正昌粮机股份
ZHENGCHANG CEREAL AND FEED MACHINERY

# SHWZ/T Series Horizontal Dryer

Zhengchang Research Institute


Stability and Reliability Contribute to Long-term Development

# Brief Introduction

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Storage Performance

Water Resistance

Appearance Quality


The horizontal dryer is the key equipment and necessary equipment for the successful production of aquatic feeds and pet food.

# Technical Parameters

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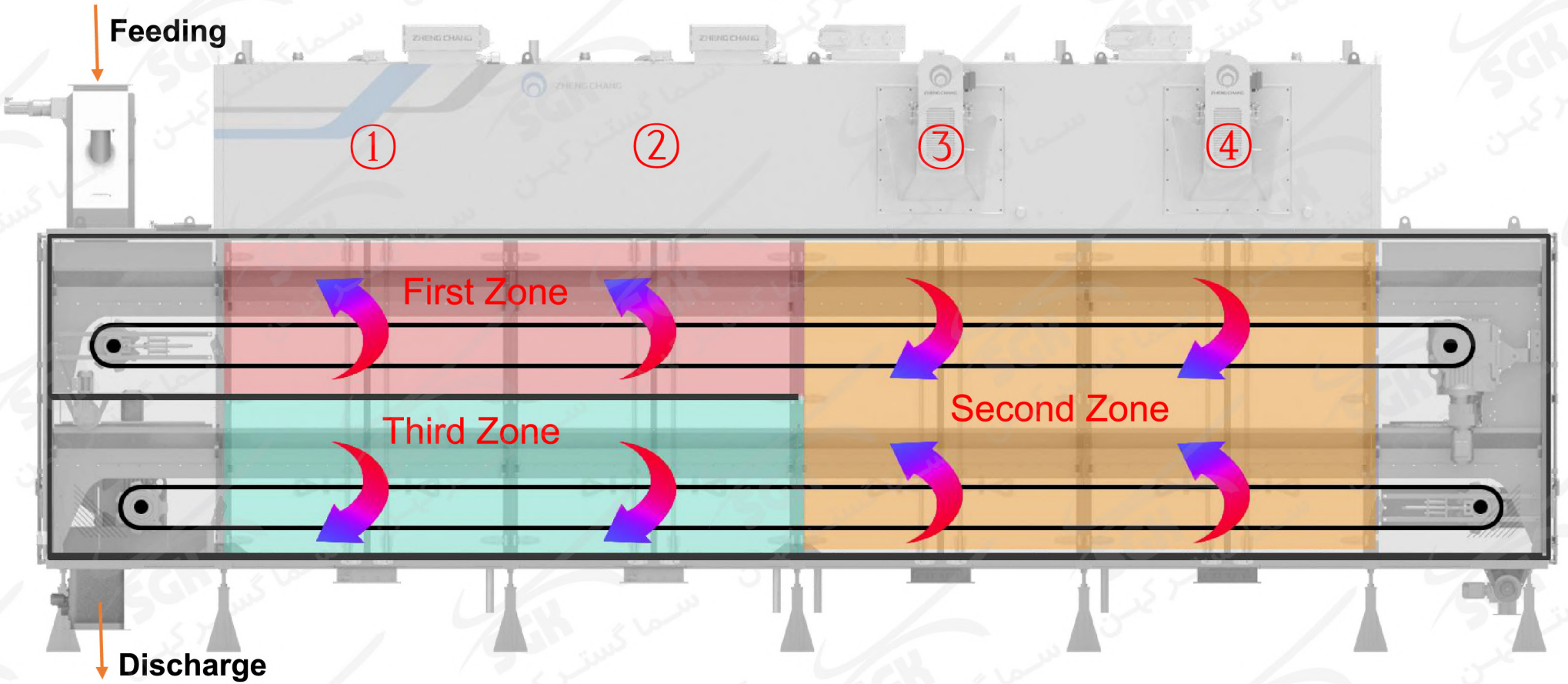
Steam Type


Natural Gas Type

| | Number of Drying Sections | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| SHWZ/T 220×2 | Capacity (floating feed: φ3-φ5mm, t/h) | 2.0 ~ 2.5 | 3.5 ~ 4.5 | 5 ~ 5.5 | 6 ~ 7 | 7.5 ~ 8.5 | 9.0 ~ 9.5 | 10 ~ 11 |
| | Capacity (sinking feed: φ3-φ5mm, t/h) | 1.0 ~ 1.7 | 1.5 ~ 2.5 | 2.5 ~ 3.5 | 3.5 ~ 4 | 4.5 ~ 5.0 | 5 ~ 6 | 6 ~ 7 |
| | Power (KW) | 36.5 | 51.5 | 66.5 | 81.5 | 96.5 | 112.2 | 127.2 |
| | **Number of Drying Sections** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| SHWZ/T 300×2 | Capacity (floating feed: φ3-φ5mm，t/h) | 3.0 ~ 3.5 | 5.0 ~ 5.5 | 7.0 ~ 7.5 | 8.5 ~ 9.5 | 10 ~ 11 | 12 ~ 13 | 14 ~ 15 |
| | Capacity (sinking feed: φ3-φ5mm，t/h) | 1.5 ~ 2.0 | 3.0 ~ 3.5 | 4.0 ~ 4.5 | 5.0 ~ 6.0 | 6.0 ~ 7.0 | 7.5 ~ 8.5 | 8.5 ~ 9.5 |
| | Power (KW) | 43.5 | 62.0 | 80.5 | 99.0 | 117.5 | 138 | 156.5 |

Note：SHWZ is a Steam type dryer, SHWT is a Natural Gas type dryer.

