



Mobarakeh Steel Co.



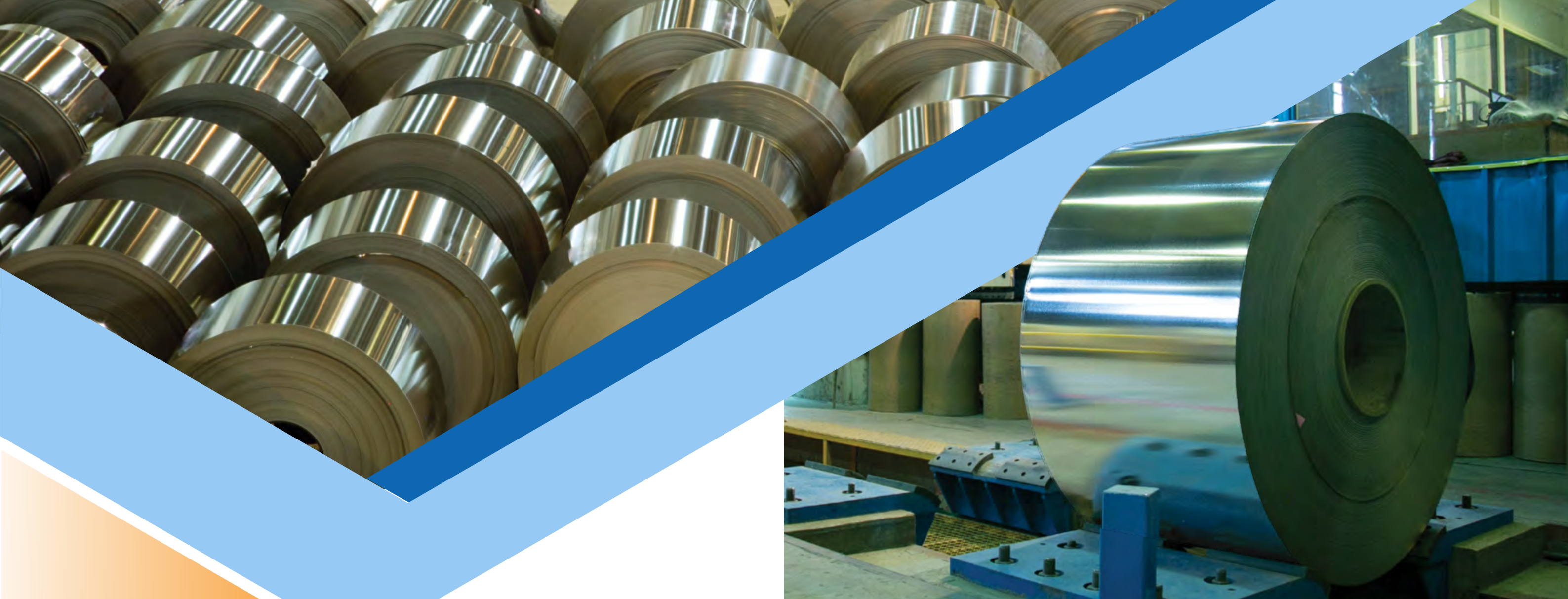
Tinplate Producer





▶ Contents

About Us	4
Features and Advantages of Tavan Avar Asia Steel Industries	5
Characteristics of Tinplated Sheets	6
Applications of Tinplated Sheets	7
Tinplated Sheet Production Process	8
Tinplated Sheet Cutting Process	16
Tinplated Sheet Packaging Process	18
Printing Process	20
Lacquering Process	22
Easy-Open Process	25
Can Making Process	27



▶ About Us

Tavanavar Steel Industries began its operations in the private sector in response to the needs of various industries that rely on tin-plated sheets. With the aim of providing the highest quality products in accordance with relevant industries and adhering to international standards for machinery and technology, the company has installed and commissioned its production lines with the collaboration of the world's most reputable manufacturers. The company's management of this company, utilizing the experience and expertise of its specialists, strive to ensure that the products offered meet the highest quality standards and satisfy all the needs and orders of valued customers.

▶ Features and Benefits of Tavanavar Steel Industries:

- ▶ Modern and advanced machinery synchronized with cutting-edge world technology.
- ▶ The largest manufacturer of tinplate sheets in Iran with an annual nominal capacity of 150,000 tons.
- ▶ Establishing a connection between raw materials and final products in the field of metal packaging.
- ▶ Preventing excessive outflow of foreign currency and supporting the domestic economy.
- ▶ Alignment of industry and academia towards construction and production.
- ▶ Capability to export products to surrounding countries, Asia, and Europe.
- ▶ Having suitable infrastructure for development projects and the expansion of manufactured products.
- ▶ Obtaining standard 15997 for tin-plated sheet production in Iran.
- ▶ Holding the highest international standards and a unified quality control unit.
- ▶ Fastest delivery speed to customers in the country.
- ▶ Equipped with tinplated coil production line.



