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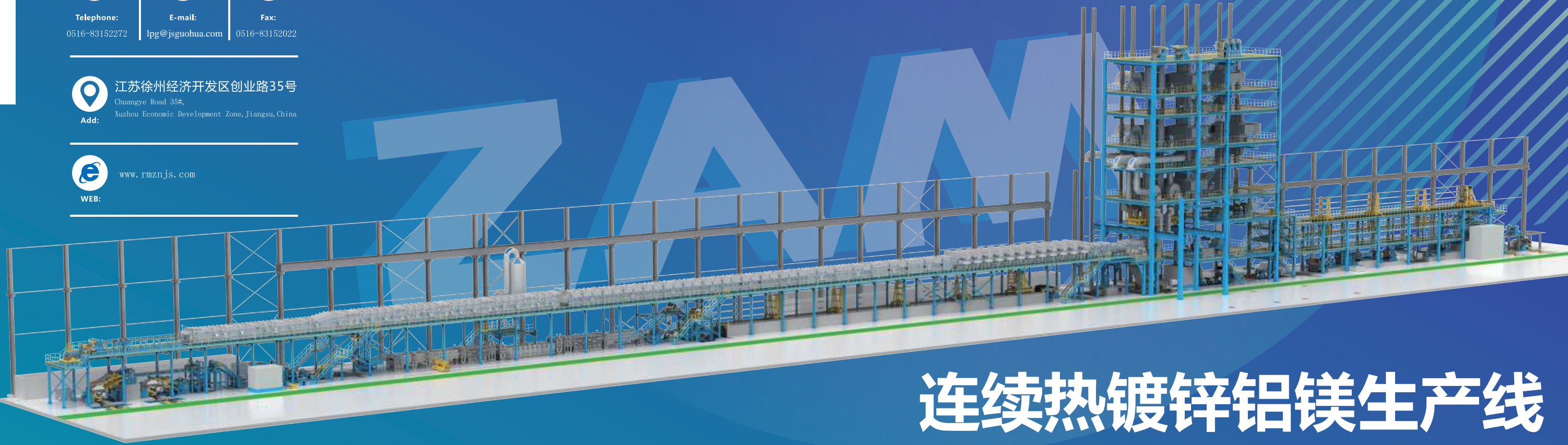
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WEB:



连续热镀锌铝镁生产线  
ZAM Production Line



徐州瑞马智能技术股份有限公司  
Xuzhou RITMAN Intelligent Technology Co., LTD

## “ 瑞马智能企业简介 RITMAN Company Introduction

瑞马智能以“热镀锌生产绿色化、信息化、智能化、无忧化”为使命，以热镀锌生产全新价值创造为设计理念，专注于新型环保数字化热镀锌生产线及相关设备研发、制造和实践。

数据赋能，技术驱动，公司基于热浸镀锌工业大数据，利用定制数字化产品和工业物联网技术，致力于热镀锌全产线的智能制造。

近年来，热镀锌铝镁工艺凭借其超薄的镀层、卓越的耐蚀性被广泛应用于各领域。随着技术的发展和市场需求的提升，公司花大力气进入铝镁工艺及连续板带镀锌机组的研发工作。经过多年的潜心研究和钻研，技术上取得重大突破，成功推出中铝锌铝镁（6%Al+3%Mg）板带机组，并在行业内受到一致好评。本产品机组用于冷轧硬态带钢（酸洗带钢）进行连续热镀锌铝镁的工艺。它可以生产较厚带钢，具备优良的板形调整及板面质量控制能力。

Xuzhou RITMAN Intelligent Technology Co., LTD, taking environmental, informationized, intelligentized and trouble-free HDG production as our mission and new value creation for HDG production as design concept, is devoted itself into R&D, manufacturing and practices of new type environmental digitalized HDG production line and relevant equipment.

Data Enable and Technology Driven. Our company, based on big data for HDG industry and by applying industrial IoT technology and customized digital products, focuses on the intelligent manufacturing of entire HDG production line.

In recent years, the ZAM process has been widely used in various fields by virtue of its ultra-thin coating and excellent corrosion resistance. With the development of technology and rising market demand, the company has made great efforts to enter into the research and development of galvanizing units for ZAM process and CGL. After years of dedicated research and study, a major technical breakthrough has been achieved, and we have successfully launched a galvanizing unit for ZAM(6% Al + 3% Mg), which has been well received in the industry. This unit is used in the process of cold rolled hard state strip (pickled strip) for continuous ZAM. It can produce thicker strip steel with excellent strip shape adjustment and strip quality control.