# Temperature Zone Setting and Air Path Design

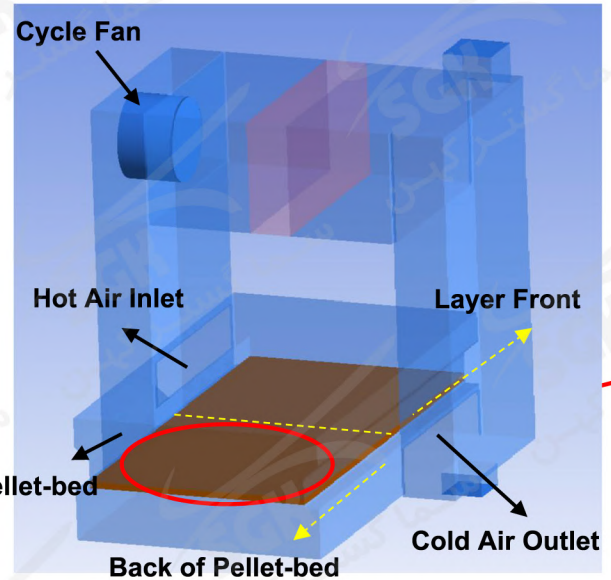



- The whole equipment adopts reversing through-flow drying technology and reasonable temperature zone design, which is more energy-saving.

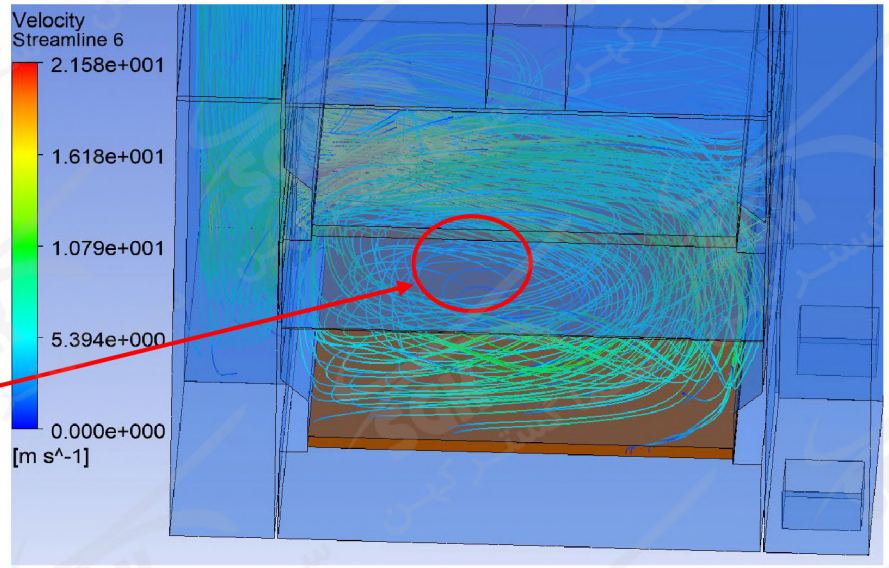
# Temperature Zone Setting and Air Path Design


- The airflow direction through the pellet-bed is changed with the drying process, so that the pellet-bed is heated evenly and the drying is more uniform. The moisture uniformity after drying is <±0.5%.

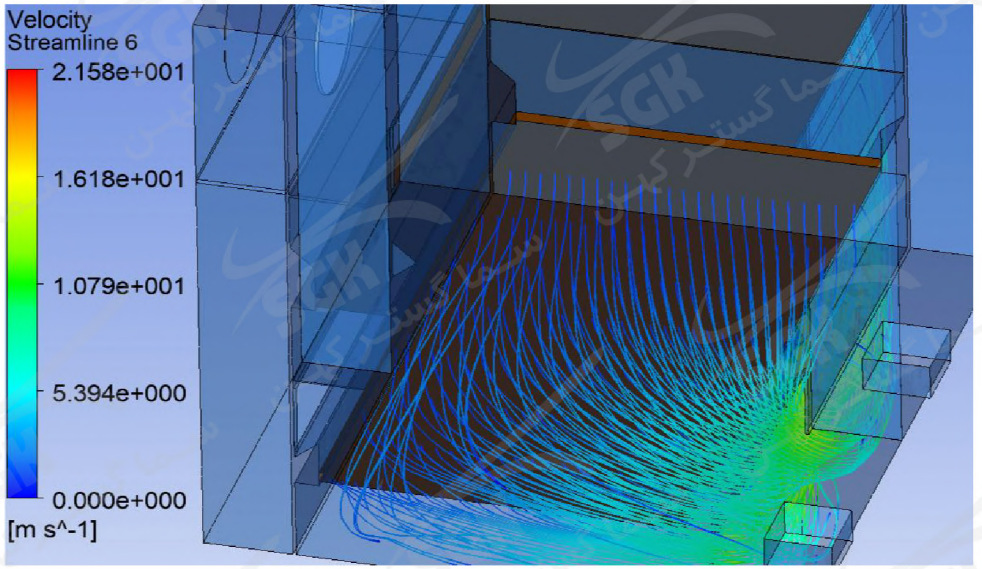
# CFD Airflow Simulation




Temperature Zone Model




Side Streamline Diagram of Air Intake



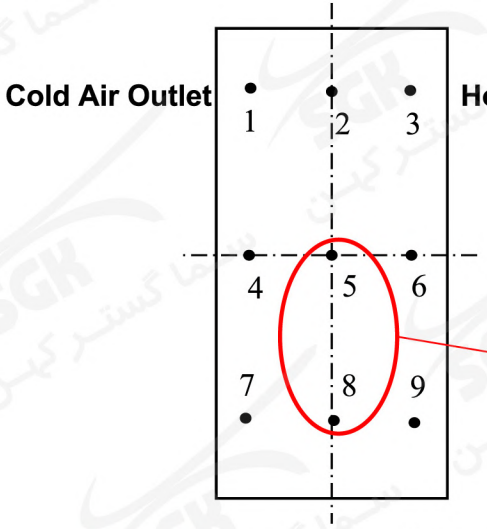

Side Streamline Diagram of Air Outlet

- The airflow distribution inside the dryer is very important, which not only determines the drying efficiency and energy consumption, but also determines the uniformity of product moisture.
- Through the CFD airflow simulation analysis inside the dryer, there will be an airflow "vortex" in the red circle area. The air volume passing through the pellet-bed is small, and the drying effect is poor.