► Applications of Tinplated Sheets

The largest consumption of tinplate is in the production of food containers, with over 90% of the tinplate produced worldwide used for making food cans. The unique properties of tinplate have facilitated an industrial transformation in can manufacturing. Advancements in the canning industry including reduction of the weight of cans without compromising the strength, producing easy-open cans, and creating attractive cans (with diverse shapes, colors, and designs) are amongst the advancements in the canning industry.

Technological advancements in the production of thin tinplate and can manufacturing, along with rising aluminum prices and the advantages of steel in recoverability, have increased beverage companies' inclination to use tinplate.

Additionally, the excellent formability and corrosion resistance of tinplate have opened up its use in the packaging of products from other industries, such as chemicals, cosmetics, hygiene products, and the manufacturing of decorative items like watch and perfume cases, and many others.

► Characteristics of Tinplated Sheets

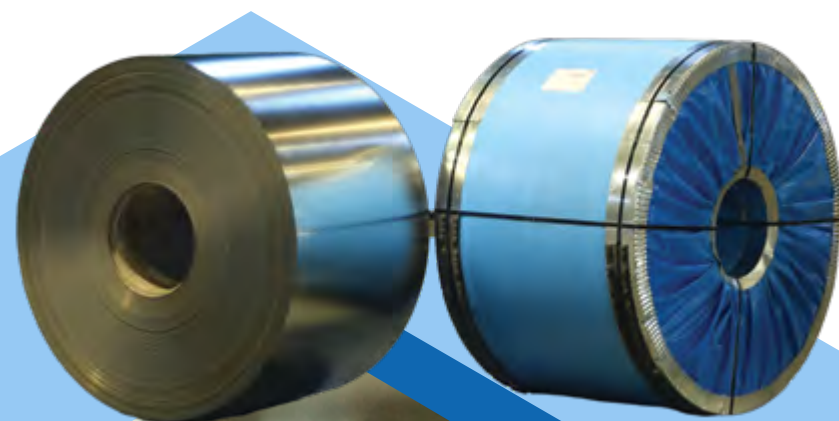
- Strong, durable, shatterproof, and lightweight
- Excellent formability
- Resistant to corrosion and mechanical stress
- Exceptional color and printability
- Non-toxic
- Wear-resistant and capable of withstanding relatively high temperatures
- Excellent weldability
- Fixed recovery capability, relatively inexpensive, and abundant



▶ Tinplate Coils

The production process for tinplated sheets at Tavanavar Steel Industries employs the electrolytic method, involves a precise tin coating with a thickness of less than 0.4 micrometers evenly to the surface of the steel base sheet. To enhance the adhesion and durability of the tin coating, an induction furnace is used to reabsorb the tin coating into the steel surface. This process not only increases the adhesion of the coating but also imparts a bright surface finish to the sheet.

The tinplate line at Tavanavar Steel Industries is equipped with a tension leveler, which can significantly reduce the waviness and arching of the sheet.