## THE HONORS OF OUR COMPANY



### 瑞马智能荣誉资质

Honors and Qualifications of RITMAN

- ◎ 26项发明专利  
26 Patents
- ◎ 57项实用新型专利  
57 Utility Models
- ◎ 38项软件著作权  
38 Software copyrights
- ◎ 国家工信部“两化融合”认证  
Certification of Integration of Informationization and Industrialization of the Ministry of Industry and Information Technology of China
- ◎ 省级“首台套重大装备产品”  
First (set) of major equipment products of Jiangsu Province
- ◎ 省级“示范智能车间”  
Demonstration Smart Workshop at provincial level
- ◎ ISO9000质量管理体系认证  
ISO9000 Quality Management System
- ◎ 环境管理体系认证  
Certification of Environment Management System
- ◎ 国家高新技术企业  
National Hi-tech enterprise
- ◎ 热浸镀锌智能化工程研究中心  
Engineering RD Center for HDG Intelligentization
- ◎ 江苏省研究生工作站  
Jiangsu Province Postgraduate Workstation
- ◎ SIEMENS数字化工厂集团和  
过程工业和驱动集团合作伙伴  
Cooperation Partner of SIEMENS Digital Factory and  
SIEMENS Process Industry and Drives Group



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# 核心技术--基于热浸锌工业云实现全产线的数智化

Core technology - The intelligent manufacturing of the entire production line based on the industrial cloud of the HDG



## 01 三维仿真 3D simulation

全线采用数字仿真三维设计

Digital 3D simulation adopted for the design of the production line.

## 02 信息化技术 Information technology

通过MES技术的加持实现全线数字化制造

With the addition of the MES technology to realize digital manufacturing of the entire production line.

## 03 智能化管理系统 Intelligent management systems

实现前处理、炉区、炉鼻、冷却系统精准控制

Precise control of pre-treatment, furnace zone, snout and cooling systems.

## 04 关键技术 Key technology

针对中铝锌铝镁工艺研发设计的工艺

Process requirements aiming at the development and design of ZAM (6%Al+3%Mg)





根据“智改数转”的导向，我公司将产线设计三维化、模块化、一体化和标准化设计，采用工厂化预制，现场装配式快速安装，提升标准的同时，大大缩短现场交付时间，实现快速交付、快速达产的目标；通过自动化、信息化和数字化技术的加入，使得整线的生产全面进入数字化时代。

According to the orientation of "Intelligent transformation and digital transformation", our company adopts the design of three-dimensional, modular, integrated and standardization for the production line. By the means of factory prefabrication and on-site assembly, the fast installation is realized while improving the standards and greatly shortening the project delivery period, to achieve the goal of fast delivery and fast reaching the designed production capacity; through the integration of the automation, information and digitalization, to allow the entire production line to enter into the digital



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## 热镀锌铝镁工艺及产品简介

### ZAM Process and Product Introduction



## 锌铝镁的优点:

### Advantages of ZAM process

- |                       |  |
|-----------------------|--|
| 1. 防锈性能是普通镀锌板的10-20倍; | 1. 10-20 times more rust-proof than ordinary galvanized sheet.                             |
| 2. 镀层厚度相当于普通镀锌板的1/6;  | 2. The thickness of the coating is equivalent to 1/6 of that of ordinary galvanized sheet. |
| 3. 具有良好的切口自修复性;       | 3. Good self-healing properties of the cut.  |
| 4. 具有良好的机械加工性能;       | 4. Good machinability.   |
| 5. 可根据需要随时调整镀层厚度;     | 5. The thickness of the coating can be adjusted at any time according to needs             |
| 6. 耐蚀性强、适应环境广泛、寿命长。   | 6. High corrosion resistance, wide adaptability to the environment and long life.          |

ZAM是一种热镀锌技术，是在熔融的锌液中加入一定比例的铝和镁，从而形成耐蚀性更强、镀层更薄、切边保护性良好镀层的工艺过程。

ZAM is a hot-dip galvanizing technique, a process in which a certain percentage of aluminium and magnesium is added to a molten zinc bath, resulting in the formation of a more corrosion-resistant, thinner coating with good cut edge protection.

ZAM是日本日新公司2000年研发成功的热镀锌技术。

ZAM is a hot-dip galvanizing technology successfully developed by Nissin Japan in 2000.