# CFD Airflow Simulation

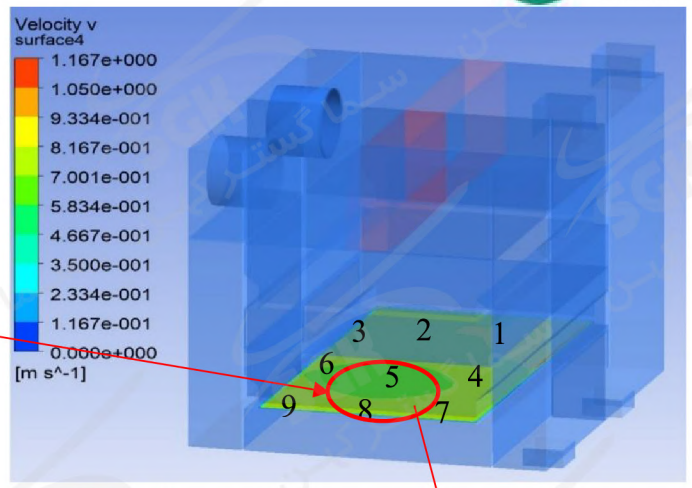
Smoke Test 1

Smoke Test 2




Anemometer Measuring Point Position 1

Anemometer Measuring Point Position 2



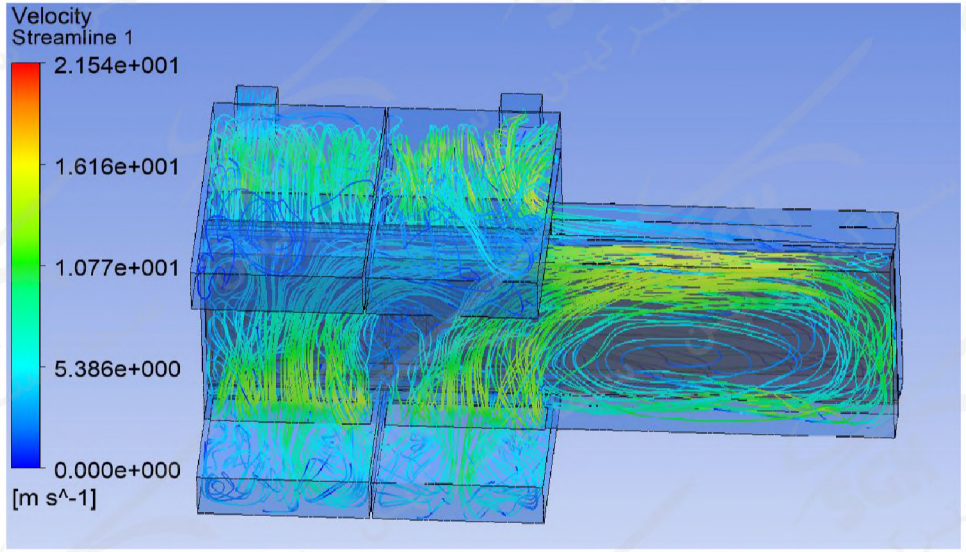

CFD Velocity Profile

| | Wind Speed m/s_30Hz | Wind Speed m/s_35Hz |
|---|---|---|
| 1 | 0.83 | 0.91 |
| 2 | 0.99 | 1.16 |
| 3 | 0.8 | 0.9 |
| 4 | 0.9 | 1.11 |
| 5 | 0.3 | 0.36 |
| 6 | 0.62 | 0.71 |
| 7 | 0.75 | 1 |
| 8 | 0.23 | 0.27 |
| 9 | 1.02 | 1.08 |
| Average Data | 0.72 | 0.83 |
| Standard Deviation | 0.283 | 0.324 |

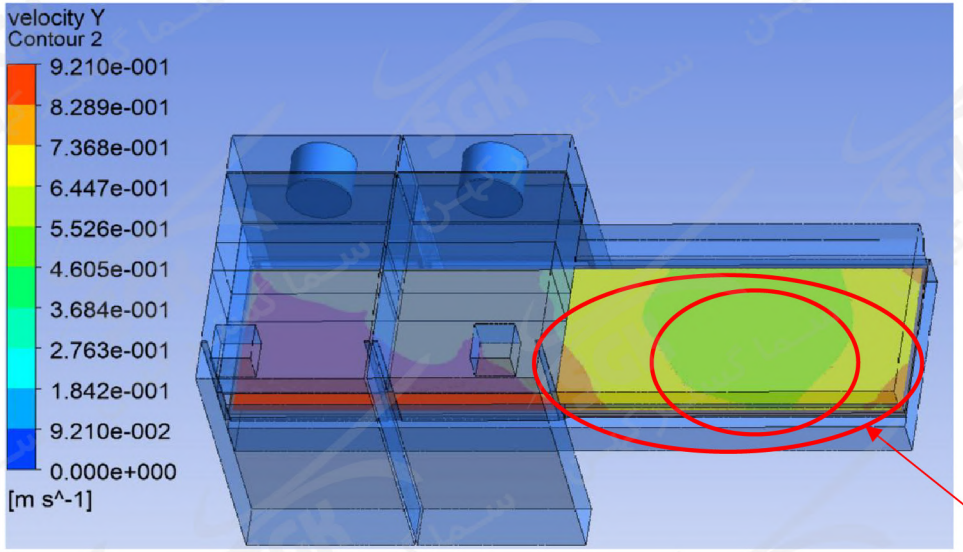
In the center of the vortex, the wind speed is relatively small.

- In the smoke experiment, it can be observed that the airflow enters to form a vortex on the pellet-bed, and then gradually spreads to the farthest point, which is consistent with the CFD analysis results.
- Through the vertical wind speed test of the pellet-bed, the wind speed is consistent with the CFD analysis results.

