

Influence of Belt Furnaces on Glass to Metal Sealing

The logo for Hengli, featuring the word "Hengli" in white, bold, sans-serif font inside a dark blue oval.

Hengli



**TORREY HILLS
TECHNOLOGIES**

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Key Indicators

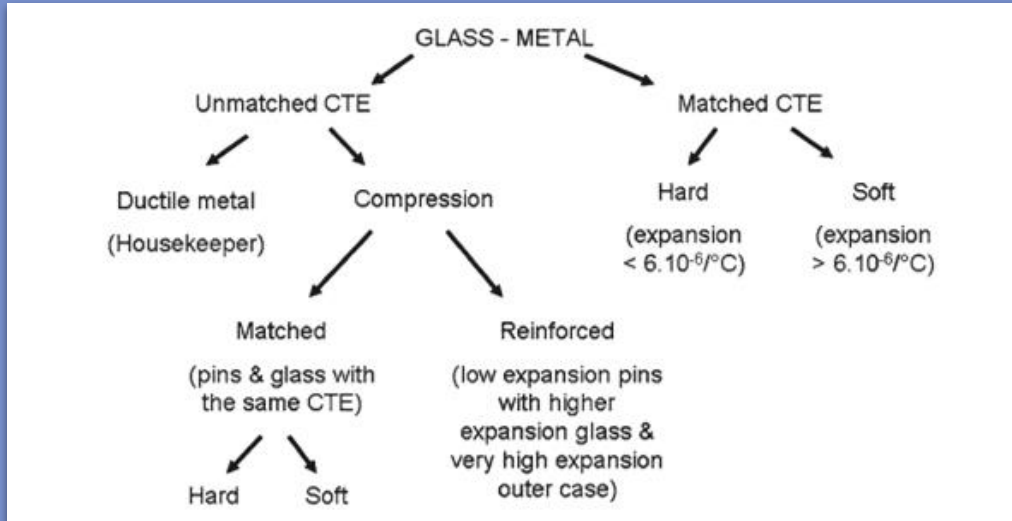


GTMS Furnace introduction

GTMS Furnace Introduction

Application :

Compressor terminals, aviation connectors, battery covers and other metal to glass sealing products.