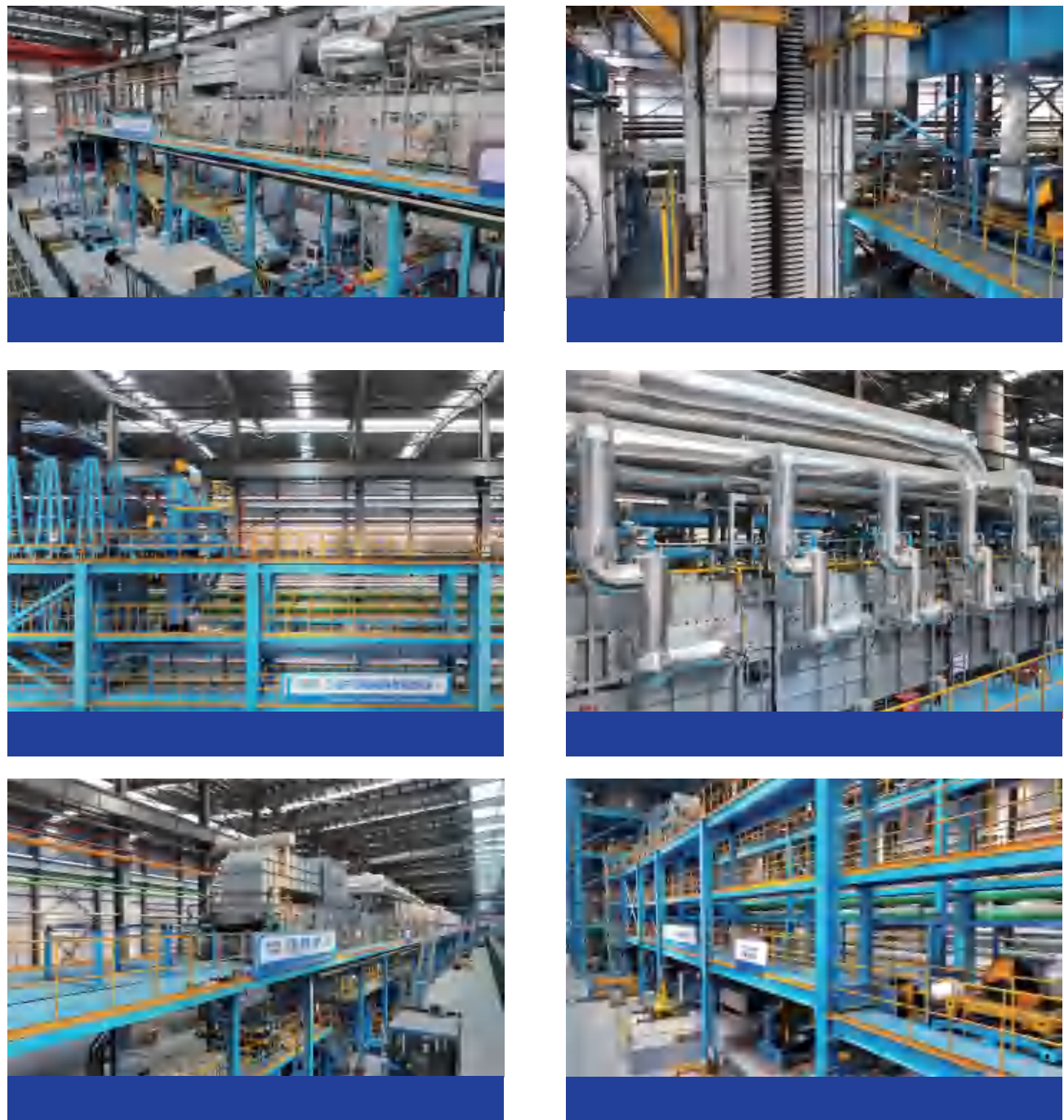
ZAM—热镀锌铝镁钢板是一种高耐腐蚀新型环保型钢板。它极大的提高了钢板的耐蚀性，延长了钢板的使用寿命，即使在严酷的腐蚀环境下仍能体现出其优异的性能，极大地延长其寿命，降低成本，符合家节能减排的政策。

ZAM - hot-dip galvanized strip steel is a new type of highly corrosion resistant and environmentally friendly steel sheet. It greatly improves the corrosion resistance of the steel sheet and extends the service life of the steel sheet. Even under severe corrosive environments, it shows its excellent performance and can extend the service life and reduce the cost, in line with the national policy of energy saving and emission reduction.

