature.

### **1.7 LIMITATIONS OS THE REPORT:**

Throughout this report, I communicate with customers to conduct the survey. However, it is really difficult to gain correct information as managers are often not willing to provide accurate information. Unlike other surveys, this was not just distributing the questionnaire among respondents and getting it back. Managers from import-export department are always busy and they leave when their work has done. Within a short period, in whatever time they stay in the office, I try to take their response as quickly as possible. However, I managed to get 10 respondents which might be a viable number but still insufficient for in depth analysis. The major limitation is this paper is not justified by any testing tools and managers are tending to provide false information. So critics might arise against this report. Another limitation was time constraint. The time was too short to complete a research on a topic like this. For further analysis, more time was required. Lack of secondary source is another limitation that I have faced. In fact, I did not find any previous research on this topic. However, I had to rely on other relevant studies, books and websites for this purpose. The limitation could be summarized as follows:

1. Respondents do not provide correct information.
2. Time constraint
3. Lack of secondary sources.
4. It is not justified by testing tools.

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***CHAPTER: TWO***

***COMPANY OVERVIEW***

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## SALEBRIDGE CORPORATION

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### **Background:**

SaleBridge Corporation was established in 1960 as a wholly owned business organization. It is one of the leading television importers in Bangladesh. Its objective is to make a good relation between importer and supplier so that business organizations in our country can get the finest raw materials for their production at a competitive price which will later make them able to produce quality products at a low price for our people. SaleBridge Corporation came to the market with full support to the business organization in export-import sector like indenting, fridge forwarding, CNF etc.

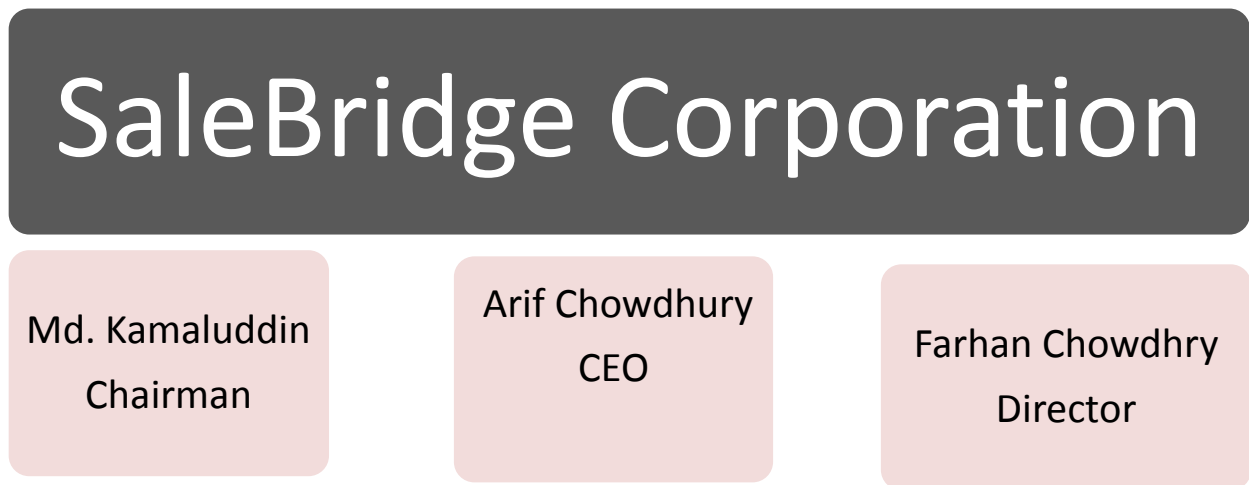
### **Values:**

- ✓ Result Driven
- ✓ Accountable & Transparent
- ✓ Courageous & Respectful
- ✓ Engaged & Inspired
- ✓ Focused on Customer Delight

### **2.2 City Brokerage Limited at a glance:**

<b>Name of the Company</b>	SaleBridge Corporation
<b>Represented By</b>	Mohammad Kamaluddin
<b>Address</b>	Shatabdi Center, 292, Inner Circular Road, Fakirapool, Dhaka
<b>Office Phone</b>	880-2-7192427
<b>Website</b>	www.confer-bd.com
<b>E-mail</b>	cflarif@link3.net
<b>NBR License no.</b>	0297(Dhaka), 0178(Chittagong)

### 2.3 Key executives of Sale Bridge Corporation:



### 2.4 Operating process of SaleBridge Corporation:

As I had been done my Internship at SaleBridge Corporation, I had an opportunity to have a close look on the operating process of an indenting firm. The day to day operations of SaleBridge Corporation, is divided into two parts. These are communication with local buyers and foreign suppliers. First we have to know what are the products local firms uses as raw materials for their production. Indenters first collect information from local client about their need. i.e. product name, brand, grade, approximate quantity, payment mood. Once we have a clear idea about our client's demand we move for searching foreign suppliers. We have agent in almost all countries in the world. As we have relation with different suppliers and clients, we can purchase a huge volume of products at a competitive price with is the key to our success. Again while putting orders local firms test our reliability and it is measured in terms of our ability to

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complete the deal successfully, our previous experience and creditability. Often it happens indenters cannot provide orders in time or they import low quality of products. The same creditability is tested in case of choosing suppliers which is done by indenters.



## ***CHAPTER: THREE***

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### ***PRODUCT KNOWLEDGE***

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#### **Hot-rolled steel coil (HR COIL)**

In metalworking, rolling is a metal forming process in which metal stock is passed through a pair of rolls. Rolling is classified according to the temperature of the metal rolled. If the temperature of the metal is above its recrystallization temperature, then the process is termed as hot rolling. If the temperature of the metal is below its recrystallization temperature, the process is termed as cold

rolling. In terms of usage, hot rolling processes more tonnage than any other manufacturing process, and cold rolling processes the most tonnage out of all cold working processes.



A coil of hot-rolled steel

Hot rolling is a metalworking process that occurs above the recrystallization temperature of the material. After the grains deform during processing, they recrystallize, which maintains an equiaxed microstructure and prevents the metal from work hardening. The starting material is usually large pieces of metal, like semi-finished casting products, such as slabs, blooms, and billets. If these products came from a continuous casting operation the products are usually fed directly into the rolling mills at the proper temperature. In smaller operations the material starts at room temperature and must be heated. This is done in a gas- or oil-fired soaking pit for larger workpieces and for smaller workpieces induction heating is used. As the material is worked the temperature must be monitored to make sure it remains above the recrystallization temperature. To maintain a safety factor a finishing temperature is defined above the recrystallization temperature; this is usually 50 to 100 °C (90 to 180 °F) above the recrystallization temperature. If the temperature does drop below this temperature the material must be re-heated before more hot rolling.

Hot rolled metals generally have little directionality in their mechanical properties and deformation induced residual stresses. However, in certain instances non-metallic inclusions will

impart some directionality and work pieces less than 20 mm (0.79 in) thick often have some directional properties. Also, non-uniform cooling will induce a lot of residual stresses, which usually occurs in shapes that have a non-uniform cross-section, such as I-beams and H-beams. While the finished product is of good quality, the surface is covered in mill scale, which is an oxide that forms at high-temperatures. It is usually removed via pickling or the smooth clean surface process, which reveals a smooth surface. Dimensional tolerances are usually 2 to 5% of the overall dimension.

Hot rolled mild steel seems to have a wider tolerance for amount of included carbon than cold rolled, making it a bit more problematic to use as a blacksmith. Also for similar metals, hot rolled seems to typically be less costly.

Hot rolling is used mainly to produce sheet metal or simple cross sections, such as rail tracks.

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### DEFECTS

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In hot rolling, if the temperature of the work piece is not uniform the flow of the material will occur more in the warmer parts and less in the cooler. If the temperature difference is great enough cracking and tearing can occur.

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## COLD ROLLED STEEL COIL (CR COIL)

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Cold rolling occurs with the metal below its recrystallization temperature (usually at room temperature), which increases the strength via strain hardening up to 20%. It also improves the surface finish and holds tighter tolerances. Commonly cold-rolled products include sheets, strips, bars, and rods; these products are usually smaller than the same products that are hot rolled. Because of the smaller size of the work pieces and their greater strength, as compared to hot

rolled stock, four-high or cluster mills are used. Cold rolling cannot reduce the thickness of a work piece as much as hot rolling in a single pass.