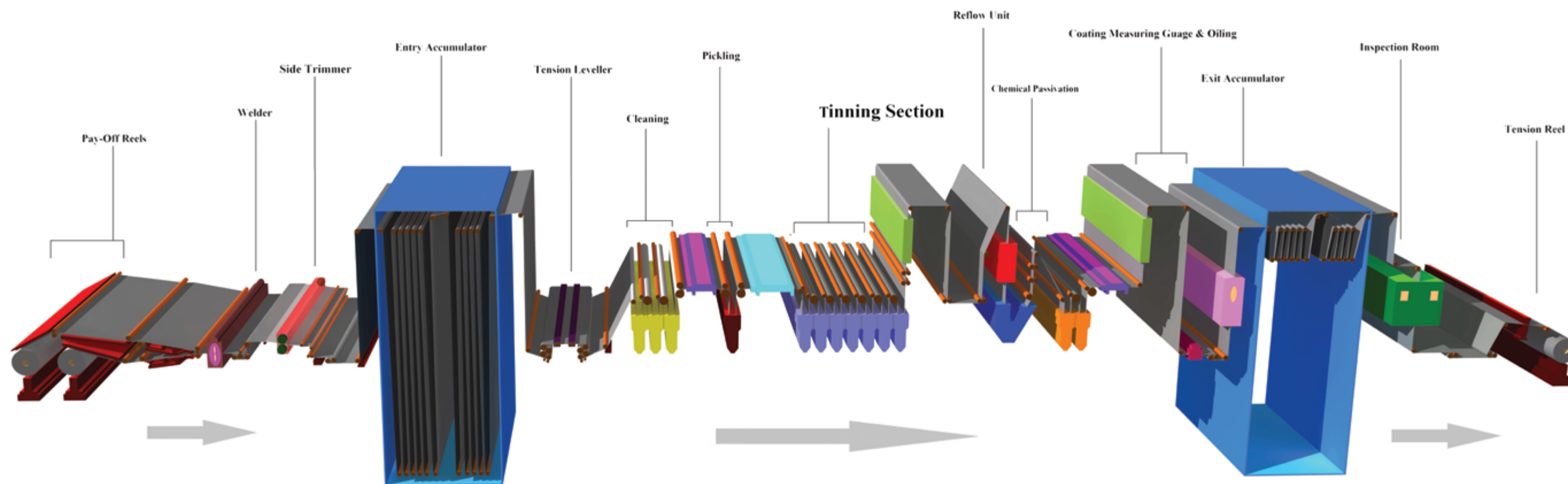
Technical Specifications of the Tinplate Sheet Production Line	
Production Capacity	150,000 (tons per year)
Line Input and Output Speed	380 (meters per minute)
Process Line Speed:	280 (meters per minute)
Sheet Width	550 to 1100 (millimeters)
Inner Coil Diameter	420 (millimeters)
Outer Coil Diameter	1760 (millimeters)
Thickness	0.15 to 0.5 (millimeters)
Maximum Coil Weight	20,000 (kilograms)
Tin Coating Amount	Minimum 2.8 and Maximum 5.6 (grams per square meter)

Specification of tin plated sheet			
Designation of temper grade	Rockwell superficial hardness HR30T		
	Thickness (mm)		
	t ≤ 0.210	0.210 < t ≤ 0.280	0.280 < t
T-1	50 ± 4	49 ± 4	48 ± 4
T-2	54 ± 4	53 ± 4	52 ± 4
T-3	58 ± 4	57 ± 4	56 ± 4
T-4	62 ± 4	61 ± 4	60 ± 4
T-5	66 ± 4	65 ± 4	64 ± 4
DR-8	72 ± 4		
DR-9	75 ± 4		
DR-10	79 ± 3		

▶ Features of the Tinplate Production Line

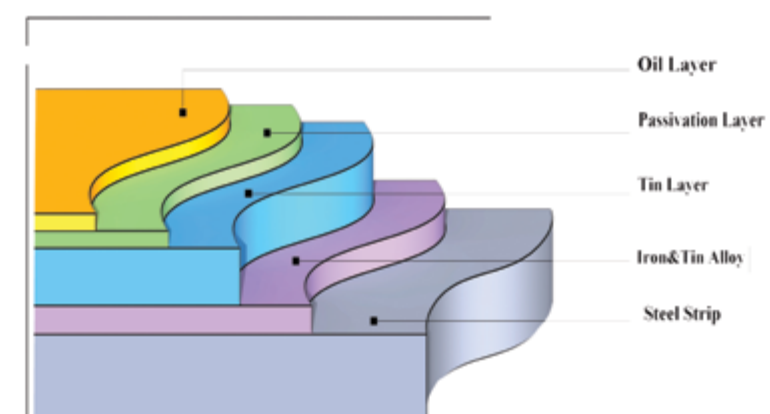
- ▶ Modern surface melting furnace
- ▶ Advanced levelling devices
- ▶ Pinhole Detector for detecting small holes
- ▶ High speed production capabilities
- ▶ Advanced quality control systems
- ▶ Uniformity of the tin coating on the surface of the sheet

Tavan Avar Asia Steel Ind. Electro Tinning Line



Technical Specification

Production.....150,000 Ton/year	Coil OD.....1760 mm	Tin Coating Weight.....(2.8-5.6-8.4-11.2) gr/m ²
Thickness.....0.15-0.5 mm	Line Speed In Process280 m/min	Passivation.....3.5-9 mgr/m ²
Strip Width (En).....600-1100 mm	Max. Line Speed In Entry&Exit380 m/min	Oil Layer.....3-5 mgr/m ²
Strip Width (Ex).....550-1050 mm	Max. Length Of The Entry&Exit Accumulator...450-480 m	Process Type.....Electrolytic
Coil ID.....420 mm	Max. Weight Of The Coil.....20 Ton	Incoming Strip.....Steel Strip Type (MR, D, L)





► Input Section

In the input section of the tinplate line, the processes of loading coils, cutting off waste, welding coils, trimming edges, and flattening sheets are performed. Often, the starting ends of the coils are not in optimal condition; for example, they may exhibit wrinkles, wavy edges, or holes at the beginning of the sheet, which require trimming using a shear. Subsequently, resistance welding is performed on the sheet using a welder. The welding wheel passes over the weld area to ensure that resistance welding occurs with heat and pressure. The loop tower serves to store

sheets to compensate for delays caused by welding operations at the line's entrance. The maximum length of sheet that can be stored in the loop is between 450 to 480 meters.