# 热镀锌铝镁设备 Galvanizing units for ZAM

本热镀锌机组用于将冷轧硬态钢板（酸洗钢板）进行连续热镀锌铝镁的表面处理。它可以生产较厚带钢，具备优良的板形调整及板面质量控制能力。机组由入口段、前处理、工艺段、整形段、出口段等设备组成。具有连续退火还原、热浸镀锌铝镁、拉矫、钝化等功能。产品质量符合国家及国际相关标准。

This hot dip galvanizing unit is used to surface treat cold rolled hard steel sheets (pickled steel sheets) with continuous ZAM. It can produce thicker strip steel with excellent sheet shape adjustment and quality control. The unit consists of an entrance section, pre-treatment, process section, shaping section and exit section. It has the functions of continuous annealing reduction, hot dipping galvanized ZAM, pulling and straightening, passivation, etc. The product quality meets the relevant national and international standards.



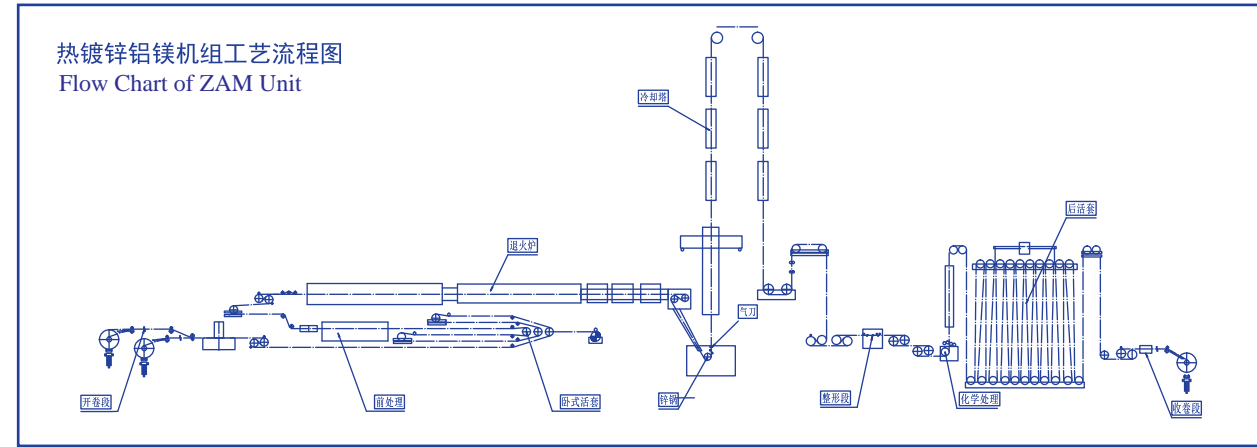
# 工艺特点 Process features



- A. 采用自动化上料系统，完美解决材料缓冲库和机组间的物料运输问题；
- B. 采用高精度纠偏活套系统，解决中宽带、厚板带的跑偏问题，提高连续生产的稳定性；
- C. 在改良森吉米尔炉的基础上，使用双交叉限幅控制技术设计的退火炉，让炉子具有良好的可操控性，实现炉区的全自动化生产；
- D. 机组配备在线锌层测厚仪，实时记录锌层厚度。

- A. Adopting an automatic feeding system, which perfectly solves the problem of material transportation between material buffer storage and the unit.
- B. The use of a high-precision deviation correcting looper system solves the problem of runout of the medium and wide strip and thick strip and improves the stability of continuous production.
- C. The annealing furnace is designed using double cross-limit control technology based on the improved Sengiemir furnace, giving the furnace good manoeuvrability, to realize the fully automatic production in the furnace area.
- D. The unit is equipped with an online coating thickness gauge to record the coating thickness in real-time.

# 工艺流程图 Flow Chart



## 全线采用三维可视化设计

3D visualization design adopted for the production line

- (1) 产线全景完美虚拟展示（1:1模型），提升设计准确性，规划的合理性；

(2) 三维模型可用于静力学分析，轻量化设计，可用于流体、热力学仿真，验证工艺与设备的最佳匹配；

(3) 模型可与工业软件无缝对接，用于数字孪生，进行生产全流程模拟仿真。

(1) Perfect virtual display of the panoramic view of the production line (1:1 model) to improve the accuracy of design and the rationality of planning.

(2) The 3D model can be used for static analysis and lightweight design; it can be used for fluid and thermodynamic simulation to verify the best match between process and equipment.

