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SUMMARY

My intership in Ankara Temelli OSB plant. I worked produce plastic material in Arangül Plastic. There are 3 factories in the industrial zone. There are 2 factories side by side other factory is different name Unisera Factory. This factory exist for overseas business but all of product produce by Arangül factory. Factory vocation is outside the city but factory zone is large. Especially, transportation is a good an easy zone for transport vehicles. The factory started to dat 8.00 am lunch is 12.00 am and end of the day is 18.00pm. We produce plastic water fragment, PP compression fittings, PP ball valve, PP compression valve, PP flanged adaptor, clampe saddle, valve boxes, and dripline fittings. This product maked injection machine and CNC machine. There is a 700 different molds.

There are much more injection machine. There two different injection machines. Automatic injection machine and manuel injection. I learn two type injection machine. Automatic injection machine do everything on his own. Manuel machine the operators has to open and closed. CNC machine is maked to molds. I learn intership 1 write to system parameters and machine worked principle. I think injection machine worked to principle is basic. Valf is pulling the raw material into it. Raw material is two different types. First raw material is polypropylene other raw material is the plastic part of the produced part. The machine takes this raw material, it presses it with the shaft. We write to system parameters. This parameters is important. Finally, presses the shaft and products is over but produced products cooled in the machine. I learn injection machine. My intership 1 worked machine but sometimes 1 prefer 1 went to production planning. I did similar things for 20 days.



Figure:1

ABOUT THE FACTORY

Company name Arangül Plastik Ticaret Limited Şirketi. My first summer training work Arangül Plastic. Arangül plastic was founded in 1970. First location is Ankara İvedik Organize Sanayi after that transfer to Sincan Organize Sanayi in 2013. This location develop to industry. The company continues to produce 24,300 square meters of 14,500 square meters of covered outdoor space in the Ankara Industrial Zone. It is a convenient area for land transportation but far from air transportation. Arangül company is a that makes sales in abroad and Turkey. The company doing model design, preparing to moldsinjection press. The company sector is plastic injection. Company maked to water pipes, plastic inserts are produced. Main product is fittings material and compression fittings material. Total number of the workers 77 person. 3 person is industrial engineer and machine engineer and chemical engineer. If order is received maket o automotive, agricultural, electricity, link water, energy, cleanliness, and food.

Factors affecting the factory. Arangül plastic is suitable for the factors that should be taken in consideration in the place of establishment. The most important thing in this sector is to produce quality material and deliver it to the customer in a good way. So transportation vehicle is important. Company place is distance to airport 90 kilometer and distance to railway network is 30 kilometer. Company much more vehicle is truck. Company place weather conditions hot and dry in summers, winters are cold. Workers are live in Ankara. Personal vehicle is staff transport service.

Factory is located outside in city. Workers need to get up early to get into the service. The work starts at 8 in the morning so in the morning, the workers are getting into the service at 6.30am. This is problem of the workers.



Figure:2

Arangül plastic exports to more than 50 countries. 5 thousand tons of raw materials are consumed annually. In 2014, it has risen to 3rd place in its own sector. The company's TSE quality certificates and trademark registration documents are available. We speak Turkish in Arangül companies.

Arangül Plastik Kalıp Sanayi ve Tic. Ltd. Şti. Başkent Organize Sanayi Bölgesi Başkent Bulvarı No:75, Malıköy-Temelli, Sincan, 06909 Sincan/Ankara You can reach the website of the factory here: www.arangul.com