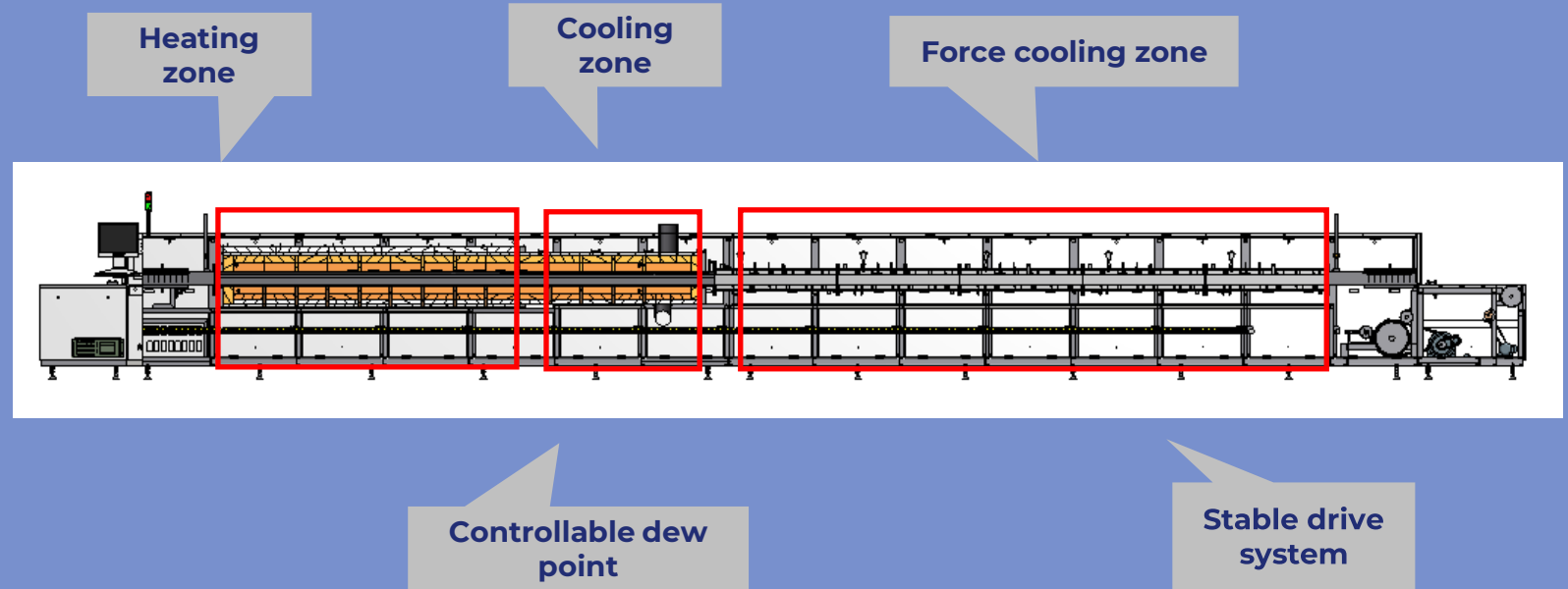


Glass to metal hermetic connectors

GTMS Furnace Introduction

Features of Our Furnace:

Combined with the sealing process, special atmosphere control is adopted to maintain a moisture atmosphere with a controllable dew point in the heating zone and high temperature zone, with a controllable cooling-rate method at the end section to meet the requirements of slow cooling of the product.



Model	Belt Width (mm)	Heat zone	Heated length(mm)	Peak Temperature(°C)	Height (mm)	Temperature uniformity (°C)	ATMO
HSA	100-400mm	8-10	300/450/600	1050	50-100mm	±1~2	(Wet)N ₂ +H ₂



Problems and Key Technologies in GTMS

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Problem 1:

The uncontrolled oxidation of the metal shell affects the sealing effect



The level of oxidation to the metal shell will directly impact the sealing effect.