(3) The model can be seamlessly interfaced with industrial software for digital twinning and simulation of the entire production process.
- 
- ## MES信息化技术
- MES informationization technology
- 本系统主要分成工控管理、系统管理、基础管理、生产管理、设备管理、报表管理六大部分，帮助生产实现轻松、规范、细致的设备生产业务一体化管理工作。提高管理效率，掌握及时、准确、全面的生产动态，有效控制生产过程。
- The system consists of six major parts, including industrial control management, system management, basic management, production management, equipment management and report management, which help achieve easy, standardized and detailed integrated management of equipment and production operations, thus to improve the management efficiency, master the timely, accurate and comprehensive production dynamics, and effectively control the production process.
- 
- ## 智能化开卷系统
- Intelligent Uncoiling System
- 开卷准备段设置有运卷小车、开卷机、夹送五辊矫平机、横切剪、汇合夹送机、窄搭接焊机等设备组成。采用自动化上卷、开卷、送料等功能，进行数智化系统管理，可提高机组的操作性、降低工人的劳动强度，提高产能。
- The uncoiling preparation section is set up with equipment such as roll trolleys, uncoiling machines, clamping and five-roller leveller feeding machine, cross-cutting shears, converging clamping and feeding machines and narrow lap welding machine. This section adopts the functions of automatic coil loading, automatic uncoiling and automatic feeding, and carries out digital and intelligent system management, which improves the operability of the unit, reduces the labour intensity of workers and improves the production capacity.
- 
- ## 高效前处理清洗系统
- High efficiency pre-treatment cleaning system
- 前处理采用数智化管理，可精准控制漂洗液的使用和漂洗水的流量，前处理段设置有碱冲洗、碱刷洗、电解清洗、逐层溢流式水洗段，采用高压喷射结合刷洗的工作方式，自动化调整，数智化管理。
- The pre-treatment is of digital intelligence management, which precisely controls the use of rinsing liquid and the flow of rinsing water. The pre-treatment section is equipped with alkali rinsing, alkali brushing, electrolytic cleaning and layer-by-layer overflow water washing sections, using the working method of high-pressure jetting combined with brushing, automatic adjustment and digital and intelligent management.
- 
- ## 无氧化加热技术
- Oxidation-free heating technology
- 无氧化加热技术是带钢加热退火的关键环节，该段炉区主要有预热段和加热段组成。该段的主要特点是加热效率高、加热速度快，在还原气氛下加热带钢，大大降低了带钢在加热过程中的氧化。降低还原炉的工作压力，降低能耗。该段采用自动化加热控制技术、数智化管理，自动精确控制和采集整个炉区的产品信息和工作状况。
- The oxidation-free heating technology is the key link in the heating and annealing of the strip steel. The section of the furnace area mainly consists of a preheating section and heating. The main features of this section are high heating efficiency, fast heating speed and heating of the strip in a reducing atmosphere, which greatly reduces the oxidation of the strip in the heating process, lowers the working pressure of the reducing furnace, and reduces energy consumption and saves production costs. The automatic heating control and digital and intelligent management are adopted in this section to automatically and precisely control and collect the product information and working conditions in the entire furnace area.
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## 炉辊凸度精准控制系统

Precise control system for the convexity of the furnace rollers

炉辊凸度精准控制，智能化控制系统，增强了带钢炉内稳定运行，降低跑偏的机率，提高炉辊速度和带钢速度的一致性，降低了炉辊结瘤。

The precise control of furnace roller convexity and the intelligent control systems enhance the stable operation of the strip in the furnace and reduce the chances of runout. The intelligent control system improves the consistency of the furnace roller speed and the strip speed and reduces the accretion on the furnace rolls.



## 炉鼻采用机械密封和旁外过滤系统

The mechanical seal and the side external filter system adopted for the furnace snout

炉鼻采用全密封式结构，配有加湿功能、加热保温功能、旁外过滤系统、排渣系统及高温摄像头，且与热张室之间采用闸板隔断，最大程度地降低锌灰对带钢表面的影响，提高产品质量。

The furnace snout is of a fully sealed structure, equipped with humidification function, heating and heat preservation function, side and external filtration system, slag removal system, and high temperature camera, and is separated from the thermal expansion chamber by a flashboard to minimize the influence of zinc ash on the surface of the strip and to improve the quality of the product.



## 智能化锌锅结构设计

The structural design of the intelligent galvanizing kettle

独有的智能化锌锅结构设计，减少锌锅温度的流失，保证锌液温度的稳定性，降低锌渣的产生，增强板面的美观程度。

The unique intelligent design of the structure for galvanizing kettle reduces the temperature loss of the kettle, improves the stability of the temperature of the molten zinc, reduces the generation of zinc slag and enhances the appearance of the strip surface.