Figure:3



Figure:4

ORGANIZATION CHART



Figure:5

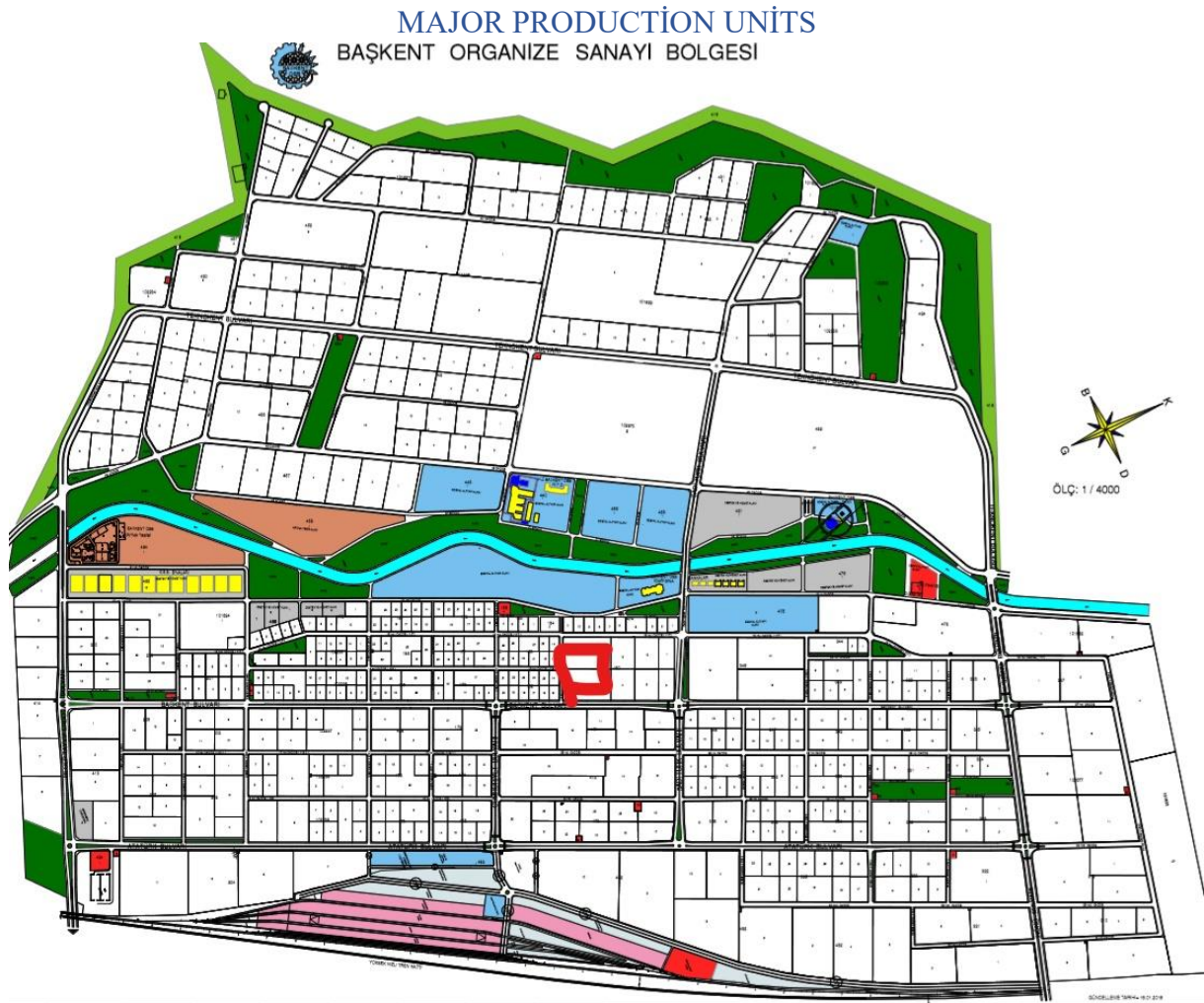


Figure:6

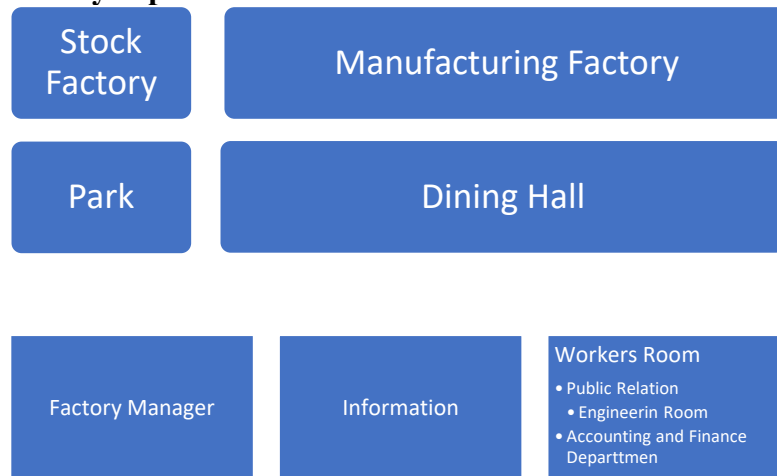
Factory Departments

Figure:7

Especially the unit 1 was in was the injection machine and production planning. I worked injection machine. Second week, 1 write to parameter system. The system is basic and while writing to the system there were people on my side because 1 learn system and 1 wrong the parameter. In the production site, i had the chance to do work and time study. I think the most difficult department was.

