



Management Project

Mold & Co in China

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Introduction

This document describes all aspects of the ChineseTooth project which the main goal is to install IT systems around the new production line in the eco-city of Taijin. This project includes a social and ecological aspect in order to fit to the requirements of Taijin city guidelines.

In this document, we describe what are the goals, the processes, the planning and the risk of such deployment in China.

Project description

The main goal is to install a toothbrush production line in the eco-city of Taijin in China. Our company is working for MOLD & Co. to make this production line a reality.

Our main guidelines in this project is to install a production line that can produce a great amount of toothbrushes within an eco-city. This project needs to be respectful of the surrounding environment and social aspects of the project's stakeholders.

2.1 Specifications

This project has to achieve the following specifications.

The production line must contain all the required machines to automate the production of toothbrushes. These machines include moulting machine, stamping machine, tufting machine, bristle cutter machine, bristle trimming machine and Packaging machine. These machines need to be bought and connected to each other in order to build the full product.

To connect all the machines in the assembly line, the project requires also a full digital connection to an internal network. This network groups all connected machines and database servers to store monitoring informations about the production. These informations need to represent the current production, the past production and potential errors in the production line.

The production line is fully automated through this network and the production is regulated to produce exactly what is needed. This automation brings many advantages including the environmental impact reduction, reduction of the storage requirement of finished products and 24/7 production in case of huge demand.

The informations collected need to be displayed to the employees in charge of the production line. These informations are displayed through an interface reading the monitoring data from the database. A master server has to be installed in order to control all machines and to control the production flow.

Several materials are required to produce toothbrushes. These materials are plastic, nylon, brass wire, paper box packing, plastic hard container packaging, high frequency blister packaging and Blister card packaging. The project must include a storage space for all these materials and human resources to load the resources in the appropriate machines.

All the production line machines, storage and digital network requires engineering the organisation of all these components depending on the space available and the shape of the building. Engineering human resources are required to create, configure and install monitoring system. Human resources may also be required to manipulate machines, connect

each machine to the other and install network.

2.2 Forces

The forces of the project are mainly focused on the high efficiency of the production line. This high efficiency is guaranteed by the monitoring system and the automatic management of the amount of product produced on the assembly line. This project represents a great opportunity to modernize the production of MOLD & Co. and automate the assembly line. By automating the assembly line, MOLD & Co. gain a lot of money on storage of manufactured products and human resources.

2.3 Weaknesses

This project have also small weakness that may have an impact on risks (Risk management will be covered in the section 6).

The main weakness are the important amount of advanced technologies that requires a great amount of high qualified employees in charge of the installing and maintaining the autonomous system of the assembly line. Another weakness is the requirement of heavy and pricy machines that can represent a major part of the project's costs.

2.4 Social & Environmental guidelines

As our project takes place in the eco-city of Tianjin, it must include proper social and environmental guidelines. These are guidelines and must be evaluated during the project to qualify if these are possible to set up with MOLD & Co. budget.

2.4.1 Social engagement for project human resources

These guidelines includes social engagements for the well being of employees and human resources during the project.

Working hours For employeee better productivity, it could be good to restrict to 8 hours the day of work to complete a full week withing 44 hours. We must audit reguarly our employees about their opinion and well-being within the company through feedbacks.

Human rights and equity Our project must respect the human rights about children labor or unpaid employees. These are forbidden. Finally, our employees salary musn't depend on genre, race or physical ability.

Health Thus, our project is about health product. We must establish health requirements to reduce bacterial or viruses risks during toothbrushes production. We must include protection against noise and injury risks on the production line. That include collective equipments like protective foam, barrier, etc. But also personal equipment like hear protections, gloves, etc. And we could give an introduction to the handling of machines for all employees to avoid injuries.

2.4.2 Environmental guidelines

Waste and recycling We must establish a plan and write good practices about material waste in order to reduce our waste that have a huge environmental impact. Our automation system must optimise production in order to reduce waste. We could also collect rainwater in order to use it in bathrooms or for floor washing.

Efficiency We could invest in machines that are more profitable and resource-efficient to reduce the resources required to get the assembly line working. Moreover, it could be good to progressively invest in renewable energy in order to reduce our energy-related environmental impact. This includes solar panels, wind turbines or heat pumps that can be installed outside of the building or on employees parking.

Building optimizations The whole building could include some automations to reduce environmental impact and reduce energy waste. These automations includes auto-switch lights and computers when there are not used.