Cold-rolled sheets and strips come in various conditions: full-hard, half-hard, quarter-hard, and skin-rolled. Full-hard rolling reduces the thickness by 50%, while the others involve less of a reduction. Skin-rolling, also known as a *skin-pass*, involves the least amount of reduction: 0.5-1%. It is used to produce a smooth surface, a uniform thickness, and reduce the yield point phenomenon (by preventing Lüders bands from forming in later processing). It locks dislocations at the surface and thereby reduces the possibility of formation of Lüders bands. To avoid the formation of Lüders bands it is necessary to create substantial density of unpinned dislocations in ferrite matrix. It is also used to break up the spangles in galvanized steel. Skin-rolled stock is usually used in subsequent cold-working processes where good ductility is required.

Other shapes can be cold-rolled if the cross-section is relatively uniform and the transverse dimension is relatively small. Cold rolling shapes requires a series of shaping operations, usually along the lines of sizing, breakdown, roughing, semi-roughing, semi-finishing, and finishing.

If processed by a blacksmith, the smoother, more consistent, and lower levels of carbon encapsulated in the steel makes it easier to process, but at the cost of being more expensive.

### Hot-rolled versus cold-rolled steel and the influence of annealing

Hot rolled		Cold rolled	
<b>Material properties</b>	<b>Yielding strength</b>	The material is not deformed; there is no initial strain in the	The yield value is increased by 15%–30% due to prework (initial

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		material, hence yielding starts at actual yield value as the original material.	deformation).
	<b>Modulus of elasticity</b>	29,000 ksi	29,500 ksi
	<b>Unit weight</b>	Unit weight is comparatively huge.	It is much smaller.
	<b>Ductility</b>	More ductile in nature.	Less ductile.
<b>Design</b>		Most of the time, we consider only the global buckling of the member.	Local buckling, Distortional Buckling, Global Buckling have to be considered.
<b>Main uses</b>		Load bearing structures, usually heavy load bearing structures and where ductility is more important ( Example Seismic prone areas)	Application in many variety of loading cases. This includes building frames, automobile, aircraft, home appliances, etc. Use limited in cases where high ductility requirements.
<b>Flexibility of shapes</b>		Standard shapes are followed. High value of unit weight limits the flexibility of manufacturing wide variety of shapes.	Any desired shape can be molded out of the sheets. The light weight enhances its variety of usage.
<b>Economy</b>		High Unit weight increases the overall cost – material, lifting, transporting, etc. It is difficult to work with (e.g. connection).	Low unit weight reduces the cost comparatively. Ease of construction (e.g. connection).
<b>Research possibilities</b>		In the advanced stages at present.	More possibilities as the concept is relatively new and material finds wide variety of applications.

## PROCESSES

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### ROLL BENDING

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Roll bending produces a cylindrical shaped product from plate or steel metal.

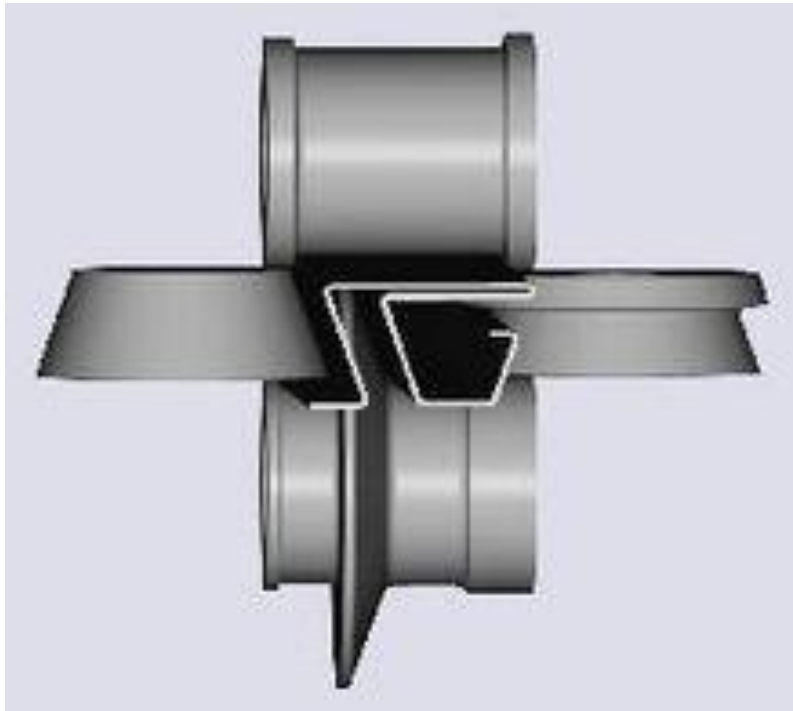


Roll bending

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## ROLL FORMING

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Roll forming

Roll forming, roll bending or plate rolling is a continuous bending operation in which a long strip of metal (typically coiled steel) is passed through consecutive sets of rolls, or stands, each performing only an incremental part of the bend, until the desired cross-section profile is obtained. Roll forming is ideal for producing parts with long lengths or in large quantities. There are 3 main processes: 4 rollers, 3 rollers and 2 rollers, each of which has as different advantages according to the desired specifications of the output plate.

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#### FLAT ROLLING

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Flat rolling is the most basic form of rolling with the starting and ending material having a rectangular cross-section. The material is fed in between two rollers, called working rolls, that rotate in opposite directions. The gap between the two rolls is less than the thickness of the

starting material, which causes it to deform. The decrease in material thickness causes the material to elongate. The friction at the interface between the material and the rolls causes the material to be pushed through. The amount of deformation possible in a single pass is limited by the friction between the rolls; if the change in thickness is too great the rolls just slip over the material and do not draw it in. The final product is either sheet or plate, with the former being less than 6 mm (0.24 in) thick and the latter greater than; however, heavy plates tend to be formed using a press, which is termed forming, rather than rolling.

Oftentimes the rolls are heated to assist in the workability of the metal. Lubrication is often used to keep the workpiece from sticking to the rolls. To fine tune the process the speed of the rolls and the temperature of the rollers are adjusted.

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### FOIL ROLLING

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*Foil rolling* is a specialized type of flat rolling, specifically used to produce foil, which is sheet metal with a thickness less than 200  $\mu\text{m}$  (0.0079 in). The rolling is done in a cluster mill because the small thickness requires a small diameter rolls. To reduce the need for small rolls *pack rolling* is used, which rolls multiple sheets together to increase the effective starting thickness. As the foil sheets come through the rollers, they are trimmed and slitted with circular or razor-like knives. Trimming refers to the edges of the foil, while slitting involves cutting it into several sheets. Aluminum foil is the most commonly produced product via pack rolling. This is evident from the two different surface finishes; the shiny side is on the roll side and the dull side is against the other sheet of foil.

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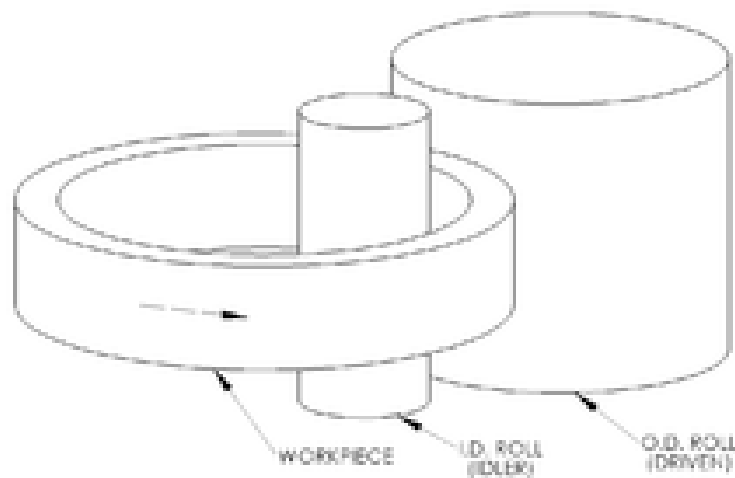
### RING ROLLING

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Ring rolling is a specialized type of hot rolling that increases the diameter of a ring. The starting material is a thick-walled ring. This workpiece is placed between two rolls an idler roll, while another roll, called the driven roll, presses the ring from the outside. As the rolling occurs the wall thickness decreases as the diameter increases. The rolls may be shaped to form various



cross-sectional shapes. The resulting grain structure is circumferential, which gives better mechanical properties. Diameters can be as large as 8 m (26 ft) and face heights as tall as 2 m (79 in). Common applications include rockets, turbines, airplanes, pipes, and pressure vessels.