HEALT AND SAFETY

Occupational health and safety is a comprehensive title. Let me explain the subtitle.

1-Work Security Education

Arangül's company importance workers healthy. It is imperative to provide a medical report when starting work. This report is important. If this reports is nor give manager in later times can be damaged by working tempo. This report is neccesary. The person entering the job is given basic occupational safety information. In the country, all of companies all employees are obliged to receive occupational safety training.

2-First Aid Training

In the country, 1 out of the 10 employees must know first aid training. Arangül companies 5 person receive to first aid training.

3-Risk Analysis

All of companies must evaluation risk analysis.

4- Electrical Earthing and Installation Compliance Report

Arangül company systematically electric circuits. If these checks are not report to company. In later times major problems may arise. For example, fire from electric circuits.

5-Periodic Control

This control makes machine. The oil condition of the machine is important. Oil is cooled for machine.

6-Safety

Healt and safety measures should be taken in factories. These security measures are important for workers to wear and how they work.

Arangül companies give importance to worker and physical conditions, machine maintenance, educations of workers, pay attention.



Figure:8



Figure:9

QUALITY CONTROL

Company engineers testing to raw material and start to produce. Finishes to production engineers control to product and this control is trust companies customer. Preparing to raw material received propylene is important. How do we do the desired product in the best way during the test. If this testing makes wrong or incorrect, production becomes faulty. Finished makes production control .

In quality control we always compare the calibration with a product made right. Calibration is important because let me us measure the system and accept an its reference.



Figure:10

Figure 10 is metal threaded male adaptor. This product 20*1/2 in size. If we make production to adaptor we take this product as a reference. The inner width, size and weight are important. How much raw material is necessary is important.

SUPPLIERS AND RELATIONSHIPS

Our production policy; development and renewal, technology, experienced specialist staff, safety and training of workers and customer-focused approaches. It is a factory that serves both in the country and abroad. In Turkey, production to plastic material or drip irrigation system development to design and quality control. If to be succesful plastic material customer satisfaction is important.

- Ateş Halat Tic. İzmir
- Öz Kızmaz Tic. Antalya
- Atay Makine Tic. Diyarbakır

Arangül Plastic is a company that works extensively in the supply of plastic raw materials. Buying and selling with more than one company. They work with many foreign and domestic companies.

TOOLING

Molds

We process the general parts of iron parts in CNC machines. After that production to cast goes to foundry and correction and control. We produce molds with 0.5 kilos to 5 kilos. Our biggest machine is 788 tons. This machine is can take 2 kilos mold. There are 700 differents molds in this company.



Figure:11

MODEL AND MODEL DESING

Preparing to cast we maked to plastic fittings material. Preparing casting ;

Plastic Models

We maked cast in Cnc machine. We models are it is certain. If we get a new job and this job is different to we product. Engineers are doing a new model and these cast make in Cnc machine.

Iron Models

Iron models are made by engineers when a special job comes.

Required Material and Modelling

We use raw material is polypropylene and the products own plastic.

Polypropylene

Derived from the crude oil derivates “Naphta”. It is a natural white color. The average price and availability is proportional to petroleum as it uses 97% crude oil in its production. improvements can be made on the physical properties of polypropylene raw materials such as hardness, elasticity, heat resistance and fragility. Polypropylene raw material which is more expensive than other plastic materials is the biggest advantage of high temperature and pressure can be used safely for many years. Polopropylene Bloco Copolimer (ethylene is a raw material of up to 3%. It is not very resistant to temperature. It can be used only for the production of plastic pipes which can be used in cold water transmission lines).