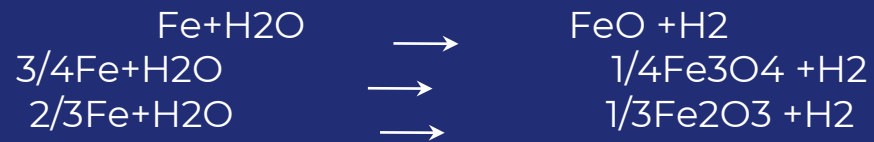
Major reasons:

When water vapor and metal react at high temperature, three metal oxides of FeO, Fe₃O₄ and Fe₂O₃ are formed. Fe₂O₃ has a loose structure and low sealing strength with glass. The level of oxidation directly impacts the thickness of Fe₂O₃ and directly affects the sealing effect.

Problems and Key Technologies in GTMS

Basic principles of metal to glass sealing

The reaction between the metal shell and water vapor at high temperature from the inside layer to the outside layer



The chemical bond of metal and FeO is similar; therefore, the bond is tight

The chemical bond of Glass and Fe₃O₄ is similar; therefore, the bond is tight

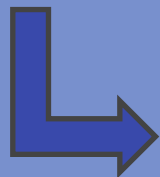
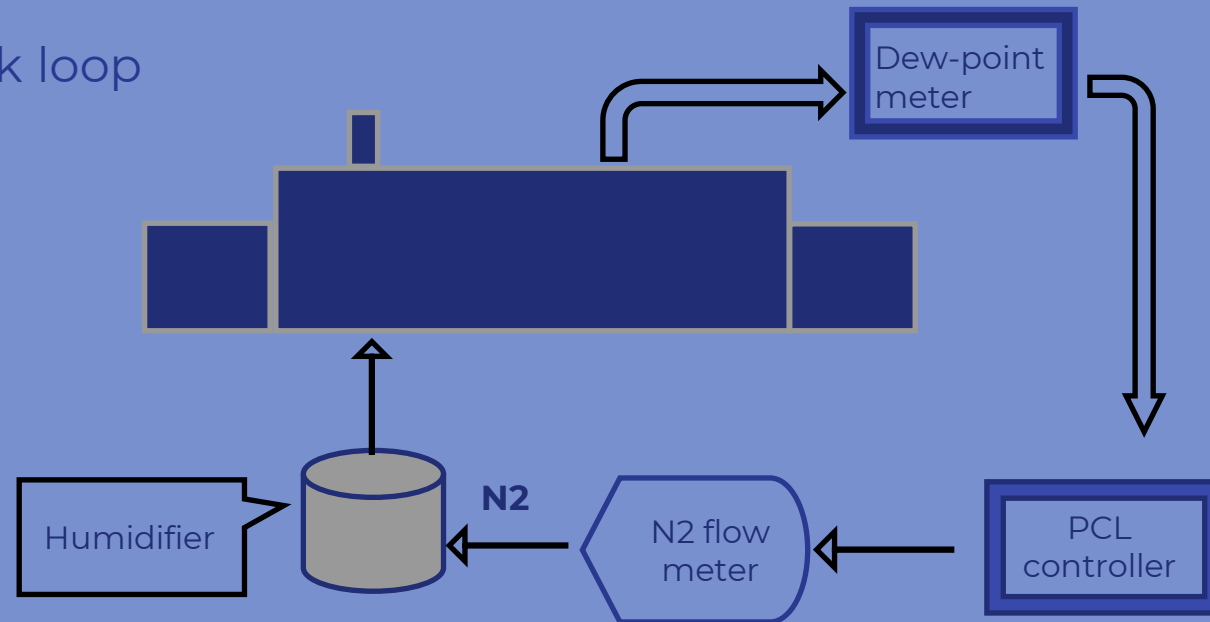
Fe₂O₃ has a loose structure and insufficient bonding strength with glass