A schematic of ring rolling

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### CONTROLLED ROLLING

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*Controlled rolling* is a type of thermomechanical processing which integrates controlled deformation and heat treating. The heat which brings the workpiece above the recrystallization temperature is also used to perform the heat treatments so that any subsequent heat treating is unnecessary. Types of heat treatments include the production of a fine grain structure; controlling the nature, size, and distribution of various transformation products (such as ferrite, austenite, pearlite, bainite, and martensite in steel); inducing precipitation hardening; and, controlling the toughness. In order to achieve this the entire process must be closely monitored

and controlled. Common variables in controlled rolling include the starting material composition and structure, deformation levels, temperatures at various stages, and cool-down conditions. The benefits of controlled rolling include better mechanical properties and energy savings.

## SS SLIT COIL

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In metallurgy, stainless steel, also known as inox steel or inox from French "inoxydable", is a steel alloy with a minimum of 10.5% to 11% chromium content by mass.

Stainless steel does not readily corrode, rust or stain with water as ordinary steel does, but despite the name it is not fully stain-proof, most notably under low oxygen, high salinity, or poor circulation environments. It is also called corrosion-resistant steel or CRES when the alloy type and grade are not detailed, particularly in the aviation industry. There are different grades and surface finishes of stainless steel to suit the environment the alloy must endure. Stainless steel is used where both the properties of steel and resistance to corrosion are required.

Stainless steel differs from carbon steel by the amount of chromium present. Unprotected carbon steel rusts readily when exposed to air and moisture. This iron oxide film (the rust) is active and accelerates corrosion by forming more iron oxide, and due to the greater volume of the iron oxide this tends to flake and fall away. Stainless steels contain sufficient chromium to form a passive film of chromium oxide, which prevents further surface corrosion and blocks corrosion from spreading into the metal's internal structure, and due to the similar size of the steel and oxide ions they bond very strongly and remain attached to the surface.

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An art deco sculpture on the Niagara-Mohawk Power building in Syracuse, New York

Stainless steel's resistance to corrosion and staining, low maintenance and familiar lustre make it an ideal material for many applications. There are over 150 grades of stainless steel, of which fifteen are most commonly used. The alloy is milled into coils, sheets, plates, bars, wire, and tubing to be used in cookware, cutlery, household hardware, surgical instruments, major appliances, industrial equipment (for example, in sugar refineries) and as an automotive and aerospace structural alloy and construction material in large buildings. Storage tanks and tankers used to transport orange juice and other food are often made of stainless steel, because of its corrosion resistance. This also influences its use in commercial kitchens and food processing plants, as it can be steam-cleaned and sterilized and does not need paint or other surface finishes.

Stainless steel is used for jewelry and watches with 316L being the type commonly used for such applications. It can be re-finished by any jeweler and will not oxidize or turn black.

Some firearms incorporate stainless steel components as an alternative to blued or parkerized steel. Some handgun models, such as the Smith & Wesson Model 60 and the Colt M1911 pistol, can be made entirely from stainless steel. This gives a high-luster finish similar in appearance to

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nickel plating. Unlike plating, the finish is not subject to flaking, peeling, wear-off from rubbing (as when repeatedly removed from a holster), or rust when scratched.

Some automotive manufacturers use stainless steel as decorative highlights in their vehicles.

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## ARCHITECTURE

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Stainless steel is used for buildings for both practical and aesthetic reasons. Stainless steel was in vogue during the art deco period. The most famous example of this is the upper portion of the Chrysler Building . Some diners and fast-food restaurants use large ornamental panels and stainless fixtures and furniture. Because of the durability of the material, many of these buildings retain their original appearance.

Type 316 stainless is used on the exterior of both the Petronas Twin Towers and the Jin Mao Building, two of the world's tallest skyscrapers.

The Parliament House of Australia in Canberra has a stainless steel flagpole weighing over 220 tonnes (240 short tons).

The aeration building in the Edmonton Composting Facility, the size of 14 hockey rinks, is the largest stainless steel building in North America.

## RECYCLING AND REUSE

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Stainless steel is 100% recyclable. An average stainless steel object is composed of about 60% recycled material of which approximately 40% originates from end-of-life products and about 60% comes from manufacturing processes. According to the International Resource Panel's Metal Stocks in Society report, the per capita stock of stainless steel in use in society is 80–180 kg in more developed countries and 15 kg in less-developed countries.

There is a secondary market that recycles usable scrap for many stainless steel markets. The product is mostly coil, sheet and blanks. This material is purchased at a less-than-prime price and sold to commercial quality stampers and sheet metal houses.

## POLYPROPYLENE (PP) RESIN

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Polypropylene (PP), also known as polypropene, is a thermoplastic polymer used in a wide variety of applications including packaging and labeling, textiles (e.g., ropes, thermal underwear and carpets), stationery, plastic parts and reusable containers of various types, laboratory equipment, loudspeakers, automotive components, and polymer banknotes. An addition polymer made from the monomer propylene, it is rugged and unusually resistant to many chemical solvents, bases and acids.

In 2008, the global market for polypropylene had a volume of 45.1 million metric tons, which led to a turnover of about \$65 billion.

## INDUSTRIAL PROCESSES

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Traditionally, three manufacturing processes are the most representative ways to produce polypropylene.

**Hydrocarbon slurry or suspension:** Uses a liquid inert hydrocarbon diluent in the reactor to facilitate transfer of propylene to the catalyst, the removal of heat from the system, the deactivation/removal of the catalyst as well as dissolving the atactic polymer. The range of grades that could be produced was very limited. (The technology has fallen into disuse).

**Bulk (or bulk slurry):** Uses liquid propylene instead of liquid inert hydrocarbon diluent. The polymer does not dissolve into a diluent, but rather rides on the liquid propylene. The formed polymer is withdrawn and any unreacted monomer is flashed off.

**Gas phase:** Uses gaseous propylene in contact with the solid catalyst, resulting in a fluidized-bed medium.

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## SALEBRIDGE CORPORATION

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### MANUFACTURING

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Melt processing of polypropylene can be achieved via extrusion and molding. Common extrusion methods include production of melt-blown and spun-bond fibers to form long rolls for future conversion into a wide range of useful products, such as face masks, filters, nappies (diapers) and wipes.

The most common shaping technique is injection molding, which is used for parts such as cups, cutlery, vials, caps, containers, housewares, and automotive parts such as batteries. The related techniques of blow molding and injection-stretch blow molding are also used, which involve both extrusion and molding.

The large number of end-use applications for polypropylene are often possible because of the ability to tailor grades with specific molecular properties and additives during its manufacture. For example, antistatic additives can be added to help polypropylene surfaces resist dust and dirt. Many physical finishing techniques can also be used on polypropylene, such as machining. Surface treatments can be applied to polypropylene parts in order to promote adhesion of printing ink and paints.

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### BIAXIALLY ORIENTED POLYPROPYLENE (BOPP)

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When polypropylene film is extruded and stretched in both the machine direction and across machine direction it is called biaxially oriented polypropylene. Biaxial orientation increases strength and clarity. BOPP is widely used as a packaging material for packaging products such as snack foods, fresh produce and confectionery. It is easy to coat, print and laminate to give the required appearance and properties for use as a packaging material. This process is normally called converting. It is normally produced in large rolls which are slit on slitting machines into smaller rolls for use on packaging machines.

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### HEALTH CONCERNS

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In 2008, researchers in Canada asserted that quaternary ammonium biocides and oleamide were leaking out of certain polypropylene labware, affecting experimental results. As polypropylene is used in a wide number of food containers such as those for yogurt, Health Canada media spokesman Paul Duchesne, said the department will be reviewing the findings to determine whether steps are needed to protect consumers.

The Environmental Working Group classifies PP as of low to moderate hazard. PP is dope-dyed; no water is used of its dyeing in comparison for example with cotton.

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## APPLICATIONS

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Polypropylene lid of a Tic Tacs box, with a living hinge and the resin identification code under its flap

As polypropylene is resistant to fatigue, most plastic living hinges, such as those on flip-top bottles, are made from this material. However, it is important to ensure that chain molecules are oriented across the hinge to maximize strength.

Very thin sheets of polypropylene are used as a dielectric within certain high-performance pulse and low-loss RF capacitors.