Machine repairs To reduce environmental impact and keep our machines as long as possible, it's possible to introduce a repair culture during the project and after. This repair guidelines include buying repairable machines, recycle spare parts of defective machines and train employees about machine repair.

Delivery guidelines Delivery is a huge part of our environmental impact. To reduce this environmental impact, we could group most of our delivery to reduce waste of space in polluting transports like trucks. We could also promote rail transport over truck transport. This transport method are way less polluting but more expensive. But High-speed train are developing in china and it could be reduced in the future.

2.5 Local investments & suppliers

Local investment It could be good, to participate in local project of Tainin. This investments could represent a good opportunity to communicate of the green engagement of MOLD & Co..

suppliers guidelines MOLD & Co. must audit it's suppliers in order to evaluate there social and environmental impact and be sure they fits with our own requirements.

Local implication Our factory is in a city and MOLD & Co. must communicate with local authorities about what it's happening in the factory. Local authorities include Tanjin City Hall and People's Republic of China government. MOLD & Co. must inform authorities about environmental risks and how we will manage in such case. We also require to be informed about local chinese health and sanitary requiremet in order to be consistent with it.

Actors and Stakeholders

We have assembled all the actors of the project in a clear and precise way in order to identify them. You will first find the different actors who have an impact on the project. Secondly, the stakeholders and their position in the project. Finally, the teams that need to be set up.

3.1 Actors impacting the project

You will find below a table containing all the actors having an impact on the project. All the stakeholders were identified and analysed according to the client's needs by the Cesi conseil team.

There are four columns :

Name : it is the name of the actor and stakeholder.

External or Internal to MOLD & Co. companie : The actor in question is internal or external to MOLD & Co.. This is its positioning within the project.

State : what type of domain is the actor affiliated.

Influence level : this is the level of importance of the actor in the project.

Name	External or internal	Status	Influence level
Mold and Co - HR department	Internal	Supervision	Important
Mold and Co - Production department	Internal	Manufacturation	Important
Mold and Co's direction	Internal	Client	Important
Cesi conseil	External	Provider	Important
Mold and Co's - It department	Internal	Supervision	Medium
Mold and Co's - Maintenance department	Internal	Supervision	Medium
Mold and Co's - Logistic department	Internal	Supervision	Medium
Tianjin city hall	External	Notice of construction	Important
People's Republic of China government	External	Supervision	Important
Suppliers	External	Supply	Important

Figure 1 – Table of stakeholders

3.2 Setting up teams

Following the stakeholder analysis for this project, we set up teams to maximize the company's production and meet the Chinese company's standards.

These are three teams distributed as a service to ensure the proper functioning of the company Chinetooth.

Name	Objective	influence level
Human Resource department	Recruit new employees, retain them and develop their skills.	Important
Engineering department	Conception, resource planning, scheduling, recording and traceability of production activities	Important
Assembly line installation department	storage and installation of machines	Important

Figure 2 – Table of teams working on the project

Human resource department :will help to maintain a stable workforce over the long term.

Engineering department :its objective is to continuously improve the management of flows and stocks included in the work chain that begins with suppliers and ends with intermediate or end customers. There are three engineer department, one for machine, second for network and the last for industrie 5.0.

Assembly line installation department : the role of the marketing department is to define a company's strategy by proposing products and services that will promote the development and sustainability of Mold & Co. There are three teams, one for resource installation, second for network installation and the last for IoT installation.