# CFD Airflow Simulation

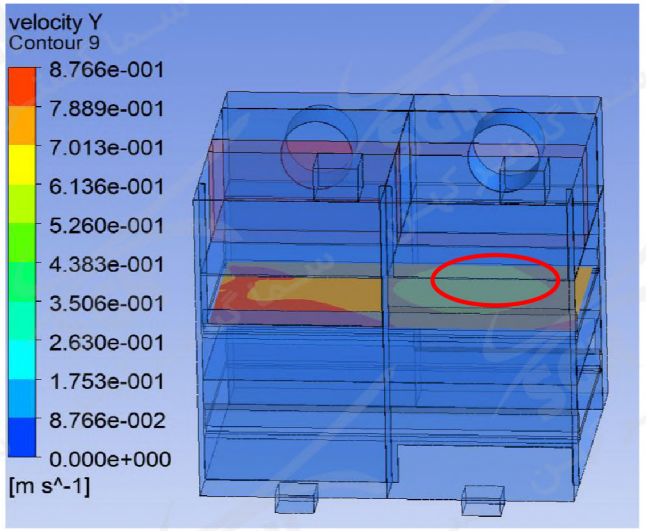



**The streamline diagram after increasing the length of the temperature zone**




**Velocity distribution diagram after increasing the length of the temperature zone**

From the streamline diagram, the longer the temperature zone, the larger the influence range of the vortex zone; it can be seen intuitively from the wind speed on the surface of the pellet-bed that the uniformity of the wind speed is also getting worse. Therefore, the dryer must be divided into reasonable temperature zones.




The influence range of the vortex area increases, and the uniformity of wind speed becomes worse.

# CFD Airflow Simulation

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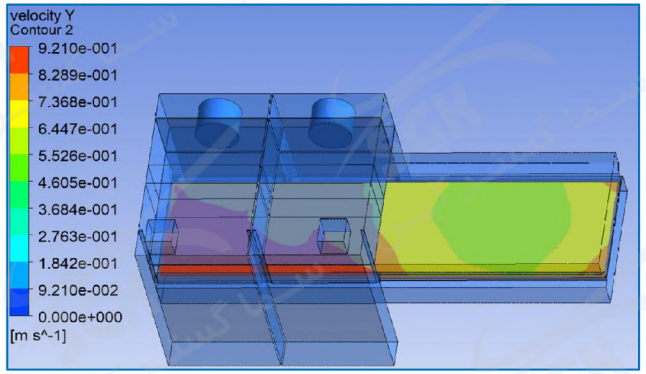
## Comparison of the uniformity of air path in the temperature zone between other competitors and our company

The vertical speed of the pellet-bed in the temperature zone of competitors




| | velocity Y [ m s^-1 ] |
|---|---|
| 1 | |
| 2 | 7.61E-01 |
| 3 | 7.60E-01 |
| 4 | 7.61E-01 |
| 5 | 7.62E-01 |
| 6 | 7.58E-01 |
| 7 | 7.58E-01 |
| 8 | 7.55E-01 |
| 9 | 7.54E-01 |
| 10 | 7.52E-01 |
| 11 | 7.51E-01 |
| 12 | 7.49E-01 |
| 13 | 7.48E-01 |
| 14 | 7.46E-01 |
| 15 | 7.43E-01 |
| 16 | 7.42E-01 |
| 17 | 7.39E-01 |
| 18 | 7.38E-01 |
| 19 | 7.35E-01 |
| 20 | 7.33E-01 |

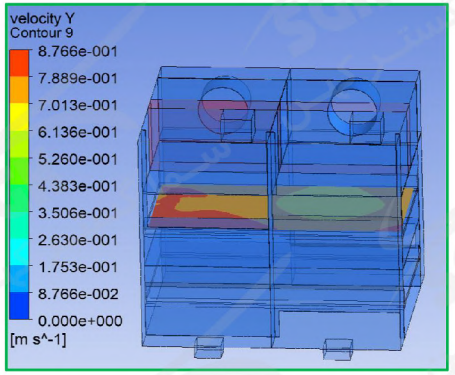
| | | |
|---|---|---|
| 20430 | 7.67E-01 | |
| 20431 | 7.79E-01 | |
| 20432 | 7.94E-01 | |
| 20433 | 8.01E-01 | |
| 20434 | 8.01E-01 | |
| 20435 | 8.14E-01 | |
| 20436 | 8.16E-01 | |
| 20437 | 8.17E-01 | |
| 20438 | 7.86E-01 | |
| 20439 | 6.48E-01 | |
| 20440 | 5.88E-01 | |
| 20441 | 7.65E-01 | |
| 20442 | 平均值m s^-1 | 7.41E-01 |
| 20443 | 标准差 | 0.095446 |
| 20444 | | |
| 20445 | | |
| 20446 | | |
| 20447 | | |

**Competitors:**

Average wind speed: 0.741m/s

Standard deviation: 0.0954

The vertical speed of the pellet-bed in the temperature zone of Zhengchang




| | velocity Y [ m s^-1 ] |
|---|---|
| 1 | |
| 2 | 7.76E-01 |
| 3 | 7.76E-01 |
| 4 | 7.75E-01 |
| 5 | 7.75E-01 |
| 6 | 7.74E-01 |
| 7 | 7.73E-01 |
| 8 | 7.72E-01 |
| 9 | 7.71E-01 |
| 10 | 7.71E-01 |
| 11 | 7.70E-01 |
| 12 | 7.68E-01 |
| 13 | 7.68E-01 |
| 14 | 7.66E-01 |
| 15 | 7.65E-01 |
| 16 | 7.64E-01 |
| 17 | 7.63E-01 |
| 18 | 7.61E-01 |
| 19 | 7.60E-01 |
| 20 | 7.58E-01 |

| | | |
|---|---|---|
| 10130 | 7.46E-01 | |
| 10131 | 7.47E-01 | |
| 10132 | 7.49E-01 | |
| 10133 | 7.51E-01 | |
| 10134 | 7.52E-01 | |
| 10135 | 7.54E-01 | |
| 10136 | 7.56E-01 | |
| 10137 | 7.57E-01 | |
| 10138 | 7.59E-01 | |
| 10139 | 7.59E-01 | |
| 10140 | 7.60E-01 | |
| 10141 | 7.61E-01 | |
| 10142 | 7.64E-01 | |
| 10143 | 7.68E-01 | |
| 10144 | 7.73E-01 | |
| 10145 | 7.79E-01 | |
| 10146 | 7.84E-01 | |
| 10147 | 7.87E-01 | |
| 10148 | 7.79E-01 | |
| 10149 | 平均值m s^-1 | 7.48E-01 |
| 10150 | 标准差 | 0.048591 |
| 10151 | | |

**Zhengchang:**

Average wind speed: 0.748m/s

Standard deviation: 0.0486

The data shows that the uniformity of wind speed inside our equipment is better than that of our competitors.