Controlling the amount of Fe₂O₃ is Controlling the thickness of the oxide layer

Controlling the dew point in the furnace is controlling the thickness of the oxide layer

Problems and Key Technologies in GTMS

Dew point feedback loop



- ◆ Great Dew point feedback loop, accuracy $\pm 1^{\circ}\text{C}$
- ◆ The U.S. Dew-point meter, with a probe protective filter, increased stability of dew point detection

Problems and Key Technologies in GTMS



With a wide furnace, the oxidations at left, middle and right points are inconsistent, resulting in inconsistent product performance

Problem 2: The furnace belt is wide, so the sealing performance of the product is inconsistent

Major reason :

The inlet air at the heating and high temperature zone is the key. The uneven air intake will lead to inconsistent sealing performance of the product.

Problems and Key Technologies in GTMS

How to control ATMO for GTMS

ATMO control system

- Stable gas inlet
- Well mix of wet and dry N₂
- Evenly gas inlet

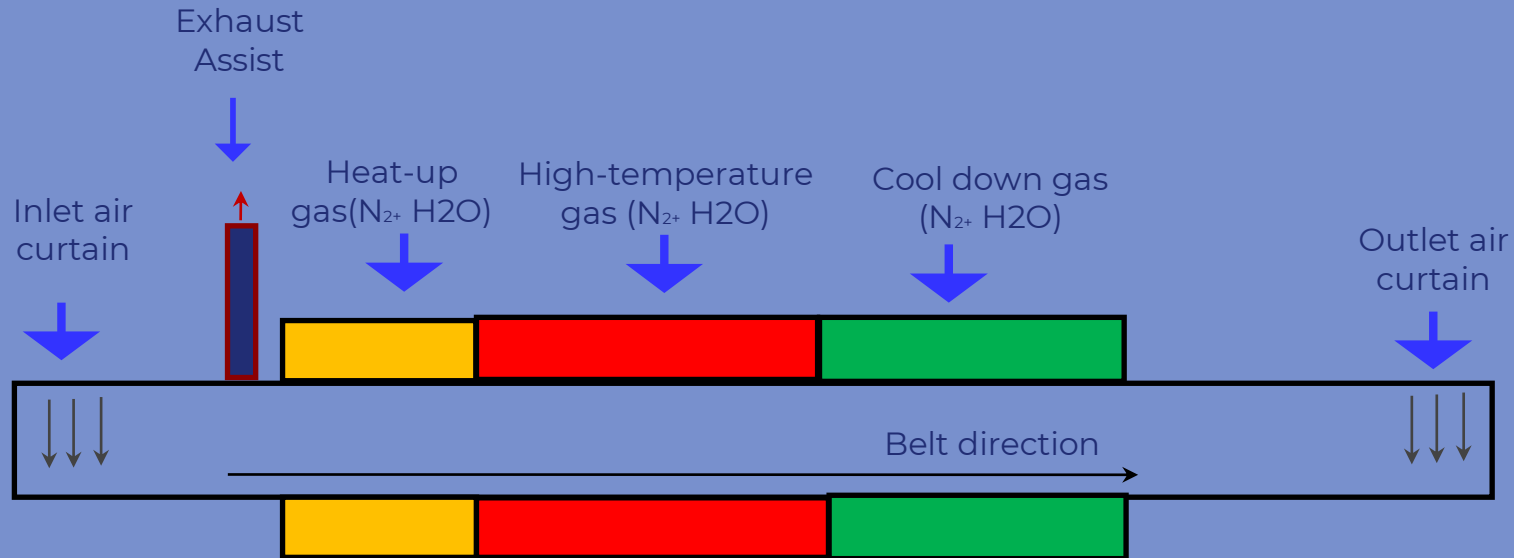
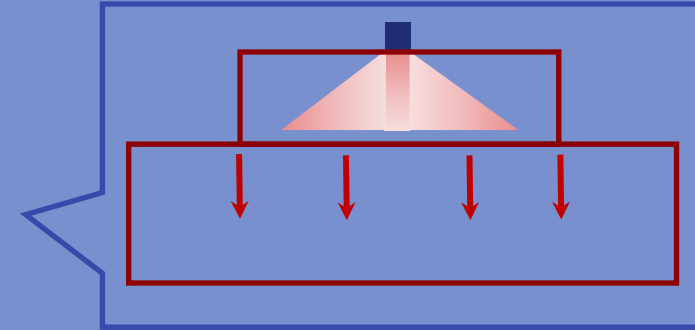
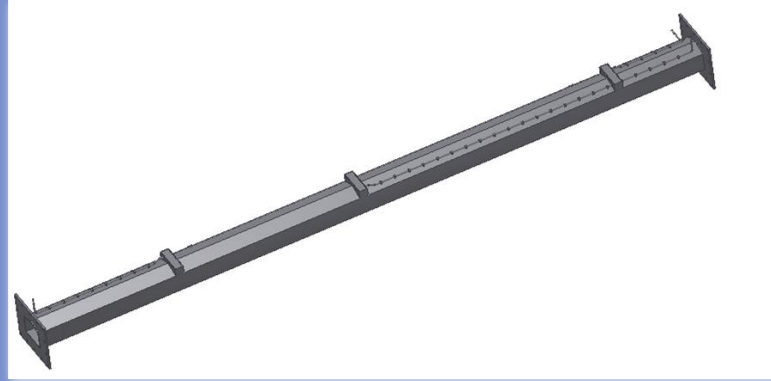


Diagram of atmosphere control furnace

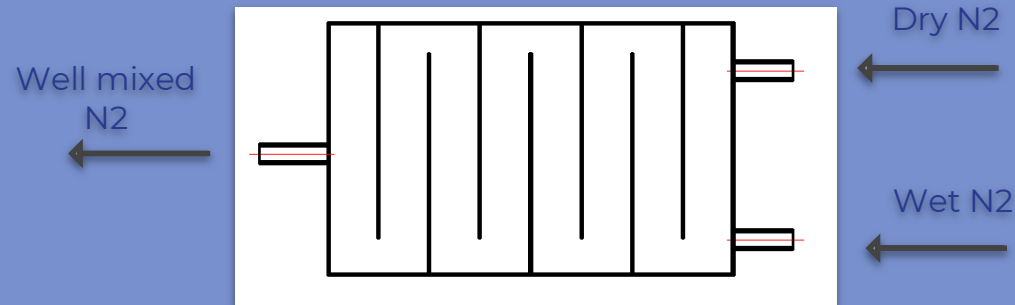
Problems and Key Technologies in GTMS



Multi-stage regulated air inlet system can effectively avoid the interference of air source pressure fluctuation