Project planning

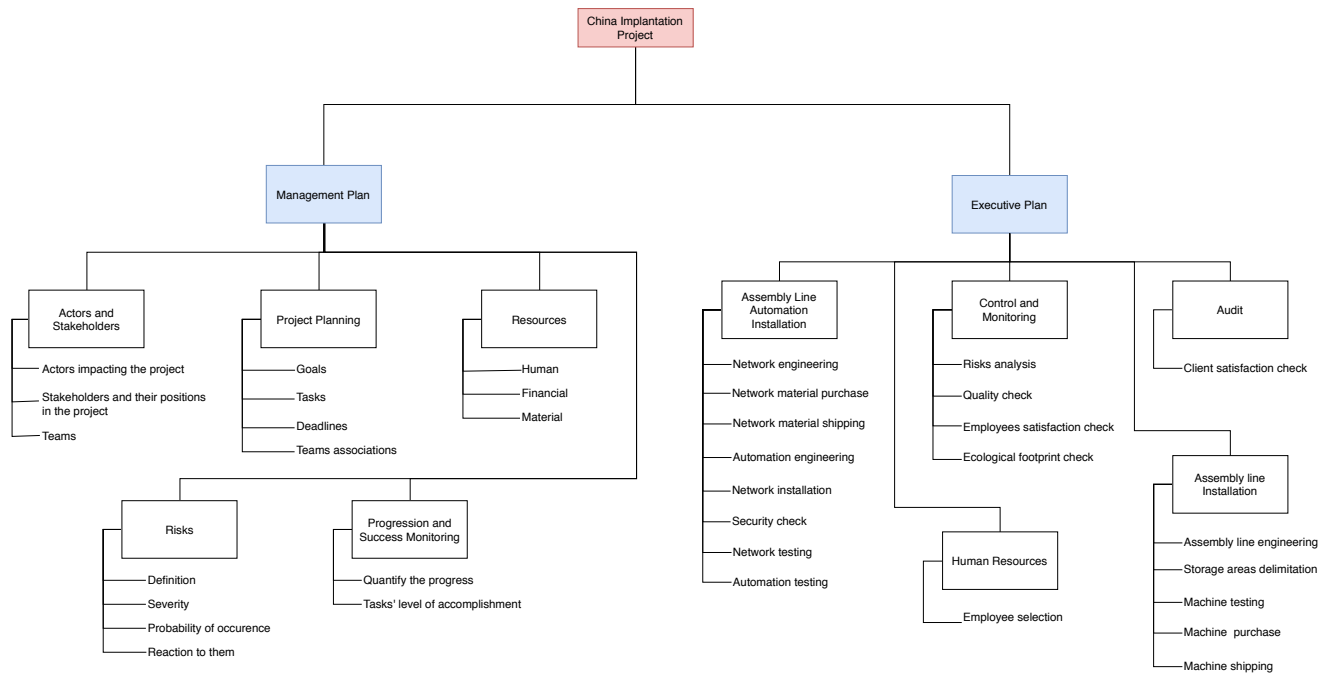


Figure 3 – Work Breakdown Structure of the project

4.1 Tasks

Required resources

5.1 Human cost

The human cost we analyze represents the amount of work in days and the remuneration of everyone involved in the realization of, based on our project planning, the two parts (the initial part with the management plan, and the executive plan with the installation and monitoring of one assembly line, and the formation of the employees to the handling of the machines). The costs are based on the total number of days of work, the persons involved, and the average price cost of the employees which you can see in this table.

Senior Engineer (french)	35 000€/year
Junior Engineer (french)	20 000€/year
Senior Engineer (local)	26 000€/year
Junior Engineer (local)	13 000€/year
Technician (french) -includes travel and cost of living	6 500€/week
Technician (local)	300€/week

Figure 4 – Average employee cost

To calculate the cost we used the working rules in France and China :

- In France : 35 hours of work per week and 272 days of work per year.
- In China : 40 hours of work per week and an average of 345 days of work per year.

The next table will present the different type of actors (employees) of this project and how much they are paid per hour according to the average employee cost of the previous table and the working rules for each country.

Title	Cost	Cost per hour (according to the working rights of the associated country)
Senior Engineer (french)	35 000€/year	18,38€/hour
Junior Engineer (french)	20 000€/year	10,5€/hour
Senior Engineer (local)	26 000€/year	9,42€/hour
Junior Engineer (local)	13 000€/year	4,71€/hour
Technician (local)	300€/week	7,5€/hour

Figure 5 – Average employee costs per hour

With this data, we now analyze the number and type of the actors of each part and calculate the total cost.

5.1.1 Initial part

The initial part took place during 4 days and involved a team of five french engineers, one leader senior engineer and four junior engineers. The cost is calculated according to the french working rule of 35 hours of work a week, so 7 hours a day.

Actors	Unit Cost for 4 days	Total Cost for 4 days
1 Senior Engineer (french)	514,64 €	514,64 €
4 Junior Engineers (french)	1 176,00 €	4 704 €
		TOTAL : 5 218,64 €

Figure 6 – Initial part cost

5.1.2 Executive part

According to the gantt diagram, the executive part is 102 days long, minus 80 days of equipment shipping (twice 40 days), it represents 22 days of work. During these 22 days, 7 chinese engineers and 10 chinese technicians/regular employees (counted as technicians), as you can see here, we estimated these numbers while partitionning the executive part (installation and monitoring/control) in different tasks.

