CHAPTER – 3 PRESENTATION OF THE SAMPLED UNITS

General Profile of the Sampled Units. (Investment Casting Units in Bhavnagar Region)

Winning companies know that people make the difference. It is winning people who create winning companies.

The pace of change in the field of HR is high. There are three factors that particularly drive the theory and practice forward: the dynamics of the job market, the employment environment in large and medium sized employers and the legislative framework. In the past five years there has been a transformation in the job market. There is a desperate shortage of certain skills. This has driven up pay levels and torn apart many of the established conventions about remuneration management. There has also been a major shift away from conventional full-time employment; more people in the work-force than ever are not in full-time, permanent employment. Opportunities for self-employment, part-time employment and temporary work have all had an impact on the reward strategies and policies of larger employers who can no longer offer the job security of the past.

There has also been upheaval within organizations. This has changed the nature of many jobs and has also transformed the environment of work. Remuneration policies and practices have had to become more flexible and adaptive. We have seen tremendous growth in performance related remuneration, the adoption of policies which encompass rewards for competency development and the return of team-based pay.

As the Indian economy becomes increasingly attractive to foreign investors, multinational corporations find themselves focusing more and more upon effective human resource management. International human resource managers
dealing with India must be able to attract, motivate and retain appropriate talent, all the while expressing the corporation’s overall global human resource management philosophy within the complexities of the local laws and local market practices. As a result, it is important to gain an understanding and appreciation of the models and practices within India, and the rationale behind their origin and prevalence in the country.

Whilst an employee works not only for monetary compensation, the financial consideration does constitute a very important reason for his working. Various methods of compensation have been evolved over a period of time, more particularly with a view to motivate the worker or employee concerned.

Organizations need to be performance oriented to be competitive. Acquiring competent employees is not enough to exert high performance unless they are motivated enough to deliver the results. It is desirable to have innovative practices keeping in view the changing employee need and expectations.

Organizations are beginning to understand that pay should no longer be considered only in terms of specific jobs and current financial results. Compensation must inextricably be tied to people, their performance and the organizational vision and values that their performance supports. It is an important tool for communicating and reinforcing new values and behaviours, supporting accountability for results and rewarding the achievement of new performance goals.

To reward effectively, it is important to understand the political and socioeconomic environment and its impact on human resource management processes and practices.
We take the examples of two important industries, TAMBOLI CASTINGS LIMITED (TCL) and INVESTMENT & PRECISION CASTINGS LTD (I&PCL), in Bhavnagar, to see how performance related pay is being practiced in an industry.

3.1 Introduction

Investment Casting is among the most ancient of metal-crafting arts; conversely, it is among the most modern.

3.1.1 WHAT IS AN “INVESTMENT CASTING

The process of Investment Casting can be traced back to the early dynasties of India and China where artisans cast intricately detailed Natraja statues and boxes from bronze to contain the masters’ treasures.

Investment Casting, also known as The Lost Wax Process, has been practised for thousand of years, with lost wax process being one of the oldest known metal forming techniques. From 5000 years ago, when bees wax formed the pattern, to today’s high technology waxes, refractory materials and specialist alloys, the castings ensure high quality components are produced with the key benefits of accuracy, repeatability, versatility and integrity. The “Lost Wax” Investment Casting method was used by an Italian monk some 900 years ago to craft large statues. The monk’s process was very similar to those used in Investment Casting today; the original model was sculpted in wax then coated with successive layers of plaster. After the plaster hardened, the wax melted out and molten metal was cast into the void. A short time later, after the metal cooled and hardened, the plaster was broken away and there stood the statue; an exact replica of the original wax sculpture!
For many centuries, jewelers used rubber molds to cast quantities of rings and bracelets, and during the late 19th century, dentists were using Investment Casting processes to manufacture dental fillings and inlays. The cross-cultural adoption of this complex process implies a great degree of commerce and communication in antiquity.

Industry realized the need for Investment Casting at the beginning of World War II with the sudden increase in demand for large quantities of intricately machined armament and aircraft parts. Manufacturers found that the “Lost Wax” process of casting these parts virtually eliminated all but the closest machining operations; thereby increasing their ability to produce critical items such as turbine blades, gun parts, etc. at the fraction of their original costs. Knowledge gained from the dental trade was combined with the permanent die techniques perfected by jewelers to produce critical items in unbelievable quantities.

Investment Castings are utilized today in virtually every industry where production quantities of metal parts are required. Furthermore, Investment Castings are now obtainable for prototype quantities of complex devices such as electronic housings, microwave components and subassemblies; without the necessity of producing the permanent dies to cast these devices.