Polypropylene is used in the manufacturing piping systems; both ones concerned with high-purity and ones designed for strength and rigidity (e.g. those intended for use in potable plumbing, hydroid heating and cooling, and reclaimed water). This material is often chosen for its resistance to corrosion and chemical leaching, its resilience against most forms of physical damage, including impact and freezing, its environmental benefits, and its ability to be joined by heat fusion rather than gluing.



A polypropylene chair

Many plastic items for medical or laboratory use can be made from polypropylene because it can withstand the heat in an autoclave. Its heat resistance also enables it to be used as the manufacturing material of consumer-grade kettles. Food containers made from it will not melt in the dishwasher, and do not melt during industrial hot filling processes. For this reason, most plastic tubs for dairy products are polypropylene sealed with aluminum foil (both heat-resistant materials). After the product has cooled, the tubs are often given lids made of a less heat-resistant material, such as LDPE or polystyrene. Such containers provide a good hands-on example of the difference in modulus, since the rubbery (softer, more flexible) feeling of LDPE with respect to polypropylene of the same thickness is readily apparent. Rugged, translucent, reusable plastic containers made in a wide variety of shapes and sizes for consumers from various companies



such as Rubbermaid and Sterility are commonly made of polypropylene, although the lids are often made of somewhat more flexible LDPE so they can snap on to the container to close it. Polypropylene can also be made into disposable bottles to contain liquid, powdered, or similar consumer products, although HDPE and polyethylene terephthalate are commonly also used to make bottles. Plastic pails, car batteries, wastebaskets, pharmacy prescription bottles, cooler containers, dishes and pitchers are often made of polypropylene or HDPE, both of which commonly have rather similar appearance, feel, and properties at ambient temperature.

A common application for polypropylene is as biaxial oriented polypropylene (BOPP). These BOPP sheets are used to make a wide variety of materials including clear bags. When polypropylene is biaxial oriented, it becomes crystal clear and serves as an excellent packaging material for artistic and retail products.

Polypropylene, highly colorfast, is widely used in manufacturing carpets, rugs and mats to be used at home.

Polypropylene is widely used in ropes, distinctive because they are light enough to float in water. For equal mass and construction, polypropylene rope is similar in strength to polyester rope. Polypropylene costs less than most other synthetic fibers.

Polypropylene is also used as an alternative to polyvinyl chloride (PVC) as insulation for electrical cables for LSZH cable in low-ventilation environments, primarily tunnels. This is because it emits less smoke and no toxic halogens, which may lead to production of acid in high-temperature conditions.

Polypropylene is also used in particular roofing membranes as the waterproofing top layer of single-ply systems as opposed to modified-bit systems.

Polypropylene is most commonly used for plastic moldings, wherein it is injected into a mold while molten, forming complex shapes at relatively low cost and high volume; examples include bottle tops, bottles, and fittings.

It can also be produced in sheet form, widely used for the production of stationery folders, packaging, and storage boxes. The wide color range, durability, low cost, and resistance to dirt make it ideal as a protective cover for papers and other materials. It is used in Rubik's Cube stickers because of these characteristics.

The availability of sheet polypropylene has provided an opportunity for the use of the material by designers. The light-weight, durable, and colorful plastic makes an ideal medium for the creation of light shades, and a number of designs have been developed using interlocking sections to create elaborate designs.

## SALEBRIDGE CORPORATION

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Polypropylene sheets are a popular choice for trading card collectors; these come with pockets (nine for standard-size cards) for the cards to be inserted and are used to protect their condition and are meant to be stored in a binder.

Expanded polypropylene (EPP) is a foam form of polypropylene. EPP has very good impact characteristics due to its low stiffness; this allows EPP to resume its shape after impacts. EPP is extensively used in model aircraft and other radio controlled vehicles by hobbyists. This is mainly due to its ability to absorb impacts, making this an ideal material for RC aircraft for beginners and amateurs.

Polypropylene is used in the manufacture of loudspeaker drive units. Its use was pioneered by engineers at the BBC and the patent rights subsequently purchased by Mission Electronics for use in their Mission Freedom Loudspeaker and Mission 737 Renaissance loudspeaker.

Polypropylene fibers are used as a concrete additive to increase strength and reduce cracking and spalling.

Polypropylene is used in polypropylene drums.

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## CLOTHING

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Polypropylene is a major polymer used in nonwovens, with over 50% used for diapers or sanitary products where it is treated to absorb water (hydrophilic) rather than naturally repelling water (hydrophobic). Other interesting non-woven uses include filters for air, gas, and liquids in which the fibers can be formed into sheets or webs that can be pleated to form cartridges or layers that filter in various efficiencies in the 0.5 to 30 micrometre range. Such applications could be seen in the house as water filters or air-conditioning-type filters. The high surface area and naturally oleophilic polypropylene nonwovens are ideal absorbers of oil spills with the familiar floating barriers near oil spills on rivers.

In New Zealand, in the US military, and elsewhere, polypropylene, or 'polypro' (New Zealand 'polyprops'), has been used for the fabrication of cold-weather base layers, such as long-sleeve shirts or long underwear (More recently, polyester has replaced polypropylene in these applications in the U.S. military, such as in the ECWCS . Polypropylene is also used in warm-weather gear such as some under armour clothing, which can easily transport sweat away from the skin. Although polypropylene clothes are not easily flammable, they can melt, which may result in severe burns if the service member is involved in an explosion or fire of any kind. Polypropylene undergarments are known for retaining body odors which are then difficult to remove. The current generation of polyester does not have this disadvantage.

Thanks to its specific weight, polypropylene yarn is the lightest fibre of all synthetic and natural fibers. Producers gain economic and ecological advantages when producing fabrics and clothes out of polypropylene yarn. Final users gain more comfort because the garments are lighter. This enables them to give better performance during their activities and gives them the freedom of movement. For example, If they hike, they have less weight to carry. Polypropylene yarn has very good insulation properties. Its water absorption is almost nil. Fabric made of polypropylene yarn transports humidity to the outside or to another absorbent layer from where it gradually evaporates.

The material has recently been introduced into the fashion industry through the work of designers such as Anoush Waddington, who have developed specialized techniques to create jewelry and wearable items from polypropylene.

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## MEDICAL

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Its most common medical use is in the synthetic, nonabsorbable suture Prolene, manufactured by Ethicon Inc.

Polypropylene has been used in hernia and pelvic organ prolapse repair operations to protect the body from new hernias in the same location. A small patch of the material is placed over the spot of the hernia, below the skin, and is painless and rarely, if ever, rejected by the body. However, a polypropylene mesh will erode over the uncertain period from days to years. Therefore, the FDA has issued several warnings on the use of polypropylene mesh medical kits for certain applications in pelvic organ prolapse, specifically when introduced in close proximity to the vaginal wall due to a continued increase in number of mesh erosions reported by patients over the past few years. Most recently, on 3 January 2012, the FDA ordered 35 manufacturers of these mesh products to study the side effects of these devices.

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## EPP MODEL AIRCRAFT

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Since 2001, expanded polypropylene (EPP) foams have been gaining in popularity and in application as a structural material in hobbyist radio control model aircraft. Unlike expanded polystyrene foam (EPS) which is friable and breaks easily on impact, EPP foam is able to absorb kinetic impacts very well without breaking, retains its original shape, and exhibits memory form characteristics which allow it to return to its original shape in a short amount of time. In consequence, a radio-control model whose wings and fuselage are constructed from EPP foam is extremely resilient, and able to absorb impacts that would result in complete destruction of models made from lighter traditional materials, such as balsa or even EPS foams. EPP models, when covered with inexpensive fibreglass impregnated self-adhesive tapes, often exhibit much increased mechanical strength, in conjunction with a lightness and surface finish that rival those of models of the aforementioned types. EPP is also chemically highly inert, permitting the use of a wide variety of different adhesives. EPP can be heat molded, and surfaces can be easily finished with the use of cutting tools and abrasive papers. The principal areas of model making in which EPP has found great acceptance are the fields of:

- Wind-driven slope soarers
- Indoor electric powered profile electric models
- Hand launched gliders for small children

In the field of slope soaring, EPP has found greatest favour and use, as it permits the construction of radio-controlled model gliders of great strength and maneuverability. In consequence, the disciplines of slope combat (the active process of friendly competitors attempting to knock each other's planes out of the air by direct contact) and slope pylon racing have become commonplace, in direct consequence of the strength characteristics of the material EPP.