## 自动在线检测锌锅内铝、镁含量系统

Automatic online detection for aluminium and magnesium content in the galvanizing kettle

自动加锌和在线检测锌锅内铝、镁含量系统，可稳定锌液成份，增强镀锌产品的耐腐蚀性能。

The automatic addition of zinc and the online detection of the aluminium and magnesium content in the galvanizing kettle stabilizes the composition of the molten zinc and enhance the corrosion resistance of the galvanized product.



## 高压稳流移动风冷技术

High pressure steady flow mobile air cooling technology



移动风冷主要功能是迅速降低带钢的温度，保证锌铝镁镀层不被氧化，采用静压设计，在保证气流对带钢冷却效率的同时，在带钢两侧形成空气层气垫，从而降低带钢的抖动，保证带钢平稳运行，减小对起气刀的影响，保证带钢质量。

The main function of the mobile air cooling is to rapidly reduce the temperature of the strip and ensure that the ZAM is not oxidised. The static pressure design is adopted to ensure the cooling efficiency of the airflow on the strip while forming an air cushion on both sides of the strip, thus reducing the shaking of the strip, ensuring smooth strip operation, reducing the impact on the air knife and ensuring the quality of the strip.

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什么是锌铝镁？ What is ZAM?



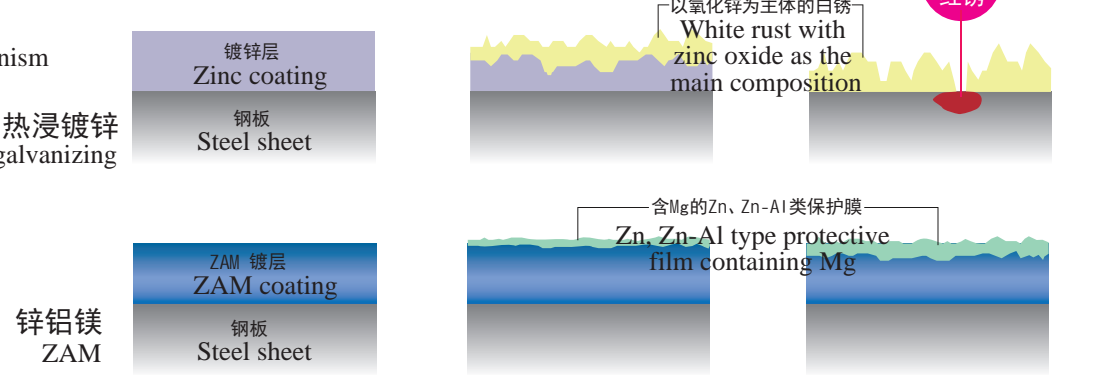
锌铝镁优异的耐蚀性 Excellent corrosion resistance of ZAM

锌铝镁的耐蚀性为热浸镀锌钢板的10~20倍  
The corrosion resistance of ZAM is 10-20 times higher than that of the hot-dip galvanized steel sheet.  
优于热浸镀锌-5%铝合金钢板5~8倍  
5 to 8 times better than the hot-dip galvanized - 5% aluminium alloy steel.