Special air box layout can ensure the uniformity of air intake

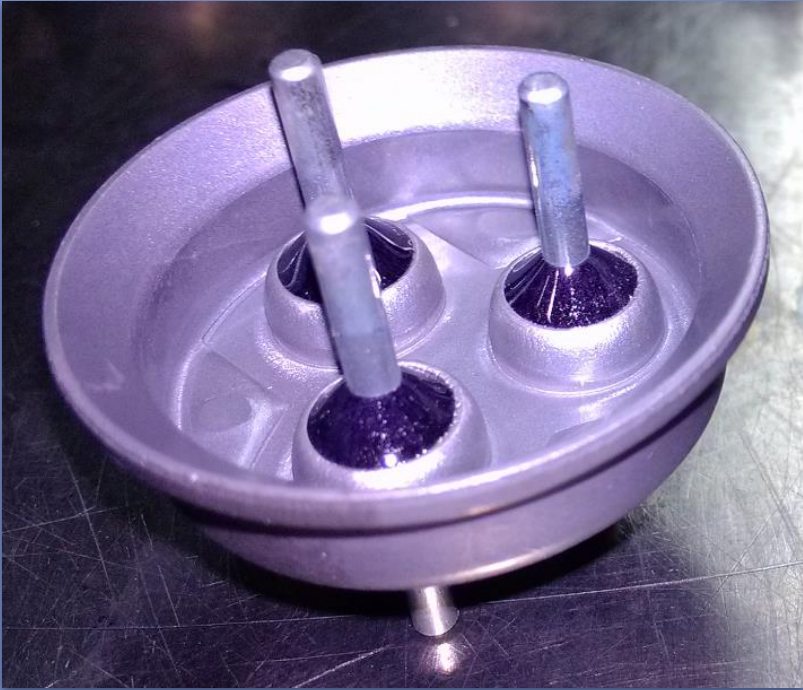


Multi-layer curtain ensures that uniform dew point is stable



Up to 400mm belt width, products will allow for good oxidation consistency and product performance consistency after sealing

Problems and Key Technologies in GTMS



After sintering, the glass is easy to crack in the subsequent process

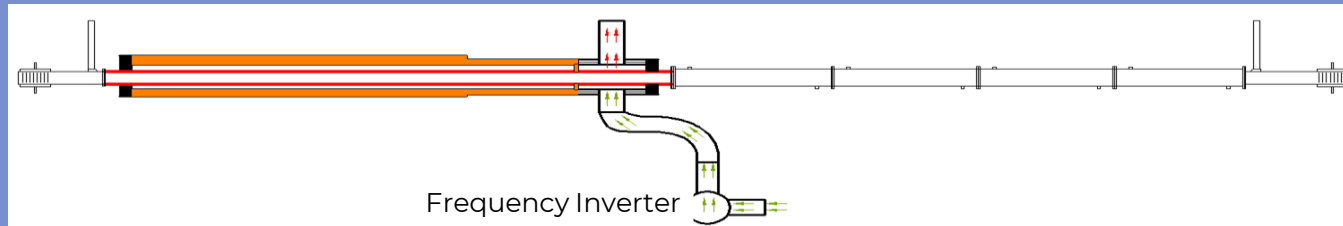
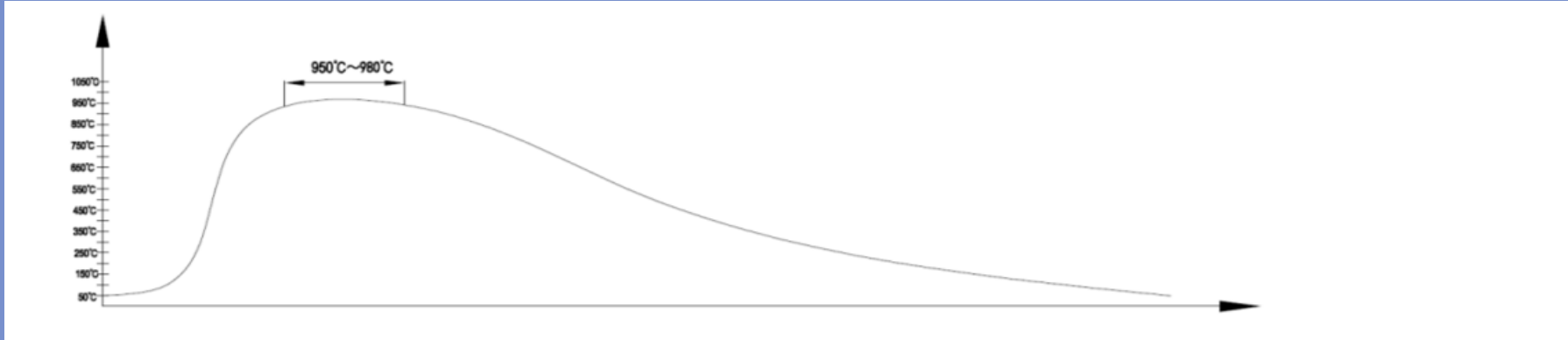
Question 3: The glass is easy to crack in the following process after the sealing is completed

Major reason :

After the sealing is completed, the cooling rate is not controlled, so there is a stress on the glass