Figure:12

Technical Feature

Yumuğama Noktasi / <i>Vcat Softening Point (1 Kg)</i>	132°C	(ISO 1183)
Erime Noktasi / <i>Melting Point</i>	146°C	(ISO 527/1)
Eriyik Akis Hızı / <i>Melt Flow Rate (Mn 230/2.16 Kg)</i>	0.3	(ISO 527/1)
Liner uzama katsayisi / <i>Linear Extension Coefficient</i>	0.15 mm/m (°C)	(ISO 527/1)
Yoğunluk / <i>Density (23 °C)</i>	0.91 g/cm ³	(ISO 527/1)
Çekme dayanımı / <i>Yield Strength (at 23 °C) (50 mm/mm)</i>	25 N/mm ²	(DIN 53505)
Çekmede uzama / <i>Elongation at Yield (23 °C) (50 mm/mm)</i>	12%	(ISO 1 79/1 eA)
Kopma dayanımı / <i>Breaking Strength (at 23 °C) (50 mm/mm)</i>	34 N/mm ²	(ASTM D 746)
Kopmada uzama / <i>Elongation at Break Point (23 °C) (50 mm/mm)</i>	> 500 %	(ISO 306)
Sertlik/Shore D Hardness (3 sec. Value)	65	(ISO 306)
Darbe dayanımı / <i>Charpy Impact Resistance (Notched) (at +23 °C)</i>	52 KJ/m ²	(ISO 1133)
Kirilganlık sıcaklığı / <i>Brittleness Temperature</i>	-13 °C	(ASTM D 696)

Figure:13

Model Design

We make plastic attachment water pipes so there too many product models. We preparing production planning. There are certain models we do but if we a new job and a new product engineers are design to model. Models are drawn in solid.

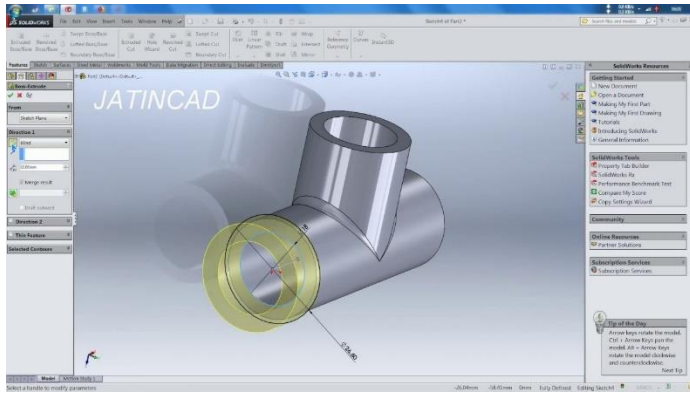


Figure:14



Figure:15

This pictures are plastic fittings material. First figure 13 is drawing solid design, second figure 14 machine prepared product. Many kinds of products are produced but the models are similar.

Some products are molding blue color. This products are compression material. In this process, the resulting plastic piece is made of blue coating.



Figure:16

Blue piece is make injection machine and added made of top on the product.

MODEL DESIGN

Design is important for the company. In the company I worked with, engineers designed using solid and autocad. If a special product has arrived, the commissioned engineers who are not able to produce the products, but ordered, complete the design with the help of solid and autocad. The main product of the company is the design of plastic materials is obvious, so it is not worked hard.



Figure:17

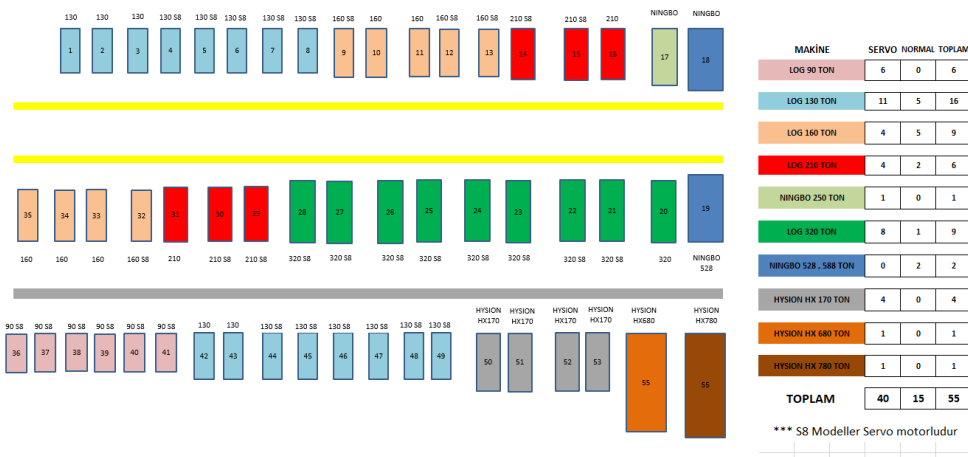
This figure made for autocad programming.

MANUFACTURED

Machining

Arangül companies on site there 55 injection machines and there are 3 CNC machines.

Injection Machine



We use injection machine and we use it in two different types. Automatic injection machines and manuel injection machines. Our biggest machine is 780 ton. This machine is automatic injection machine. Usually, machines are automatic but some little machine we use it in manuel.