3.1.2 PROCESS OF INVESTMENT CASTING

There is some confusion about the word “Investment Casting”. Some think that this has something to do with finance or investing. This is not so. The Investment Casting process is explained below:
3.1.2.1 THE PRODUCTION FLOW

Step 1

**Drawing:** On receipt of an order, along with drawings, the Engineering department designs the tooling for wax pattern. Product drawing is prepared with the help of CAD, based on the customer's drawing; the tools/dies are developed from steel or aluminium material.

Step 2

**Tool Making:** A tool maker builds a precision die to make wax replicas of the part called patterns. Before starting the casting process, the injunction die is constructed to produce wax patterns. This tool is constructed from Aluminium or Steel material, for most applications, single/multi cavity dies are used for high production quantities.

Step 3:

**Pattern Injection:** The process begins with production of a wax pattern. This pattern is made by injecting wax into a metal die. These dies may range from a simple, hand operation single cavity tool to a fully automated multi-cavity tool, depending on production quantities and complexity of the part.

These patterns have exact geometry of the required finished part, but they are made slightly larger, to compensate for volumetric shrinkage (a) in the pattern production stage and (b) during solidification of metal in the ceramic mold.

The pattern has one or more gates which are usually located at the heaviest casting section. The gates have following functions:

- to attach patterns to the tree, forming a cluster;
to provide a passage for draining out pattern material as it melts upon heating;
- guide molten metal entering the mold cavity in the casting operation;
- to ensure a sound part by feeding the casting during solidification.

Step 4

**Assembly Making:** Produced wax pattern from single cavity or multi-cavity tools are assembled on wax runners with wax made pouring cup, tie-bar, to form a cluster. The number of patterns are assembled per cluster varies, dependent upon the size, weight and configuration of a given part.

Step 5

**Ceramic Coating:** The Ceramic Shell making technique involves dipping the entire cluster into ceramic slurry (wet dip with refractory grains, called “Stucco”), draining it, and then coating it with fine ceramic sand. After drying, this process is repeated again and again until an adequate, self-supporting shell is formed. The process of surrounding the Wax Assembly with refractory materials is called “Investing” in old English, which gives the process the name of “Investment Casting” process. A casting made through this process is called an “Investment Casting”.

The temperature and humidity is controlled in this room, to allow for proper drying of the ceramic coating.

Step 6

**Dewaxing:** The coated cluster is then placed in a steam autoclave where the pattern melts and runs out through the gates, runners and pouring cup. This leaves a ceramic shell containing cavities of the casting-shape desired.
As the wax thus gets removed, and in the past was “lost” by burning off, this process of casting is also called the “Lost Wax Process”.

Step 7

**Shell Baking:** After the wax has been melted out of the ceramic shell, it is placed in the oven to heat the shell, and to allow all impurities to be removed from the shell. The shell is pulled from the oven just prior to the molten metal being poured into it.

Step 8

**Pouring:** Induction melting units are used to melt the Alloy. Having melted and de-glassed the molten metal, the pre-heated shell is filled to the required level and left to solidify.

Step 9

**Knock out:** Once the metal has had an opportunity to solidify, the ceramic shell is knocked off and the parts are cut off the tree.

Step 10

**Cutting:** The individual parts are then cut-off from the runner with the help of welding machine or cut-off machine.

The cutting process can be classified into three types:

A) Disc cutting
B) Gas cutting
C) Arc cutting

Step 11
Gate Grinding: The gates are ground to the desired dimensions. Gate grinding is of two types:

A) Belt
B) Swing

Step 12

Heat Treatment: The desired heat treatment is provided like – A battery of Electric Muffle, Salt Bath, Gas Carburizing, Sursulf and Forced Air Circulation and Sursulf Furnaces, for a variety of heat-treatment operations like normalizing, annealing, stress relieving, oil quenching, water quenching, tempering, etc. with arrangements for automatic temperature recording.

Step 13

Machining: In the machining process, dimensions of parts are adjusted to the original design.

Inspection: After the final surface preparation parts are inspected to guarantee that it meets the specification and customer requirement.

3.2 Profile of the Sampled Units

3.2.1 TAMBOLI CASTINGS LIMITED (TCL)

TAMBOLI CASTINGS LIMITED (TCL) was set up in 2004 by INVESTMENT & PRECISION CASTINGS LIMITED (I&PCL) as a fully owned subsidiary and a 100% Export oriented company, with World Class Manufacturing & Quality Control facilities.
The Factory, situated in Bhavnagar (GUJARAT) has a high degree of automation and state-of-the-art facilities to produce complex Investment Castings.