# Main Body of the Equipment

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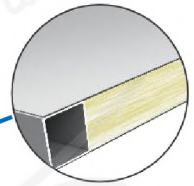
- New Material
- New Structure
- New Technology

**100mm Aluminum Silicate Wool Insulation**

Thermal insulation without hot touch



**"Butterfly" Type Cycle Fan**

Stable transmission, more energy-saving

**Fully Enclosed Distributor**

Reduce production odor



**Intelligent Control System**

Stable and labor-saving

**Fully Enclosed Structure**

Environmental friendly and hygiene, beautiful appearance

**All Stainless Steel Appearance**

Durable, easy to clean and maintain

**Air Duct Cleaning System**

Cleaning is more efficient

**Online Moisture Monitoring System**

Online moisture real-time monitoring

# Equipment Configuration —— Spreader and Moisture Monitoring

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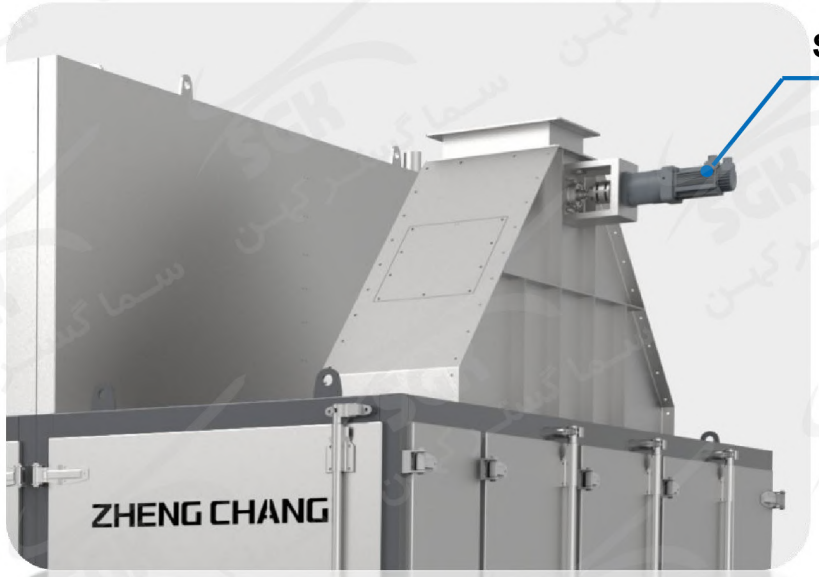



- Imported moisture sensor.

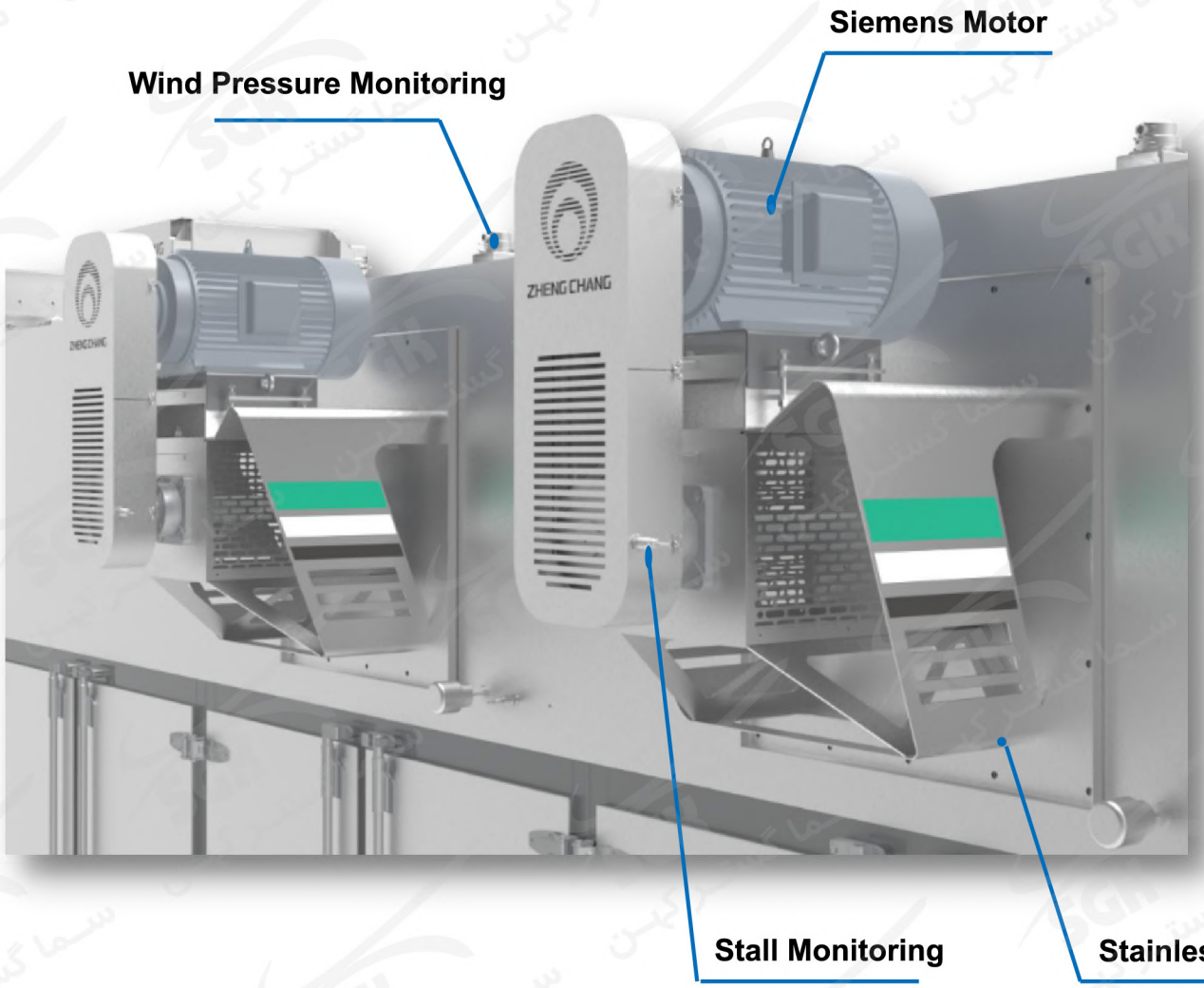
- Multi-channel data model, suitable for online real-time monitoring of moisture in different particles with multiple varieties and formulas.