Automatic Injection Machine

The machine working principle is basic. First of all, the most important thing machine maintenance and machine oil condition. Machine oil is cooled for machine because machine maintainance very important. Second important argument is machine temperature. When the machine reaches 60 degrees, it turns itself off. Everything is normal we can start to produce. We are writing parameters to the system. According to the parameters it takes the raw material with the help of vacuum. Injected into the mold with the help of the piston behind the machine. Raw material injected into the mold is changing the output time according to the size of the product. The preparing to product waiting for cooled. The estimated production time is 20 seconds, the cooling time is up to 80 seconds.

These times may vary depending on the size of the product. The cooling product principle is need valves and twisted shafts move and the valves cool the product.

Manuel Injection Machine

Operators should turn off machine. The rest is all the same as the automatic machine.

CNC Machine

Machine should be cast according to the weight and we use cnc machine. Here the CNC machines are molded. For example, he mold entering the machine to produce 1.5 kilograms of parts is important. So the injection mold has to be adapted to the machine. We use CNC machines.

WORK BENCHES

Turning Machine

Turning is done by means of rotating cutting tool with its own axis.

Milling Machine

The cutting process advances by turning the machine around itself.

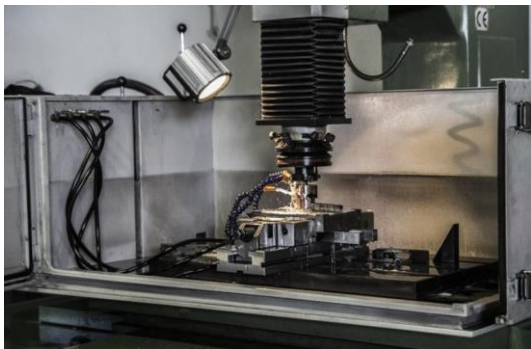


Figure:19

Start and End of Manufacturing



Figure:20



Figure:21

Production Planning

First of all started product process production planning. Company get a job, engineers started to process and we doing production planning. Model design, make a attachment, workers doing a planning, delivery date, and quantity of raw material. This process is important because for customer satisfaction.

Raw Material

How much raw material are there in the company? We look at the storage raw material. If you do not have enough raw material we will give you the order. All of fittings material, we use polypropylene and own plastic. Prepared of products, important of raw material.

Manufacturing

How much product should we prepare? For example, 10 sacks of plastic ½ 90 degrees elbows required. This value makes 2500 items. The machine produces a product in no more than 1 minute. Started to 10 machine this job. Each machine needs to produce 1 sack product. This job manufacturing is last 5 hours.

Control

All of production make by injection machine. If machine is no problem, all material is preparing without errors. Products are also checked, but very rare, but the error may occur. Control is finished and material is taken to the warehouse and put into sacks.

Storage

Products are packed and placed on trucks.

MAINTANENCE REPAIR

The product sold may be problematic. This is a very difficult situation because if the machine wrong system or raw material is a wrong put inside. When the production is finished, we can see our error. We correct the error. If the product has reached the customer, maybe 1 crack or broken out. In the case, do not come back to use because when we make sales the number of products is getting too much.

STOCK-DELIVERY

Our one factory just have for stock. This place, we storage raw material and a new product. The trucks are entering here and the products are easily loaded. If customer is in Ankara products are being released, if the car is going to that region for turkey, but if abroad, they will be taken to the port and taken by ship or a country close by.