TCL is the first Investment Casting Facility in INDIA to have Robotic Ceramic Coating for its Shell Room. They invested in Automation for QUALITY only and not for reduction of Man-power.

Breaking out of the traditional practice that foundries only provide OEM castings, TCL has created the new concept whose core is to offer solutions, terminal casting parts and customer services so as to secure a position in the top-end markets with the improvement of its added value of products as its core competitiveness. So far, over 3,000 kinds of products have been developed and produced to meet the needs at home as well as abroad, including over 30 countries such as USA, Germany, Japan, Spain, Italy, UK, France, Australia and Canada.

The company has built a solid reputation for high quality, cost effective solutions to the most stringent engineering demands, encouraging close collaboration throughout design and manufacturing stages, ensuring maximization of the benefits of the Investment Casting Process. The foundry is well known for the development and manufacturing of complex and critical casting components.

The company has set it as its strategic object that it will lead the industry and cast core competitiveness and core value in this industry. It sticks to the business philosophy that it starts from the need of customers and ends with the satisfaction of theirs; that it regards customers as its center and transcends their expectations.
3.2.1.1 TECHNOLOGY LEADERSHIP

TCL has in-house facilities for making complex ceramic cores, CNC Machining, electro-polishing and dedicated ancillaries for electro plating, thus enabling the company to supply fully machined and ready for use components, at competitive prices.

It has the capability to supply fully machined, ready-to-assemble parts, especially to the Automotive Industry.

TCL has adopted the modern enterprise management to achieve its standardization, routinization and delicacy in management and implemented completely the ISO9001:2000 quality management system. Meanwhile, by making an effective improvement of software and hardware and advocating ISO14000 management system in environmental protection, OHSAS 18001 management system in vocational health and safety and SA8000 management system in social accountability, the company tries to gain a win-win situation for its performance and social benefits.

TCL has received the following Quality Certifications from TUV NORD, Germany.

ISO 9001 : 2000
ISO 14001:2004
OHSAS 18001:2007
SA: 8000 (by the end of 2010)

TCL implemented an Occupational Health and Safety Management System (OHSMS) as part of their risk management strategy to address the changing legislation and protect their workforce.
TCL promotes a safe and healthy working environment by providing a framework to consistently identify and control its health and safety risks, reduce the potential for accidents, aid legislative compliance and improve overall performance.

**The following key areas are addressed by TCL under OHSAS**

- Hazard identification, risk assessment and determining controls
- Legal and other requirements
- Objectives and OHS program(s)
- Resources, roles, responsibility, accountability and authority
- Competence, training and awareness
- Communication, participation and consultation
- Operational control
- Emergency preparedness and response
- Performance measuring, monitoring and improvement

### 3.2.2 PRODUCTS

Investment Castings manufactured by Lost-Wax and other processes, in Ferrous, Non-Ferrous, Nickel base and Cobalt base alloys, of piece weight upto 150 Kg, the highest in India. Fully machined, treated and ready-for-use components supplied.

### 3.2.3 INDUSTRIES CATERED TO:

3.2.4 CUSTOMER SATISFACTION

TCL specializes in satisfied customers. It stays ahead of its competition by providing the right product at the right price at the right time – every time.

It works together with its customers to fully understand their business. From application engineering through product delivery, expert superior service from its technical sales people, engineering and production staff.

In addition to its superior quality and delivery, it offers one more very valuable commodity, Time. Once in the hands of TCL team, one can be rest assured their product will be delivered on time with quality unsurpassed in the industry.

3.2.5 ETHICS

TCL's culture is grounded in integrity and respect. At TCL it means adhering to the highest standards of ethical business culture, and its reputation for adhering to these standards is one of the most valuable assets. It stands by everything it does.

TCL does not tolerate behaviour that is not fair and ethical, and all employees are required to comply with these standards and with applicable local, state and in-country laws.

3.2.6 OUTSOURCING HUB FOR GLOBAL CORPORATIONS:

To cut costs, the global automotive industry is looking to find a source for low-cost, high-quality components. India is turning to be a quality low cost sourcing base. Leading global auto majors have chalked out aggressive outsourcing plans from India. For instance, Delphi Corporation, the world's largest automotive parts maker plans to outsource US $140million of auto parts - forged engine parts, intricate plastic mouldings and other products. The Ford Motor Company expects to outsource more than $100 million
worth of components from Indian parts makers in the next two years. Volvo is to increase the manufacturing in India to US $ 117 million worth of parts.