- Closed structure, effectively reducing production odor.

- Servo motor driven feeder ensures pellet-bed uniformity.

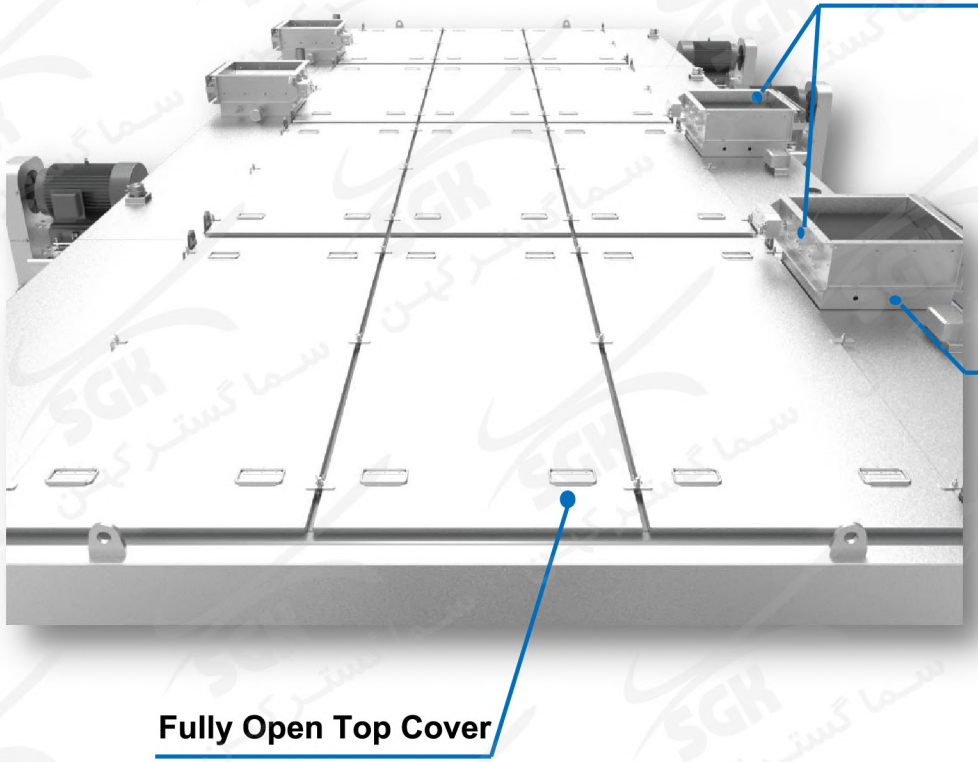
# Equipment Configuration —— Cycle Fan






- "Butterfly" type patent fan base, stable transmission;
- All stainless steel brushed appearance, hygienic and environmental friendly;
- Frequency conversion adjustment, the circulating air volume is adjusted according to the characteristics of the material particles;
- Belt driven design, compared with the direct-connected fan, the air volume is large, the air volume adjustment range is wide, and it is more energy-saving.

# Equipment Configuration —— Dehumidification System





- Each temperature zone is equipped with an electric dehumidification air valve.
- Equipped with high-precision humidity sensor.
- Precisely control the air humidity in the dryer, improve the heat utilization rate of the equipment, and reduce the heat consumption of the equipment.

- The fully open top cover design increases the maintenance space and makes maintenance more convenient.

# Equipment Configuration —— Agglomeration Breaking Device and Powder Cleaning System

- All stainless steel 304 material breaking device.
- Effectively break the agglomeration of materials and improve product quality.


- Air duct automatic cleaning.
- Reduce downtime and maintenance time and frequency, convenient and efficient.