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## RECYCLING

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Polypropylene is recyclable and has the number "5" as its resin identification code.

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## REPAIRING

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Many objects are made with polypropylene precisely because it is resilient and resistant to most solvents and glues. Also, there are very few glues available specifically for gluing PP. However, solid PP objects not subject to undue flexing can be satisfactorily joined with a two part epoxy glue or using hot-glue guns. Preparation is important and it is often helpful to roughen the surface with a file, emery paper or other abrasive material to provide better anchorage for the glue. Also it is recommended to clean with mineral spirits or similar alcohol prior to gluing to remove any oils or other contamination. Some experimentation may be required. There are also some industrial glues available for PP, but these can be difficult to find, especially in a retail store.

PP can be melted using a speed welding technique. With speed welding, the plastic welder, similar to a soldering iron in appearance and wattage, is fitted with a feed tube for the plastic weld rod. The speed tip heats the rod and the substrate, while at the same time it presses the molten weld rod into position. A bead of softened plastic is laid into the joint, and the parts and weld rod fuse. With polypropylene, the melted welding rod must be "mixed" with the semi-melted base material being fabricated or repaired. A speed tip "gun" is essentially a soldering iron with a broad, flat tip that can be used to melt the weld joint and filler material to create a bond.

## POLYETHYLENE TEREPHTHALATE (PET) RESIN

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Polyethylene terephthalate (sometimes written poly(ethylene terephthalate)), commonly abbreviated PET, PETE, or the obsolete PETP or PET-P, is a thermoplastic polymer resin of the polyester family and is used in synthetic fibers; beverage, food and other liquid containers; thermoforming applications; and engineering resins often in combination with glass fiber. The term polyethylene terephthalate is a source of confusion because this substance, PET, does not contain polyethylene. Thus, the alternate form, poly(ethylene terephthalate), is often used in scholarly journals for the sake of accuracy and clarity.

Depending on its processing and thermal history, polyethylene terephthalate may exist both as an amorphous (transparent) and as a semi-crystalline polymer. The semicrystalline material might appear transparent (particle size < 500 nm) or opaque and white (particle size up to a few microns) depending on its crystal structure and particle size. Its monomer (bis- $\beta$ -hydroxyterephthalate) can be synthesized by the esterification reaction between terephthalic acid and ethylene glycol with water as a byproduct, or by transesterification reaction between ethylene glycol and dimethyl terephthalate with methanol as a byproduct. Polymerization is

through a polycondensation reaction of the monomers (done immediately after esterification/transesterification) with water as the byproduct.

The majority of the world's PET production is for synthetic fibers (in excess of 60%), with bottle production accounting for around 30% of global demand. In the context of textile applications, PET is referred to by its common name, "polyester," whereas the acronym "PET" is generally used in relation to packaging. Polyester makes up about 18% of world polymer production and is the third-most-produced polymer; polyethylene (PE) and polypropylene (PP) are first and second, respectively.



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## USES

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Because PET is an excellent barrier material, plastic bottles made from PET are widely used for soft drinks. For certain specialty bottles, PET sandwiches an additional polyvinyl alcohol layer to further reduce its oxygen permeability.

Biaxially oriented PET film (often known by one of its trade names, "Mylar") can be aluminized by evaporating a thin film of metal onto it to reduce its permeability, and to make it reflective and opaque (MPET). These properties are useful in many applications, including flexible food packaging and thermal insulation such as "space blankets". Because of its high mechanical strength, PET film is often used in tape applications, such as the carrier for magnetic tape or backing for pressure sensitive adhesive tapes.

Non-oriented PET sheet can be thermoformed to make packaging trays and blisters. If crystallizable PET is used, the trays can be used for frozen dinners, since they withstand both freezing and oven baking temperatures.

When filled with glass particles or fibers, it becomes significantly stiffer and more durable.

PET is also used as substrate in thin film and solar cell.

## DRYING

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PET is hygroscopic, meaning that it absorbs water from its surroundings. However, when this 'damp' PET is then heated, the water hydrolyzes the PET, decreasing its resilience. Thus, before the resin can be processed in a molding machine, it must be dried. Drying is achieved through the use of a desiccant or dryers before the PET is fed into the processing equipment.

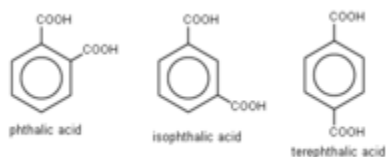
Inside the dryer, hot dry air is pumped into the bottom of the hopper containing the resin so that it flows up through the pellets, removing moisture on its way. The hot wet air leaves the top of the hopper and is first run through an after-cooler, because it is easier to remove moisture from cold air than hot air. The resulting cool wet air is then passed through a desiccant bed. Finally, the cool dry air leaving the desiccant bed is re-heated in a process heater and sent back through the same processes in a closed loop. Typically, residual moisture levels in the resin must be less than 50 parts per million (parts of water per million parts of resin, by weight) before processing. Dryer residence time should not be shorter than about four hours. This is because drying the material in less than 4 hours would require a temperature above 160 °C, at which level hydrolysis would begin inside the pellets before they could be dried out.

PET can also be dried in compressed air resin dryers. Compressed air dryers do not reuse drying air. Dry, heated compressed air is circulated through the PET pellets as in the desiccant dryer, and then released to the atmosphere.

## Copolymers

In addition to pure (homopolymer) PET, PET modified by copolymerization is also available.

In some cases, the modified properties of copolymer are more desirable for a particular application. For example, cyclohexane dimethanol (CHDM) can be added to the polymer backbone in place of ethylene glycol. Since this building block is much larger (6 additional carbon atoms) than the ethylene glycol unit it replaces, it does not fit in with the neighboring chains the way an ethylene glycol unit would. This interferes with crystallization and lowers the polymer's melting temperature. In general, such PET is known as PETG or PET-G (Polyethylene Terephthalate Glycol-modified; Eastman Chemical, SK Chemicals, and Artenius Italia are some PETG manufacturers). PETG is a clear amorphous thermoplastic that can be injection molded or sheet extruded. It can be colored during processing.



Replacing terephthalic acid (right) with isophthalic acid (center) creates a kink in the PET chain, interfering with crystallization and lowering the polymer's melting point..

Another common modifier is isophthalic acid, replacing some of the 1, 4-(Para-) linked terephthalate units. The 1, 2- (ortho) or 1, 3-(meta-) linkage produces an angle in the chain, which also disturbs crystallinity.

Such copolymers are advantageous for certain molding applications, such as thermoforming, which is used for example to make tray or blister packaging from co-PET film, or amorphous PET sheet (A-PET) or PETG sheet. On the other hand, crystallization is important in other applications where mechanical and dimensional stability are important, such as seat belts. For PET bottles, the use of small amounts of isophthalic acid, CHDM, DEG or other comonomers can be useful: if only small amounts of comonomers are used, crystallization is slowed but not prevented entirely. As a result, bottles are obtainable via stretch blow molding ("SBM"), which are both clear and crystalline enough to be an adequate barrier to aromas and even gases, such as carbon dioxide in carbonated beverages.



## SALEBRIDGE CORPORATION

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### SAFETY

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Commentary published in Environmental Health Perspectives in April 2010 suggested that PET might yield endocrine disruptors under conditions of common use and recommended research on this topic. Proposed mechanisms include leaching of phthalates as well as leaching of antimony.

### BOTTLE PROCESSING EQUIPMENT

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There are two basic molding methods for PET bottles, one-step and two-step. In two-step molding, two separate machines are used. The first machine injection molds the preform, which resembles a test tube, with the bottle-cap threads already molded into place. The body of the tube is significantly thicker, as it will be inflated into its final shape in the second step using stretch blow molding.

In the second step, the preforms are heated rapidly and then inflated against a two-part mold to form them into the final shape of the bottle. Preforms (uninflated bottles) are now also used as robust and unique containers themselves; besides novelty candy, some Red Cross chapters distribute them to homeowners to store medical history for emergency responders.

In one-step machines, the entire process from raw material to finished container is conducted within one machine, making it especially suitable for molding non-standard shapes (custom molding), including jars, flat oval, flask shapes etc. Its greatest merit is the reduction in space, product handling and energy, and far higher visual quality than can be achieved by the two-step system.