After the loop, the sheet enters the tension leveler. The incoming sheets may have issues such as wavy edges and longitudinal and transverse arcs, as well as dips and bends in the center. These defects require correction to produce higher-quality tinplate. The tension leveler is responsible for rectifying these defects.

► Process Section

On the black plate, there are oils, dirt, and rolling detergents that are applied by the manufacturers of the raw sheets to prevent rust and reduce friction. To remove these substances, a section called Cleaning is used, where the de-greasing process takes place. After passing through the cleaning section, the sheet enters the Rinsing area to ensure complete washing.

To remove active surface oxides and activate the sheet's surface for better adhesion, the sheet enters the Pickling section, followed by another rinsing stage to achieve thorough washing.

The Tinning section consists of five stages: pre-wetting, tin plating, washing and rinsing, induction furnace/Reflow Unit, and quenching.

In the pre-wetting stage, the sheet is kept moist before tin plating to prevent oxide formation. The tin plating stage includes seven cells, with the first five for tin plating and the last two for rinsing. In the first five cells, electrolysis (the oxidation and reduction of tin) occurs, featuring 18 bridges that support the tin anodes, and the current is transferred to the anodes through these bridges.

The Reflow Unit generates a strong magnetic field by consuming electric current, leading to

heat production. The temperature of the Reflow Unit is raised to around 280–300 degrees Celsius. When the tin-plated surface of the sheet is heated to 300 degrees Celsius, the melting point of tin being 232 degrees Celsius, the tin melts and penetrates the sheet at a rate of 0.6 grams per square meter, forming an alloy layer.

Once the sheet exits the Reflow Unit, it moves to the Quench section. The quenching mechanism involves conducting a specific surface operation on the sheet. When the tin-coated sheet, heated to 280–300 degrees Celsius, enters a section cooled by water, it rapidly loses temperature and stabilizes the tin, resulting in a stronger and more durable alloy layer.

In the Chromate Passivation section, the application of chromium on the tin-plated sheet is crucial, as it enhances the stability of the tin on the surface, increases oxidation and sulfation resistance, and improves the adhesion of varnish on the sheet.

Finally, in the Oiling unit, oil is sprayed electrostatically to prevent friction between layers of coils and to remove black dust from the sheet.



► Output Section

After the oil spraying process, the sheet enters the loop tower, which serves to store the sheets to prevent line interruptions when a coil runs out and needs to be removed. When necessary, the sheet is cut using a shear at the output, and the tinplate coil is removed. A detector identifies the weld locations and any small holes present on the surface of the sheet, along with potential defects, which are recognized during the sheet inspection station. Necessary measures are then taken to prevent the occurrence of these defects .

► Tinplate Cutting Process :

Tinplate Cutting Process :

The cutting operations for the sheets are carried out according to a planned schedule. The coil is placed on the uncoiler at the beginning of the line. After passing through the leveling rollers and the loop, it enters the cutting stage. The cut sheets are transferred to stackers, where defective and standard products are collected in separate stacks. Throughout the entire cutting process, quality supervision is performed, and the cut sheets are weighed, packaged, and stored for dispatch to customers .

This company is equipped with two cutting lines, each with an annual nominal capacity of 35,000

tons. After producing tinplated coils, if requested by customers, the coils can be cut into sheets and carefully packaged to prevent damage .

To uphold customer rights and ensure the delivery of high-quality products, the quality control unit selects several samples from each sheet pallet for laboratory testing. Tests such as hardness, tensile strength, surface roughness, and measurement of tin, chromium, and oil coatings are performed on the samples. Additionally, the dimensions of the cut sheets are measured, and if any discrepancies are found, the sheet is removed from the production and shipping cycle.