MATERIAL FLOW

İŞ AKIŞ ŞEMASI

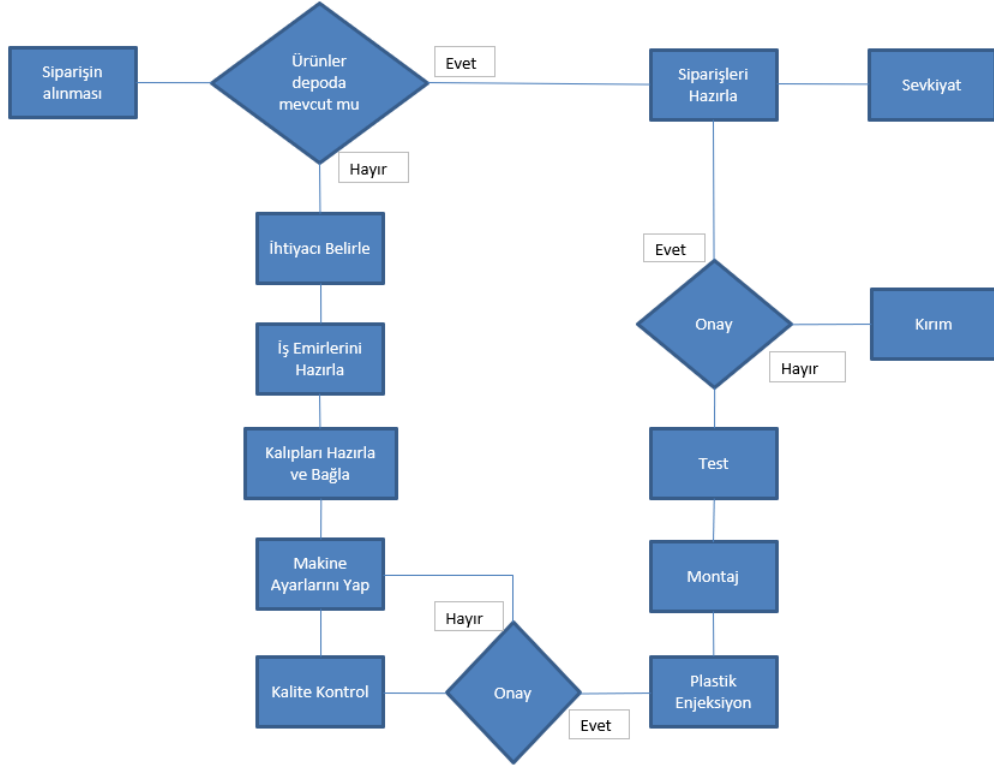


Figure:22

3.1. FAALİYETLER VE İŞ - ZAMAN PLANI												
FAALİYETLER	AYLAR											
	1	2	3	4	5	6	7	8	9	10	11	12
Makine alımlarının yapılması	✓	✓	✓	✓	✓	✓						
İnsan kaynakları alt yapısının güçlendirilmesi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yurt dışı fuarlara katılım sağlanması	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Figure:23

Factory Flow

First of all, we do not start without taking orders. Do you have the product in the order quantity in the storage. If there is no product in the storage. How much raw material in the storage and we need order raw material. After that, the engineer gives information about work orders. How many days to complete the order and information is given here. The molds are preparing. For example, 0.5 kilos molds preparing in cnc and this kilos 90 degrees produces elbow. Injection and Cnc machine write to system parameters

This parameters, we made produces to product. The step is quality control. Product is testing to engineer and workers doing.

Factory Evaluation

Arangül companies the machine layout is regular. Machines distance are 1 meter.

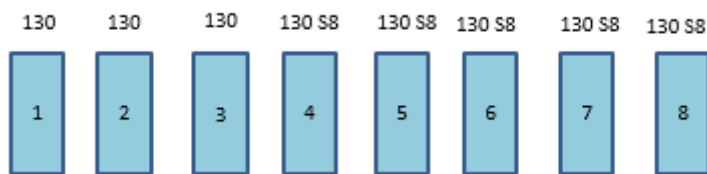


Figure:24

Figure 24 is machine layout. This machine is injection machine.

Factory temperature, layout, human relations, worker transportation is very convenient. Lighting and sunlight is quite sufficient. Factory images from inside are very bright. The air temperature is usually 25 degree.



Figure:25



Figure:26

The machine noise is average height. Workers do not need to wear headphones. The workers use injection and cnc machine. Operators are the machine is used comfortably unless there is a problem.

Worker ideas are important in terms of factory layout. Factory manager cared about these ideas. For example;

- Environmental waste is important subject for company and can be done better.
- Material supply may be problematic, and personnel may say that they lack material in advance.
- It is very useful for the company to measure personnel productivity.

COST ANALYSIS

Cost

The cost to produce and sell a product or service.

Cost-Analysis

Analysis and analysis of the cost of a product.

Direct Raw Material Cost Analysis

The cost segment which is economically suitable and high quality which constitutes the raw material of the produced product.