### POLYESTER RECYCLING INDUSTRY

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While most thermoplastics can, in principle, be recycled, PET bottle recycling is more practical than many other plastic applications because of the high value of the resin and the almost exclusive use of PET for widely used water and carbonated soft drink bottling. PET has a resin identification code of 1. The prime uses for recycled PET are polyester fiber, strapping, and non-food containers.

Because of the recyclability of PET and the relative abundance of post-consumer waste in the form of bottles, PET is rapidly gaining market share as a carpet fiber. Mohawk Industries released ever STRAND in 1999, a 100% post-consumer recycled content PET fiber. Since that time, more than 17 billion bottles have been recycled into carpet fiber. Pharr Yarns, a supplier to

numerous carpet manufacturers including Looptex, Dobbs Mills, and Berkshire Flooring, produces a BCF (bulk continuous filament) PET carpet fiber containing a minimum of 25% post-consumer recycled content.

PET, as with many plastics, is also an excellent candidate for thermal disposal (incineration), as it is composed of carbon, hydrogen, and oxygen, with only trace amounts of catalyst elements (but no sulfur). PET has the energy content of soft coal.

When recycling polyethylene terephthalate or PET or polyester, in general two ways have to be differentiated:

1. The chemical recycling back to the initial raw materials purified terephthalic acid (PTA) or dimethyl terephthalate (DMT) and ethylene glycol (EG) where the polymer structure is destroyed completely, or in process intermediates like bis-β-hydroxyterephthalate
2. The mechanical recycling where the original polymer properties are being maintained or reconstituted.

Chemical recycling of PET will become cost-efficient only applying high capacity recycling lines of more than 50,000 tons/year. Such lines could only be seen, if at all, within the production sites of very large polyester producers. Several attempts of industrial magnitude to establish such chemical recycling plants have been made in the past but without resounding success. Even the promising chemical recycling in Japan has not become an industrial break through so far. The two reasons for this are: at first, the difficulty of consistent and continuous waste bottles sourcing in such a huge amount at one single site, and, at second, the steadily increased prices and price volatility of collected bottles. The prices of baled bottles increased for instance between the years 2000 and 2008 from about 50 Euro/ton to over 500 Euro/ton in 2008.

Mechanical recycling or direct circulation of PET in the polymeric state is operated in most diverse variants today. These kinds of processes are typical of small and medium-size industry. Cost-efficiency can already be achieved with plant capacities within a range of 5 000 – 20 000 tons/year. In this case, nearly all kinds of recycled-material feedback into the material circulation are possible today. These diverse recycling processes are being discussed hereafter in detail.

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## POLYVINYL CHLORIDE (PVC) RESIN

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**Polyvinyl chloride**, commonly abbreviated **PVC**, is the third-most widely produced plastic, after polyethylene and polypropylene. PVC is used in construction because it is more effective than traditional materials such as copper, iron or wood in pipe and profile applications. It can be made softer and more flexible by the addition of plasticizers, the most widely used being phthalates. In

this form, it is also used in clothing and upholstery, electrical cable insulation, inflatable products and many applications in which it replaces rubber.

Pure polyvinyl chloride is a white, brittle solid. It is insoluble in alcohol, but slightly soluble in tetrahydrofuran.



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## APPLICATIONS

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PVC's relatively low cost, biological and chemical resistance and workability have resulted in it being used for a wide variety of applications. It is used for sewerage pipes and other pipe applications where cost or vulnerability to corrosion limit the use of metal. With the addition of impact modifiers and stabilizers, it has become a popular material for window and door frames. By adding plasticizers, it can become flexible enough to be used in cabling applications as a wire insulator. It has been used in many other applications.

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### PIPES

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Roughly half of the world's polyvinyl chloride resin manufactured annually is used for producing pipes for municipal and industrial applications. In the water distribution market it accounts for

66% of the market in the US, and in sanitary sewer pipe applications, it accounts for 75%. Its light weight, low cost, and low maintenance make it attractive. However, it must be carefully installed and bedded to ensure longitudinal cracking and overbelling does not occur. Additionally, PVC pipes can be fused together using various solvent cements, or heat-fused (butt-fusion process, similar to joining HDPE pipe), creating permanent joints that are virtually impervious to leakage.

In February, 2007 the California Building Standards Code was updated to approve the use of chlorinated polyvinyl chloride (CPVC) pipe for use in residential water supply piping systems. CPVC has been a nationally accepted material in the US since 1982; California, however, has permitted only limited use since 2001. The Department of Housing and Community Development prepared and certified an environmental impact statement resulting in a recommendation that the Commission adopt and approve the use of CPVC. The Commission's vote was unanimous and CPVC has been placed in the 2007 California Plumbing Code.

In the United States and Canada, PVC pipes account for the largest majority of pipe materials used in buried municipal applications for drinking water distribution and wastewater mains. Buried PVC pipes in both water and sanitary sewer applications that are 4 inches (100 mm) in diameter and larger are typically joined by means of a gasket-sealed joint. The most common type of gasket utilized in North America is a metal reinforced elastomer, commonly referred to as a Reiber sealing system.

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## ELECTRIC CABLES

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PVC is commonly used as the insulation on electrical cables; PVC used for this purpose needs to be plasticized.

In a fire, PVC-coated wires can form HCl fumes; the chlorine serves to scavenge free radicals and is the source of the material's fire retardance. While HCl fumes can also pose a health hazard in their own right, HCl dissolves in moisture and breaks down onto surfaces, particularly in areas where the air is cool enough to breathe, and is not available for inhalation. Frequently in applications where smoke is a major hazard (notably in tunnels and communal areas) PVC-free cable insulation is preferred, such as low smoke zero halogen (LSZH) insulation. Any metal parts must not be mixed together during the raw material stage, as it may lead to EMI.

UNPLASTICIZED POLYVINYL CHLORIDE (UPVC) FOR  
CONSTRUCTION

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"A modern Tudorbethan" house with uPVC gutters and downspouts, fascia, decorative imitation "half-timbering", windows, and doors

uPVC, also known as rigid PVC, is extensively used in the building industry as a low-maintenance material, particularly in Ireland, the United Kingdom, and in the United States. In the USA it is known as vinyl, or vinyl siding. The material comes in a range of colors and finishes, including a photo-effect wood finish, and is used as a substitute for painted wood, mostly for window frames and sills when installing double glazing in new buildings, or to replace older single-glazed windows. Other uses include fascia, and siding or weatherboarding. This material has almost entirely replaced the use of cast iron for plumbing and drainage, being used for waste pipes, drainpipes, gutters and downspouts. uPVC does not contain phthalates, since those are only added to flexible PVC, nor does it contain BPA. uPVC is known as having strong resistance against chemicals, sunlight, and oxidation from water.

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### SIGNS

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Polyvinyl chloride is formed in flat sheets in a variety of thicknesses and colors. As flat sheets, PVC is often expanded to create voids in the interior of the material, providing additional thickness without additional weight and minimal extra cost (see Closed-cell PVC foamboard). Sheets are cut using saw and rotary cutting equipment. Plasticized PVC is also used to produce thin, colored, or clear, adhesive-backed films referred to simply as vinyl. These films are typically cut on a computer-controlled plotter or printed in a wide-format printer. These sheets and films are used to produce a wide variety of commercial signage products and markings on vehicles, e.g. car body stripes.

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### CLOTHING AND FURNITURE

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PVC has become widely used in clothing, to either create a leather-like material or at times simply for the effect of PVC. PVC clothing is common in Goth, Punk, clothing fetish and alternative fashions. PVC is cheaper than rubber, leather, and latex which it is therefore used to simulate. PVC fabric has sheen to it and is waterproof so is used in coats, skiing equipment,



Black PVC pants

shoes, jackets, aprons, and bags.

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### SPORT

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Due to its versatility PVC has also developed quite a few uses within the sporting area. In the UK the British Plastics Federation has produced a novel and interesting YouTube video covering the particular use of PVC coated fabric at recent sporting events in 2012. See also Sustainability section.

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### HEALTHCARE

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The two main application areas for single use medically approved PVC compounds are flexible containers and tubing: containers used for blood and blood components for urine or for ostomy products and tubing used for blood taking and blood giving sets, catheters, heart-lung bypass sets, haemodialysis set etc. In Europe the consumption of PVC for medical devices is approximately 85.000 tons every year. Almost one third of plastic based medical devices are made from PVC. The reasons for using flexible PVC in these applications for over 50 years are numerous and based on cost effectiveness linked to transparency, light weight, softness, tear strength, kink resistance, suitability for sterilisation and biocompatibility.