平坦部的耐蚀性比较  
Corrosion resistance comparison at the flat part

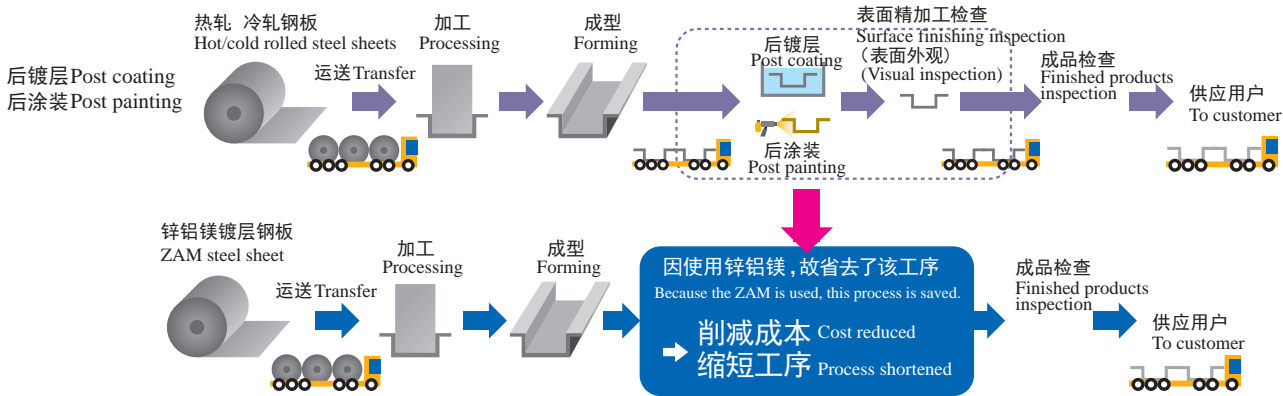


平坦部的耐蚀机理  
The anticorrosion mechanism at the flat part



使用锌铝镁可以降低成本 ZAM helps reduce the cost

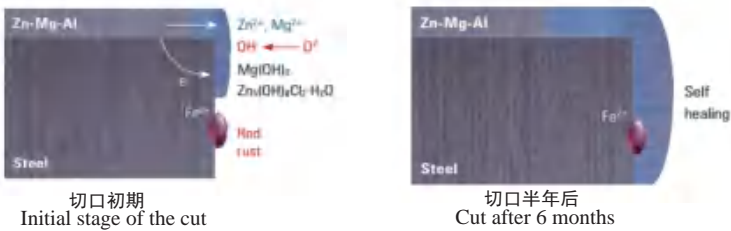
可以省去后期的镀层及涂装工艺, 故可降低成本  
As the painting and coating process afterwards could be saved, the cost could be reduced.



使用锌铝镁可以使客户简化加工工艺, 从而减少初始成本。又因该材料具有优异的耐蚀性, 故降低了寿命周期成本等, 最终使总成本的降低得以实现。  
通过铝和镁的作用, 使锌铝镁产品具有优异的耐蚀性、耐刮痕性及加工性, 可广泛应用于各种领域。  
The use of ZAM allows the customer to simplify the process and thus reduce the initial costs. In addition, the excellent corrosion resistance of the material reduces life-cycle costs, which ultimately results in a reduction in total costs. The effect of aluminium and magnesium results in the excellent corrosion resistance, anti-scratch and excellent processability of the ZAM product, which is widely applied in various fields.

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切口保护性能原理 Principle of the cut edge protection

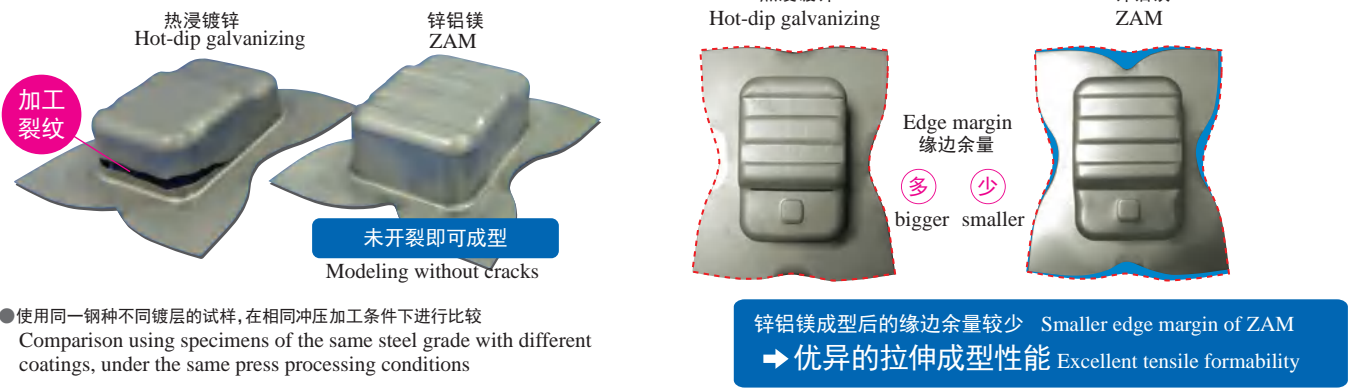


在ZAM板新发生的切口或划伤部位, 裸露的钢基会在腐蚀性环境中发生氧化, 出现初期红锈现象, 但随着时间的推移, 从镀层中溶解出来的镁及锌和铝等元素会使红锈转变为灰黑色的氧化膜, 组织较致密, 保护了断口部位不会继续被氧化掉。  
At the newly cut edge or the new scratch on the ZAM sheet, the exposed steel base will be oxidised in the corrosive environment and the red rust could occur in the early stage, but over time, the elements dissolved from the coating, such as magnesium, zinc and aluminium, will transform the red rust into a grey-black oxide film with a denser organisation, which protects the fracture area from continuous oxidation.