# Equipment Configuration —— Perforated Plate

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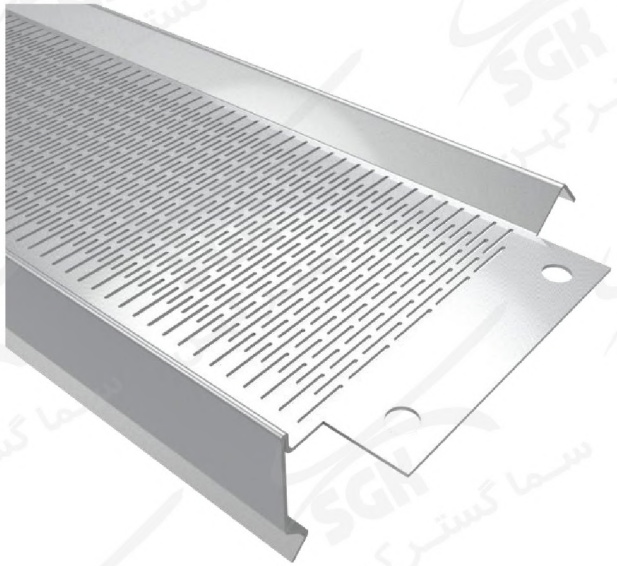
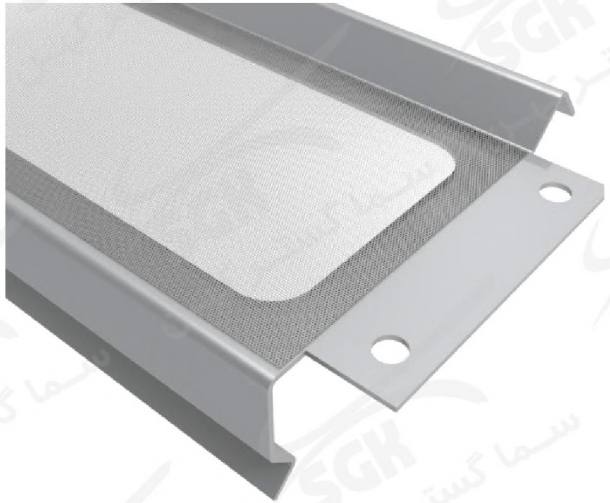
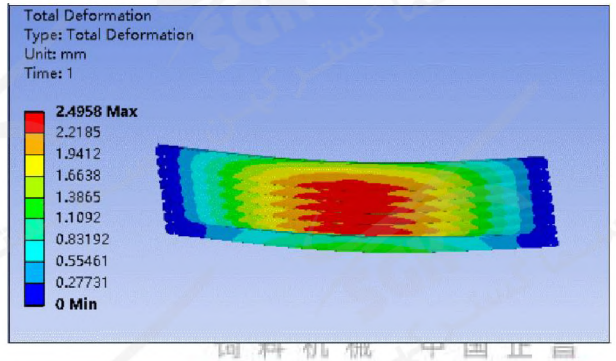
- Particles above Ø0.8mm, equipped with a single-layer punching plate;
- ≥1.5mm 304 stainless steel;
- **"Undercutting"** technology, high strength, not easy to deform and leak.





- Particles below Ø0.8mm, equipped with a laminated punching mesh plate with a high opening rate;
- ≥2mm 304 stainless steel substrate, high strength, tight seal without leakage.

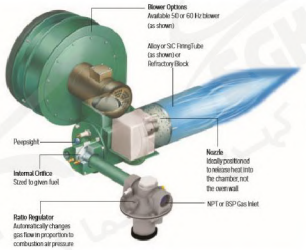


# Equipment Configuration —— Heating Device



- Equipped with imported brand high-quality heat exchanger, reliable and durable.
- The inclined structure is adopted to effectively avoid problems such as low heat transfer efficiency, slow temperature rise, easy damage to the heat exchanger and water leakage caused by water accumulation in the heat exchanger, water hammer, and steam stagnation.
- Standard modular heat exchanger unit, the whole equipment is universal;
- Independent steam inlet and outlet pipes, easier to install and maintain;
- The service life is 5-10 years longer than domestic products.

- Imported brand natural gas combustion system.
- High adjustment ratio, stable temperature control, more uniform drying.
- Independent ignition pipeline, over-temperature automatic protection, safer.
- Comply with European EN746-2 safety standard.
- The natural gas consumption per ton of finished products is 11.5-15 m³.



natural gas heating system

natural gas heating system

# CFD Comparative Analysis —— Gas Heating System

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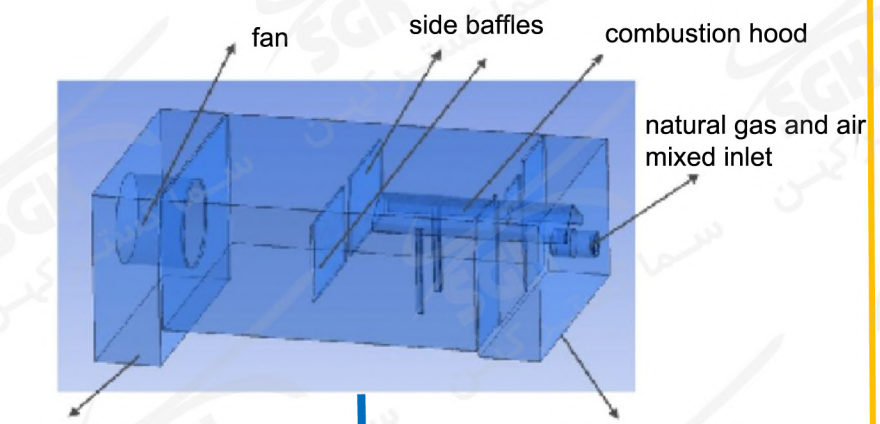
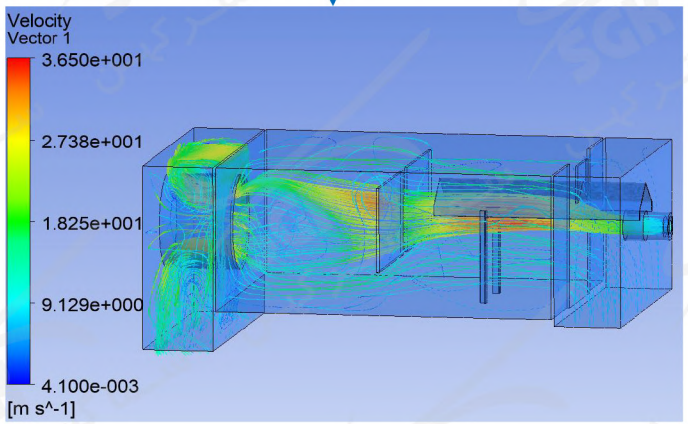
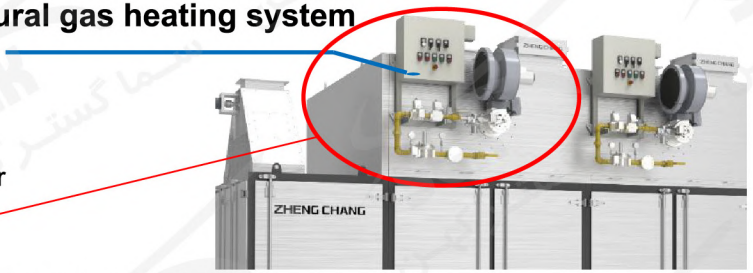
## Competitors