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### PLASTICISERS

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DEHP (Di-2ethylhexyl)phthalate) has been medically approved for many years for use in such medical devices; the PVC-DEHP combination proving to be very suitable for making blood bags because DEHP stabilises red blood cells so minimising haemolysis (red blood cell rupture) However DEHP is coming under increasing pressure in Europe. The assessment of potential risks related to phthalates and in particular the use of DEHP in PVC medical devices has been subject to scientific and policy review by the European Union authorities. As of 21 March 2010, a specific labelling requirement has subsequently been introduced across the EU for all devices containing phthalates that are classified as CMR (carcinogenic, mutagenic or toxic to reproduction). The label aims to enable healthcare professionals to use this equipment safely and, where needed, take appropriate precautionary measures for patients at risk of over-exposure. DEHP alternatives, which are gradually replacing it, are Adipates, Butyryltriethylcitrate (BTHC), Cyclohexane-1,2-dicarboxylic acid, diisononylester (DINCH), Di(2-ethylhexyl)terephthalate , polymeric and trimellitic acid, 2-ethylhexylester (TOTM).

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### FLOORING

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Flexible PVC flooring is inexpensive and used in a variety of buildings covering the home, hospitals, offices, schools, etc. Complex and 3D designs are possible due to the prints that can be created which are then protected by a clear wear layer. A middle vinyl foam layer also gives a comfortable and safe feel. The smooth, tough surface of the upper wear layer prevents the build up of dirt which prevents microbes from breeding in areas that need to be kept sterile, such as hospitals and clinics.

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### OTHER APPLICATIONS

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PVC has been used for a host of consumer products of relatively smaller volume compared to the industrial and commercial applications described above. Another of its earliest mass-market consumer applications was to make vinyl records. More recent examples include wallcovering, greenhouses, home playgrounds, foam and other toys, custom truck toppers (tarpaulins), ceiling.



PVC pipe for sewerage line

tiles and other kinds of interior cladding.



## ALUMINUM INGOT

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An **ingot** is a material, usually metal, that is cast into a shape suitable for further processing. Non-metallic and semiconductor materials prepared in bulk form may also be referred to as ingots, particularly when cast by mold based methods.



## USES

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Ingots require a second procedure of shaping, such as cold/hot working, cutting or milling to produce a useful final product. Additionally ingots (of less common materials) can be used as currency, or as a currency reserve as with gold bars.

## TYPES

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Metal, either pure or alloy, heated past its melting point and cast into a bar or block using a mold chill method. Polycrystalline and single crystal ingots are made from semiconductor materials by pulling from a molten melt. Uses include the formation of photovoltaic cells from silicon ingots by cutting the ingot into flats, known as wafers.

## SINGLE CRYSTAL

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## SALEBRIDGE CORPORATION

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Single crystal ingots (called boules) of materials are grown (crystal growth) using methods such as the Czochralski process or Bridgeman technique.

The boules may be either semiconductors—for the electronic industry, or non-conducting inorganic compounds for industrial and jewelry use, e.g., synthetic ruby, sapphire etc.

Single crystal ingots of metal are produced in similar fashion to that used to produce high purity semiconductor ingots, i.e. by vacuum induction refining. Single crystal ingots of engineering metals are of interest due to their very high strength due to lack of grain boundaries. The method of production is via single crystal dendrite and not via simple casting. Possible uses include turbine blades.

## COPPER ALLOYS

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In the United States, the brass and bronze ingot making industry started in the early 19th century. The US brass industry grew to be the number one producer by the 1850s. During colonial times the brass and bronze industries were almost non-existent because the British demanded all copper ore be sent to Britain for processing. Copper based alloy ingots weighed approximately 20 pounds (9.1 kg).

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***CHAPTER: FOUR***  
***CLIENT OVERVIEW***

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## CITY GROUP

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City Group is a prominent name in the industrial arena of Bangladesh. The Group has over 37 years of experience in the edible oil industry and expanded its wings of production gradually. At present there are 23 sister concerns, each specializing in different areas of production. Incorporating Flour, Dal, Feed, Salt, Sugar and Pure Drinking Water in the product line and integrating vertically; the Group has been in quest of transforming to a 21st century conglomerate.

City Group is dedicated to optimize the quality of the produced consumer items. Strength lies in the Group's ability to use state-of-the-art technology from Europe and other countries and imported high grade raw materials which are the finest in the world. The production facilities are well equipped with top notch machinery from Singapore, Japan, Switzerland, Germany, USA, Taiwan, Belgium, Thailand, and best quality raw materials are collected both from overseas and local suppliers. The combination ensures products with highest level of quality and hygiene.

A vertically integrated concern having more than 10,000 skilled manpower and with a true depth of market penetration City Group has the physical advantage of all its mills, factories and establishments being spread over 175 acres of land in the old part of Dhaka i.e. Gandaria; expanding industrial belt at Konapara, Demra, and Rupshi, Narayangonj and in Chittagong, the commercial capital of Bangladesh.

The secret of success of City Group lies in fulfillment of all its business commitments, uncompromising attitude in quality maintenance and intimate relationship with its customers, employees and all other social groups.

All the members of City Group are actively involved in maintaining the ideals established by Company founder. Almost four decades of this epic industrial journey can only be termed as a quest for excellence and we welcome you to be a part of it.

With firm commitment, uncompromising business integrity and pioneering attitude, City Group remains in the hearts of millions.

### MEGHNA GROUP

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Late Dr Abdul Khaleque Bunyan started bicycle and parts trading business during the late 1960's. In early 1970's he started manufacturing bicycle spoke. Gradually he established a strong position in the Bangladesh bicycle and parts market. His son Mr. Mizanur Rahman Bunyan took charge of the business when he passed away in 1986. After 2/3 years of consolidation, he expanded and diversified the business.

Meghna Group is a leading business conglomerate with a diversified portfolio. Our core business is to manufacture and export bicycle and components to Europe. We manufacture full range of bicycle tyres, motor cycle tyres and tube for all types of vehicles. Soon will start production of tyres for light vehicles. Other manufacturing units include, a joint venture hanger production unit with famous Mainetti group from Italy, a composit Knit Garment factory and a fully automated packaging industry. We also have a steel tube mill that produce quality steel pipes for our bike frames and steel furniture. In addition the group has business stake in a White Cement manufacturing unit under the license of Thailand's renowned Siam Group.

Meghna Group is very successful in automotive sector in Bangladesh. We are the sole distributor of prestigious German brand BMW in this country. Kia Motors from Korea is also represented by the group in local market.

Meghna Group was awarded with the 'Business Enterprise of the Year 2009' in The Daily Star – DHL Bangladesh Business Award. For their export performance in the year 2008, Transworld Bicycle Co Ltd received the national 'National Export Trophy – Gold' and Meghna Bangladesh Ltd received 'National Export Trophy – Silver'

### PRAN GROUP

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**RFL** started its journey with Cast Iron (CI) products in 1980. The initial main objective was to ensure pure drinking water and affordable irrigation instruments for improved rural life. Today the company has its wide ranges of CI products like pumps, tube wells, bearings, gas stoves etc and has achieved the prestige as the largest cast iron foundry and light engineering workshop in Bangladesh. With a vision to serve the common people of Bangladesh with quality necessity products, **RFL** diversified its operation into PVC category in 1996 & in Plastic Sector in 2003. At present it is market leader in all these three sectors-Cast Iron, PVC & Plastic in the country. Sizeable amount is also exported to different countries. Please visit [www.rflplastics.com](http://www.rflplastics.com) for more information on **RFL** Plastic products.

## SALEBRIDGE CORPORATION

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It is equipped with in-house R&D facilities to design and develop new products. A well organized own testing laboratory is used to ensure consistency in producing quality products. **RFL** has been awarded with BSTI Certificate and ISO 9001 Certificate for its strict compliance with the standard set by both the organizations.

**RFL** has become a benchmark for competitors on the lines of quality by manufacturing premium quality products to give clients excellent services and true value for money. The unmatched products have given a big name to the domestic market so much so that the name is accepted with trust and quality assurance the nation over. This is possible because the company is professionally managed and promoted by people who ensure that creativity is given full freedom to blossom and talent is nurtured in the company.