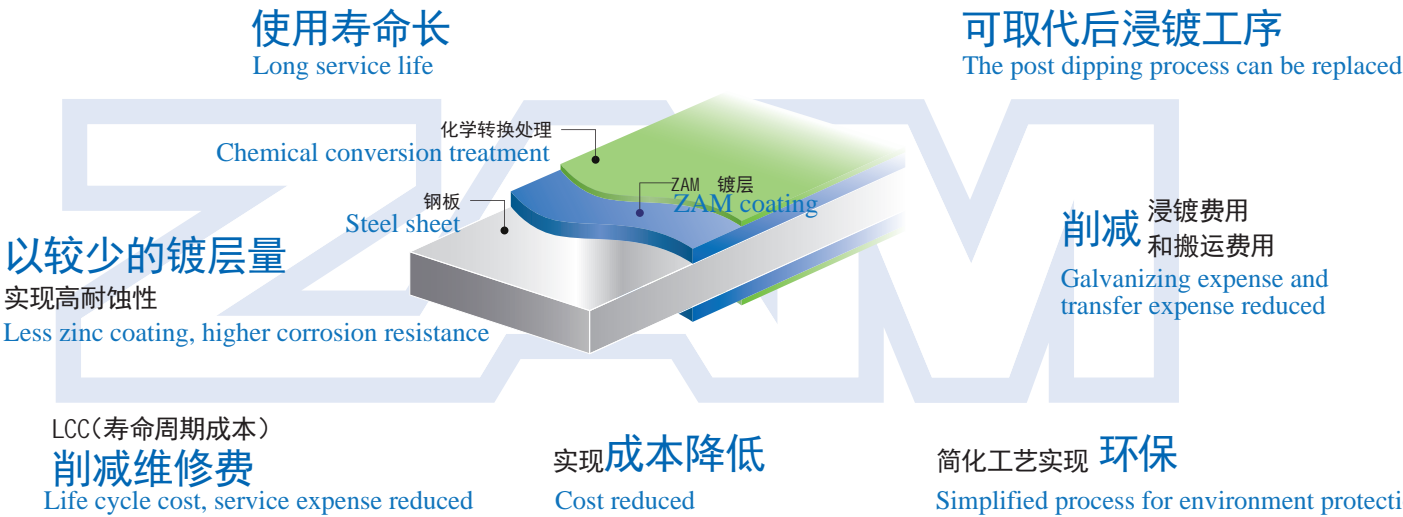
锌铝镁优异的冲压加工性能 Excellent stamping properties of ZAM

锌铝镁与热浸镀锌钢板相比, 其镀层硬度高且表面平滑, 故冲压性能优异, 从而提高了生产效率。  
Compared to hot-dipped galvanized steel, ZAM has a high hardness and a smooth surface, so it has excellent stamping properties, which can improve productivity.

拉伸成型性比较 Comparison of tensile formability



使用同一钢种不同镀层的试样, 在相同冲压加工条件下进行比较  
Comparison using specimens of the same steel grade with different coatings, under the same press processing conditions



LCC(寿命周期成本) 削减维修费 Life cycle cost, service expense reduced  
实现成本降低 Cost reduced  
简化工艺实现环保 Simplified process for environment protection

锌铝镁板带是日本制铁株式会社在世界率先成功实现商业化生产的高耐蚀性热浸镀锌-铝-镁合金钢板。  
ZAM steel sheet is a highly corrosion resistant hot-dipped galvanised -Al-Mg alloy steel plate that was successfully produced commercially by Nippon Steel for the first time in the world.

汽车部件应用领域 In the field of application for auto parts



锌铝镁板广泛应用于建筑行业、家电行业和汽车行业；现在已经深入的应用于建筑外墙板和顶板、光伏支架、钢板仓、公路护栏、风机、料塔、自动化养殖设备、钢结构建筑、抗震支架、电气机柜等。

不久的将来，有可能完全取代普通热镀锌。

ZAM sheet is widely used in the construction industry, home appliance industry and automotive industry; it has now been deeply applied to building exterior and roof panels, solar supports, steel plate silos, highway guardrails, fans, material towers, automated farming equipment, steel structure buildings, seismic stabilizer bracket, and electrical cabinets, etc.

In the near future, it is possible to completely replace ordinary hot-dip galvanizing.



汽车板  
Automobile sheet



蓄电池模块罩  
Batter module shield



散热器风扇电机罩  
Protective shield of the radiator fan

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农畜牧业和水产业领域 In the fields of agriculture, animal husbandry and aquaculture



公路、土木领域 In the fields of roads and civil engineering



电器和建材相关领域 In the related fields of electrical and building materials



工厂和住宅领域 In the field of factory and residential



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To play a leading role of the eco-friendly, intelligent and trouble-free production  
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