Industry sources believe that there is immensely potential for Indian to increase its market share of auto component/ forging/casting outsourcing, which stands at 0.1% of the US $ 1 trillion industry. Even other smaller countries like Brazil and Mexico that are established low-cost and quality manufacturing destination have much larger market share.

3.2.7 STRONG FOOTHOLD IN OVERSEAS MARKET:

TCL has gained considerable exposure and experience in International quality standards and requirements of castings by supplying to customers in countries like Japan, Austria, Canada, Spain, Australia, UK, USA, Germany, etc. The company currently derives 44% of its revenues from export markets. A geographically well-diversified client base insulates the company from sudden downturn in any particular market.

3.2.8 CAPACITY EXPANSION:

To cater to the growing demand from domestic as well as overseas customers, TCL has increased its production capacity to 500 MT, up from 400 MT last fiscal. This is being enhanced further to 600 MT, which is expected to be commissioned in March 2009. Apart from ramp up the installed capacities, the company is investing in strengthening its in-house research & development (R&D) facilities.

TCL aims to be world class, committed to customer satisfaction and to encourage the spirit of leadership amongst our dedicated team by creating a healthy environment for continuous growth, profit and prosperity.
3.3 INVESTMENT & PRECISION CASTINGS LIMITED (I&PCL)

I&PCL is a leader in the Investment Casting Industry offering products such as precision castings, ferrous and non-ferrous investment castings since 1975. They also make castings by Block mould process (BM). It is dedicated to the fast and efficient production of quality parts and has an impeccable reputation for worldwide delivery and competitive-pricing. It has focused on providing excellent customer service with a solution to virtually any obstacle while still offering low-cost products.

As a pioneer, I&PCL had to struggle a lot to impart customer awareness and create a market for Investment Castings in India. This process was then unknown to the Indian market. A lot of Application Engineering efforts were involved in educating industries in India to switch over to Investment Castings from the traditional Forging, Sand Castings and Shell Moulded Castings.

They entered into a Technical Collaboration with M/s. Arwood International, USA in June 1975. After its expiry in April 1983, they signed a Technical Collaboration Agreement with M/s. Furstlich Hohenzollersche Huttenverwaltung, (Zollern Group), Germany, who is well known in Europe for Investment Castings. They then signed a Technical Licence Agreement with Associated Foundries Engineering Co Ltd, Japan in December 1987, relating to producing large piece weight Investment Castings.

With the knowledge and experience gained through the above collaborations, and reinforced by in-house Research & Development, I&PCL is today a technology leader in the industry, handling the widest range of material specifications and piece weights.

With additional technologies acquired and developed for making Ceramic Cores and Ceramic Block Moulds, the Company is now capable of
producing castings upto a piece weight of 150Kg each, the highest in India.

I&PCL is a fully equipped Investment Casting Foundry with conventional machining facilities and State of Art CNC Machine Shop. It supplies fully machined ready to use parts to automotive and other customers.

I&PCL is a professionally managed Company historically. It has clear cut systems, procedures and delegation of authority & responsibility across Company’s organization structure. Being quality conscious, it is one of the first Investment Casting Foundries to get ISO/TS 16949 Quality Certification in India.

In an industry that is decades old, it believes in keeping ahead of its competition that can only be accomplished by expertise and advanced technology. I&PCL has the expertise and is dedicated to keeping abreast of the newest technology the industry has to offer.

3.3.1 TECHNOLOGY AT I&PCL

- I&PCL constantly improves its production method and re-equip where required to keep up with the latest technological developments. As a matter of fact, it has been constantly opening bottle necks in production to match market requirements.
- Over the years, I&PCL acquired considerable experience in the manufacturing of complex Castings requiring the use of: soluble waxes and Ceramic cores.
- The Ceramic Shell mould production is strictly controlled in a fully conditioned environment (Temperature and Humidity)
Metallurgical quality and mechanical properties are ensured by systematical inspection of each melt by controlled heat treatments in modern installments.

### 3.3.2 QUALITY CONTROL

I&PCL works to ISO 9002 requirements-standards of excellence that are recognized around the world. The foundry has been accredited by ISO-9002 certification since 1994. They have also achieved QS 9000 certification.

I&PCL covers all quality levels. Raw materials, manufacturing techniques and equipment are constantly monitored. Their strict quality control ensures the high standard which contributes to their international reputation as a source of precision castings and components.

At I&PCL, quality of the end-product and its cost effectiveness comes automatically ‘from within’ reflecting the standards attained wholesomely by their set-up itself. It exists not only because of what they do but because of how they do. They believe in the slogan: “Do it once, Do it right”.