Problems and Key Technologies in GTMS

Controllable cooling rate technology



GTMS slow cooling curve and equipment structure diagram

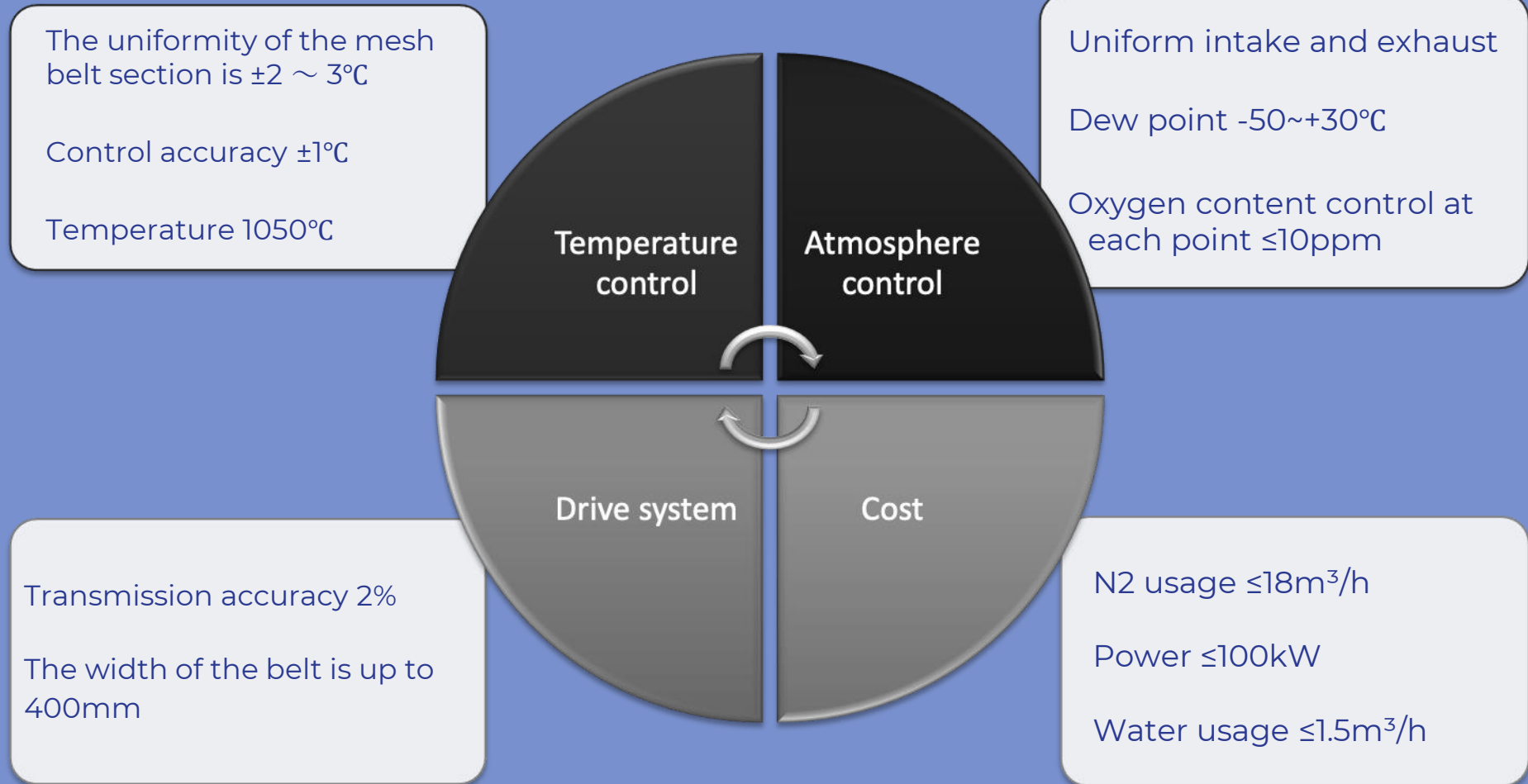
Optimize the structural design and extend heat preservation and cooling time, with an air cooling device in the cooling zone. Which can control the cooling rate of the product. Better annealing results and it can remove the internal stress of the product, which prevents cracking in the subsequent process.



Key Indicators

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HSA Belt Furnace (GTMS)



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If you are interested in our furnace line or want to save some money on your next furnace project, please also check out website:

<https://www.beltfurnaces.com>

If you want to talk to someone about your next furnace purchases, please contact:

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