Tasks	Number of engineers	Number of technicians/employees
Assembly line automation and Network	3 senior engineers - 1 junior engineer	3 technicians - 1 employee
Control and Monitoring	1 senior engineer - 1 junior engineer	X
Human Resources	X	1 employee
Assembly line installation	1 senior engineer	4 technicians - 1 employee
TOTAL : 7 engineers		TOTAL : 10 technicians/employees

Figure 7 – Number of employees for the executive part

The cost is calculated according to the chinese working rule of an average of 40 hours of work a week, so 8 hours a day.

Actors	Unit Cost for 22 days	Total Cost for 22 days
5 Senior Engineers (local)	1 657,92 €	8 289,60 €
2 Junior Engineers (local)	828,96 €	1 657,92 €
10 technicians (local)	1 320 €	13 200 €
		TOTAL : 23 147,52 €

Figure 8 – Executive part cost

5.1.3 Formation

The 17 employees involved in the executive part need to be taught how an assembly line works, how to handle the machines, how they work and also their security rules.

We estimated the cost of such a formation of 3000 euros per person (a total of 51 000 euros for the 17 employees) and 5 days, also counted as 5 days of works for them.

Actors	Unit Cost for 5 days	Total Cost for 5 days
5 Senior Engineers (local)	376,80 €	1 884,00 €
2 Junior Engineers (local)	188,40 €	376,80 €
10 technicians (local)	300 €	3 000 €
		TOTAL (+ 51 000 €) : 56 260,80 €

Figure 9 – Formation cost

With these three parts, we reach a total human cost of **84 626.96 euros**.

5.2 Material cost

This cost is about every material directly used in one assembly line and its cost. Our assembly line will include :

- Handle molds, to make the brush handle (an average of 2 per injection machine).
- An injection machine, to mold the shape of the toothbrushes.
- A tufting machin to tuft on brush holders.
- A trimming and end rounding machine to cut and shape the bristles to the manufacturers specification, and to round them to be softer and more comfortable to the teeth.
- A fully automated packaging machine to pack the toothbrushes.
- And of course conveyers belt which will link these machines together. We estimated an average of 4 meters between machines, so we would need around 16 meters of it.

All of it would be around 30 square meters.

We have access to two types of injection machines, a 50T and a 80T, which means it is a 50/80 ton servo-motor operated machine, the maximum clamping force with these machines is either 50 or 80 tons. Servo-motors are used for energy saving, so these machines give the highest energy saving in hydraulic machines. In this estimation we chose the 80T injection machine for a better energy saving.

To calculate the total cost, we used this table of average prices.

Handle Mold	8 000€/piece
Injection Machine : 80T	45 000€/machine
Injection Machine : 50T	30 000€/machine
Tufting Machine	20 000€/machine
Trimming and End Rounding Machine	25 000€/machine
Fully Automated Packaging Machine	60 000€/machine
Conveyer Belts	1 000€/meter
Electrical/Hydraulic/Water Costs	3 000€/post

Figure 10 – Average machine costs

We have 5 machines in our assembly line. We decided, for the electrical/hydraulic/water costs, that there will be a maximum of 3 machines by post, so 2 posts for one assembly line, which will cost 6 000 euros.

Machines	Cost
Handle molds (2)	16 000 €
Injection machine (80T)	45 000 €
Tufting machine	20 000 €
Trimming and end rounding machine	25 000 €
Packaging machine	60 000 €
Conveyers belt (16 m)	16 000 €
TOTAL (+ 6000 €) : 188 000 €	

Figure 11 – Machines costs for one assembly line

So, the total machine cost for one assembly line is **188 000 euros**.

We reach a total estimation cost of **272 626.96 euros** with both the human cost and the machine cost.

Risks management

Indicators of progression and success

The planning and development of the installation of toothbrush production line in the eco-city of Taijin in China is guided by a comprehensive set of Key Performance Indicators (KPIs) covering its ecological, economic and social development.

There are seven quantitatives and three qualitatives KPIs.

7.1 Quantitatives KPIs

Developing a Dynamic and Efficient Economy

Use of renewable resources : using recycled resources to save money by 40%.

Control the production : Production control to avoid overproduction, which can be costly in terms of storage and resources.