► Technical Specifications of Cutting Lines

Number of Lines	3 Units
Sheet Width	550 to 1050 (millimeters)
Inner Coil Diameter	420 (millimeters)
Outer Coil Diameter	1760 (millimeters)
Sheet Thickness	0.015 to 0.05 (millimeters)
Maximum Coil Weight	20 (tons)
Cutting Length	450 to 1250 (millimeters)
Cutting Precision	0.1 (millimeters)





► Packaging

The packaging of tin-plated products is done in two forms: sheets and coils.

Each package should weigh around 1,000 to 2,000 kg. Every package must have a label containing the following information :

- 1.A letter indicating the group and type of steel .
- 2.Production date .

- 3.Inspection number .
- 4.Dimensions (thickness, width, and length) .
- 5.Tin coating weight .
- 6.Type of temper .
- 7.Number of sheets and their weight .
- 8.Manufacturer's name or identification mark .
- 9.Customer's name .

- 10.Serial number .

- 11.Product code .

According to standards EN 10203 and JIS G3303, the packaging for tin-plated sheets should:

For coils, each coil should also have a label with the following specifications. Certain items can be omitted with customer agreement :

- 1.A letter indicating the group and type of steel .
- 2.Production date .

- 3.Inspection number .

- 4.Dimensions (thickness, width, and length) .

- 5.Thickness of the coating.

- 6.Type of temper .

- 7.Weight .

- 8.Manufacturer's name or identification mark .

- 9.Customer's name .

- 10.Serial number .

- 11.Product code .

Packaged Cut Sheets :

The packaging for sheets includes two longitudinal straps and two transverse straps, moisture-absorbing wrap, plastic cardboard on the top and bottom, metal edge protectors, a metal cover on the package, and a wooden pallet .





▶ Printing Process

The printing line of this facility uses the A122 model, which consists of a two-unit, two-color setup produced by the renowned Mailänder brand. This line operates at a speed of 4,000 sheets per hour.

Nominal speed of the line: 6,000 sheets per hour
Furnace length: 21 meters

Sheet thickness during printing: 0.12–0.30 mm

Maximum allowed print size: 1150 x 950 mm

Minimum allowed print size: 750 x 528 mm

Additionally, the line's lacquering and printing ovens use gas energy. The printing system operates with a water and alcohol mixture, typically around:

Alcohol: 10–16%

Water: 84–90%





► Lacquering Process

The lacquering line, produced by the reputable Mailänder brand (model 460), operates at a speed of 4,000 sheets per minute.

Nominal speed of the lacquering line: 4,140 sheets per hour

Furnace length: 32 meters

Generally, the lacquers used in the lacquering line can be categorized into two main types :

①1.Food-grade lacquers

②2.Industrial lacquers

All sheets used in the manufacturing process of cans and lids, in various sizes, undergo lacquering on both sides with different types of industrial and food-grade lacquers, depending on the conditions of the final product. The output of the lacquering line serve as feed for other canning and packaging industries.





► Easy-Open Lid Production Process

The easy-open lid production line is used for improved lid sealing. One advantages manufactured by Metal Box, an English company, and it produces 500 easy-open lids per minute, each with a diameter of 84 mm. In the production process, food-grade mastic is

of the production line is that, to prevent minor scratches and potential issues, the lids are placed in an electrocoater bath. This process rectifies any identified defects.



► Can Manufacturing Line Process

In the can manufacturing line, items produced include 1-kilogram cans with a diameter of 99 mm, half kilogram cans with a diameter of 73 mm available in various heights, and tuna cans with a diameter of 84 mm, and easy-open lids in sizes 99 and 73 mm.

► 1-kilogram Line :

The welding machine is from a Chinese brand called New Dodo(model 350); the lid sealer is from a Chinese brand called FBS (Long Wen); the powder spray machine is from a Taiwanese brand called Yoan Rox; and the jet printer is a Domino A122 from the UK .
Line speed: 170 cans per minute (170 CAN/MIN)

► 0.5-kilogram Line :

The cutter is from brand called Metal Box with flanger and lid sealer from England. The welding machine is from a brand called Soudronic, (model FBB425500/), and manufactured in Switzerland .

Line speed: 180 cans per minute (180 CAN/MIN)
Additionally, the company is in the process of expanding its printing and packaging industries by purchasing new lines as follows :

Two-stage stretching line for size 83 tuna with heights of 33, 37, and 43 mm, manufactured by ESTES .

Sheet press lines for producing lids for size 99 and size 70, and a shell production line for size 83, all using sheet pressing.

Three-Piece Food Cans

Diameter (mm)	Height (mm)
73	82
73	98
73	102
73	110
99	85
99	108
99	111
99	113
99	115
99	142
99	156

Two-Piece Food Cans

84	33
84	37
84	42



Factory

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