## TRANSCOM

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Originated with tea plantations in 1885, TRANSCOM today is one of the leading and fastest growing diversified business houses in the country employing over 10000 people. Not many industrial groups in Bangladesh can claim a history of continuous business pursuits stretching back over 125 years! Initially tea and later jute formed the backbone of the family business. Although these are still part of the activities and contributing marginally to the overall group turnover. Presently those early industrial ventures have moved over to businesses involving high-tech manufacturing, international trading and distribution, forming strong ties with a host of blue chip multinational companies. In recent years, TRANSCOM has emerged as the largest media house in Bangladesh.

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## COMPANIES & ASSOCIATES

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- Transcom Electronics Ltd
- Transcom Foods Ltd
- Transcom Beverages Ltd
- Transcom Cables Ltd
- Transcom Distribution Co. Ltd
- Transcom Mobile Ltd
- Transcraft Ltd
- Bangladesh Electrical Industries Ltd
- Bangladesh Lamps Ltd
- Eskayef Bangladesh Ltd
- Mediastar Ltd
- Tea & Rubber Farms
- Media world Ltd
- Reliance Insurance Ltd

## Transcom Beverages Ltd



**Transcom Beverage Ltd (TBL)** is the exclusive PepsiCoFranchisee for Bangladesh. TBL owns and operates modern plants in Dhaka and Chittagong for bottling the renowned soft drink brands such as, **Pepsi, 7UP, Mirinda, Slice, Mountain Dew, Pepsi Diet** and **7UP Light**. The company is emerging with the motto to deliver sustained growth in Bangladesh and move towards dominant Beverage Company, delighting & nourishing every Bangladeshi, by best meeting their everyday beverages needs & stakeholders by delivering performance with purpose, through talented people.

- 2009 has been an amazing year for TBL, winning several spectacular awards as PepsiCo's exclusive bottling partner in Bangladesh. For its' extraordinary and outstanding venture through excellence TBL has been rewarded with several prestigious national and international recognitions.



## SALEBRIDGE CORPORATION

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### AKIJ GROUP

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History of Akij Group stretches back to later part of the forties. In its infancy, the Group started in humble way with jute trading which was known as the golden fiber of the country, earning highest amount of foreign exchange.

Akij Group's ceaseless efforts with dynamic management and support from our numerous clients have led our Group in diversifying its business activities. In the second phase, the Group went into manufacturing handmade cigarettes popularly known as bidis. This sector gave a real boost to the revenue earning of the Group as well as making a substantial contribution to government exchequer. With the passage of time, the Group undertook new ventures and presently there are 15 units of industries under its umbrella like cigarettes, handmade cigarettes, printing & packaging, textiles, hand board, pharmaceutical, leather processing and real-estate business are in operation, catering jobs for more that 32,000 people in various categories.

The Group has plans for setting up more projects. The projects are already in pipeline. Foreign investors have shown keen interest in joining with us for joint ventures. The matter is under our active consideration and will hopefully soon mature. This will also help the nation's economy growth and will create job opportunities to various professionals.

Akij Group is also involved in socio-cultural activities. The Group has been operating a sizeable orphanage free of charge in district town. The Group has also acquired a modern mother & children hospital previously owned by Save the Children (UK). The hospital is being operated as a non-profitable concern by Ad-Din Welfare Trust.

### AKIJ FOOD & BEVERAGE LTD.

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Akij Food & Beverage Ltd. has been established at a beautiful site Krishnapura, Dhamrai of Dhaka. It has come with the best food & beverage in Bangladesh.

There are various types of drink. Mojo is the brand name of cola, Lemu is the brand name of Lemon and Speed is the brand name of energy drink. Immediately after the introduction of the brand it became very popular among its consumer because of the high quality and intensive distribution in every nook and corner of the country.

Checky Monkey is the brand name of banana chips produced from this factory. It also is becoming popular chips in Bangladesh.



## SALEBRIDGE CORPORATION

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Most of our Raw materials come from various foreign countries. The quality is very strictly controlled. At every stage, non standard products are rejected.

## RAHIM STEEL MILLS CO. (PVT.) LTD.

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backed by the energy and experience of its entrepreneurs, has made a name for itself in the field of steel making and is now the leading Quality steel manufacturing company in Bangladesh. The Managing Director Mr. Mohammed Mohsin is a qualified engineer having advanced engineering degree from USA. In addition to a large group of skilled workers and technicians, we have a number of trained and experienced chemists and metallurgists (from home & abroad) in our organization.



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***CHAPTER: FIVE***

***ANALYSIS AND FINDING***

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**Information must submit to gain order:**

1. Product Name
2. Brand Name
3. Grade

4. Country of origin
5. Price
6. Data Sheet
7. Sample
8. LC/TT
9. Delivery time

To gain order an indenter must inform above information to their clients. Local firms put a lots of emphasize on price, data sheet and products country of origin.

My first day at office, I was told to visit Mr. Rabiul-Asst. manager of Pran Group. I met him at their office and talked with for a long time about PET Resin. I offered him a variety of brand of PET Resin from different country. Those brands were Tex Pet, Sin Pet, Jade, Seviac, Optel, Hiaxe, Landly etc. Most of this product's origin is from China but he was interested in Indonesian brand. Suppliers from Indonesia want TT rather than LC and local buyers are not interested in TT as there is a huge risk of loss. Mr. Rabiul clearly informed me they do not accept Chines product because there machine cannot process chines resin. However, I stopped communicating with them because I thought we cannot do business with Pran Group.

Later I visited City Group and talked with Mr. Hifzur Rahman-junior executive. I informed him about our products. I came to know from Mr. Hifzur Rahman that currently they are purchasing Resin from "Seviac" which is a Saudi Arabian brand. If I want to sell Resin to them first I have to submit Data Sheet of the particular brand. They will test does it match with their machine or not. Later I have to provide a bag of Resin as a sample and if it passes the test they will gave us the contract.

I also visited Meghna Group, Akij Group, Hatim Hroup, Transcom and Hope Packaging ltd. All of them follow the same process as City Group.

SaleBridge Corporation is one the leading television importers in our country. Currently they are diversifying their business in plastic and metal market. Working there gave me an oppportunity to learn about metal market also.

I have visited Rahim Steel Mills and talked with MR. Mohammad Ali- Managing Director. Their requirement is melt able scrub, HR Coil, CR Coil & SS Slit Coil. They purchase 1000-2000 metric ton of product every month. I asked him whether he has a choice about raw materials country of origin or not. He told me, "I want quality products at a low price and I do not care from where you will provide it". He also informed me currently they are purchasing from England, Middle East and Spain. He does not have a good experience importing from China but if I can ensure him the quality he will import from China.

I also visited Haji Islam Group and Talked with Mr. M.A. Kader-GM. Their requirement is also the same as Rahim Steel Mills. Worldwide the price of metal is same and currently they are importing from “China Metal Corporation”. If I can import quality raw materials for them from China he will accept it. They do not import mother Coil rather they import only slit prime coil.

I also visited Kai Aluminium and talked with Mr. Shah Raihan. Their requirement is aluminium ingot and they import it at a bulk quantity. They prefer 92% of purity and do not accept secondary aluminium ingot and it is really difficult to judge whether it is primary or secondary ingot. Previously they have imported aluminium ingot from China and faces a lots of difficulty and loss because supplier export them secondary aluminium ingot. Now he is not interested to import from China.

I also visited Dhaka Thai Limited and talked with Ms. Fatema Shimul-in charge import. Their requirement is also aluminium ingot with a 92% of purity and only accept primary ingot. Currently they are importing from China and they do not have any problem to continue their business with them.

### Conclusion:

We all have a generalized idea that China cannot make standard product and their people do not keep their promise. It is not always true. Our local managers often face difficulties managing them because most of the indenters do not select suppliers carefully.

In plastic industries managers do not bother about raw materials country of origin. They think whether their machine can process the raw material or not. For example, when I talked with the GM of Meghna Group about PET Resin’s country of origin he replied me, “our machine can process only raw materials of TEX PET, SINPET and OPTEL and we do not accept any other product.” Based on his information and other managers whom I have talked, I can draw a conclusion that while purchasing raw materials managers do not think about country of origin. They only think is it going to suit with their machine or not.

Metal industries maintain the same price worldwide. From anywhere you want to import raw materials the price and quality will be same. But some managers have bad experience dealing with Chinese suppliers. Again I will say it is not the mother company who sell low quality of products. It is the agents who cheat with local companies.

Always we have to be sincere about choosing right supplier. No matter which you are importing from choosing the right supplier is the key to be successful in indenting business.

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