Transportation : Use intelligent way of transportation in order to save money by 60%.

Client satisfaction : Gather user feedback to improve the product.

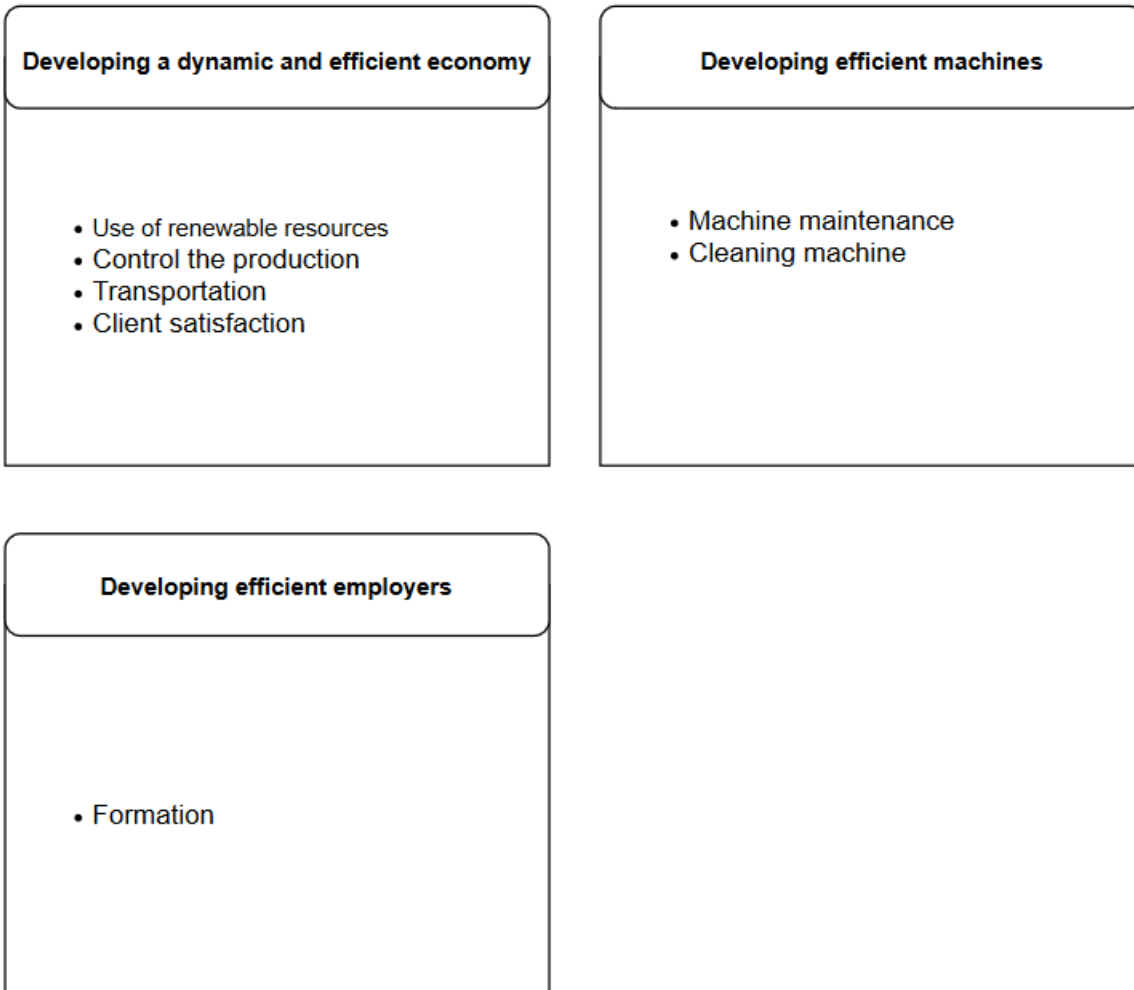
Developing efficient machines

Maintenance machine : machines must be operational at least 99% of the time.

Cleaning machine : the machines must not know any dirt that may impact the quality of the product.

Developing efficient employers

Formation : In order to improve the quality and productivity of employees by 70%.



Qualitative KPIs

- Maintain quality and safe production through careful monitoring of machines and production.
- Adopt safety policies for employees that will promote their well-being and the smooth running of production.
- Maintain the most eco-responsible production line by following the environmental standards in the factory.

Conclusion