Raw Material Cost

Raw Material: 0.43 TL

Weight: 0.7 kg

Raw Material*Weight = $0.43 \times 0.7 = 0.301$

Gross Salary: 1600 TL

SGK Premium: 15.5 % = $1600 + 248 = 1848$

Unemployment Fund: 2,5 % = $1600 + 40 = 1640$

Food & Transportation: 510

Total Cost: $1600 + 248 + 40 + 510 = 2398$

Month: $2398 / 30 / 24 = 3.33$ TL

Operations	Operation Time (sec)
Press	60 sec
Casting	3 minute
Milling	2 minute
Turning	4 minute

Figure:27

Total Workers: $1 + 3 + 2 + 4 = 10$

Workers Unit Fee : 3.33

Workers Cost: $10 \times 3,33 / 60 = 0,55$

Electrical Cost

Operations	Watt	Electric Fee	Unit	Energy	Electric Cost
Press	2200	0,85		184,8	52,8
Cnc	4000	1,54		336	156
Milling	1000	0,29		125	36
Turning	750	0,29		133	39

Figure:28

Total Cost: $52,8 + 156 + 36 + 39 = 283.8$

Maintenance Cost

Operations	Annual Maintenance	Operation Time	Maintenance Cost
Press	3000	30 minute	0,17
Cnc	2500	30 minute	0,14
Milling	1200	10 minute	0,01
Turning	850	10 minute	0,02

Figure: 29

Total Cost: $0,17 + 0,14 + 0,01 + 0,02 = 0,34$

Abrasion Cost

Operations	Operation Time	Machine Rate	Machine Service Life (year)	Abrasion Total (TL/hours)	Abrasion Cost
Press	30 minute	300000	10	3,42	0,071
Cnc	30minute	250000	10	2,85	0,59
Milling	10 minute	100000	10	1,14	0,07
Turning	10 minute	100000	10	1,14	0,07

Figure:30

Total Abrasion Cost: $0,071+0,59+0,07+0,07 = 0,801$

Total Operation Machine Cost : $0,34+283,8+0,801 = 284.9$

Total Manufacturing Cost : $0,301+3,33+283,8+0,34+0,801 = 288,572$

Total Expense (15 %) : $288,572 *15/100 = 43,28$

Total Cost : $288,572 + 43,28 = 331,85$

Production Quantities of the Last Three Years

Years	Projected	Produced
2015	9.953,569,19 TL	200 Ton (year)
2016	12.613,027,46	250 Ton (year)
2017	17.547,677,49	350 Ton (year)

Figure:31

LINEAR PROGRAMMING

Problem

Six types of PP Compression Equal Valve are produced in the company. Orders for these manufacturings are as follows. The company has a fixed capacity for produce these orders.

The three types equal valve of information are as follows:

PP COMPRESION VALVE	AVERAGE AMOUNT OF DEMAND (unit/month)	UNIT COST AMOUNT (unit/day)	UNIT PRODUCTION TIME (employee/hour)	UNIT PROFIT (TL)
PP COMPRESION EQUAL VALVE	4600	10	480	4
PP CONNECTING VALVE WITH PLASTIC BALL	2700	10	480	4
PVC CONNECTING VALVE BEST	5000	4	480	4

VALVE				
-------	--	--	--	--

Figure: 32

23

Answer

Factory, works average 24 days, 8 hours a month with 77 workers. This means it indicates a monthly capacity of the plant; $8 \times 24 \times 77 = 14784$ employee-hour. Also the maximum total monthly that produced 12300/unit. According to how many produce PP COMPRESION VALVE to get maximum profit?

Coefficient Values and Parameters Used in Solution;

The decision variables;

$A_i = i$. The production time per product

$C_i = i$. Product profit

$X_i = i$. Amount of the product to be produced.

x_1 : Arangül Plastic amount will be produced one month

x_2 : Arangül Plastic amount will be produced one month

x_3 : Arangül Plastic amount will be produced one month

$x_1, x_2, x_3 \geq 0$

Demand Constraint

$x_1 \geq 4600$

$x_2 \geq 2700$

$x_3 \geq 5000$

Production Constraints;

$x_1 + x_2 + x_3 \leq 12300$;

Capacity Constraints;

$480 \times x_1 + 480 \times x_2 + 480 \times x_3 \leq 14784$;

Objective Function;

Max X_o : $10x_1 + 10x_2 + 4x_3$

Result;

Max $X_o =$

I took the course of operations last semester, but I did not fully understand the lesson and I could not solve this question correctly.

24

My Working Area

I will talk about the orders and responsibilities given to me. I usually, I worked injection machine. I worked on the injection machine throughout the internship. Sometimes, in order to help my education, I listened to the engineers during production planning. I worked on the CNC machine and at the molding. I helped to make the products.