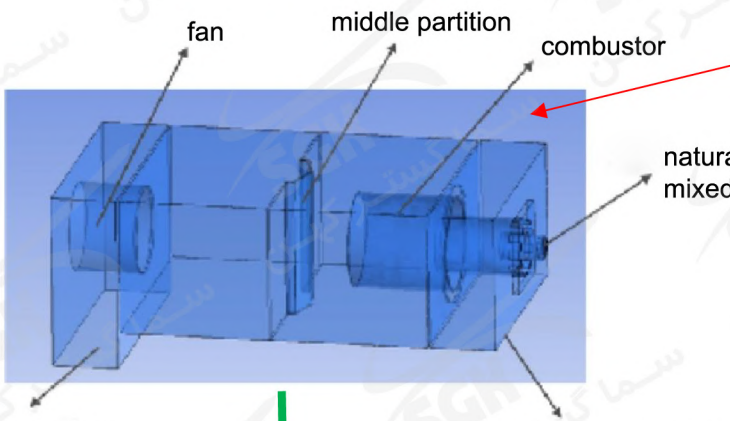


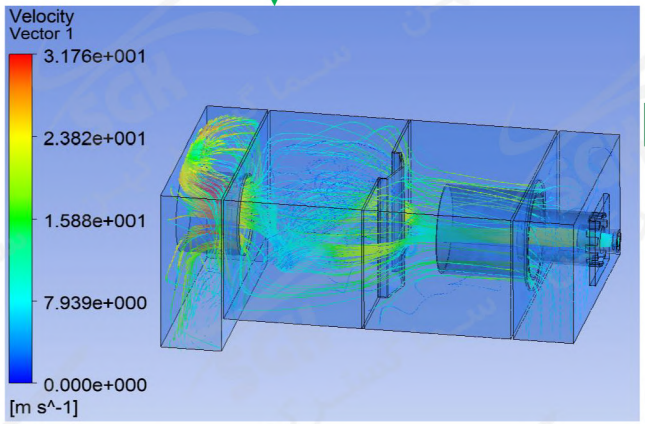




Wind Velocity Field

## Zhengchang




Wind Velocity Field

The different structures of the combustion tube and the fire cone lead to certain differences in the distribution of the internal wind velocity field. It can be seen from the figure that the wind speed inside Zhengchang equipment is more uniform.

# CFD Comparative Analysis —— Gas Heating System

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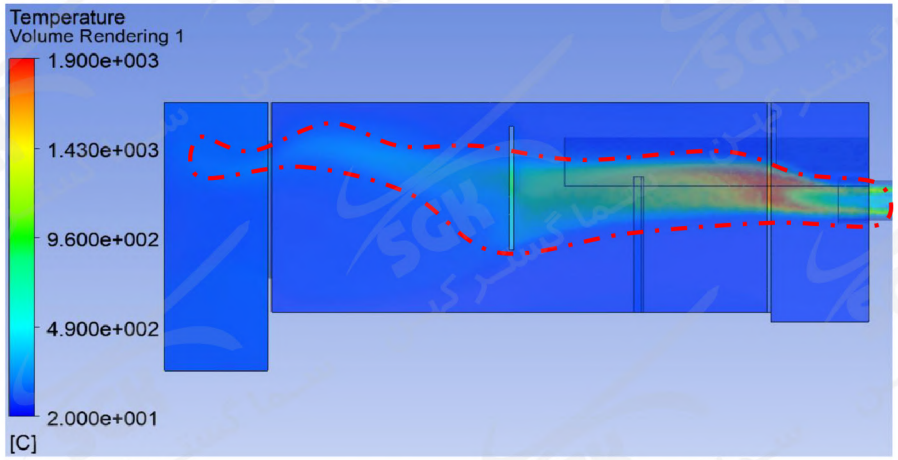
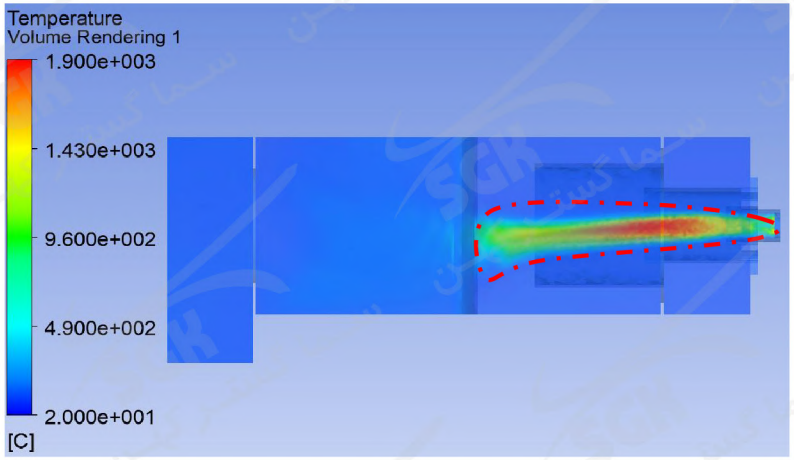
## Competitors




Flame Form

## Zhengchang




Flame Form

- Due to different structures, there are differences in the form of combustion flames.
- Competitors' equipment is more easily affected by the internal airflow, and the flame is easily elongated, unstable, and insufficient combustion, etc., which test the flame stiffness of the burner.
- The flame form of our equipment structure is relatively stable, and the combustion is more complete.

# CFD Comparative Analysis —— Gas Heating System

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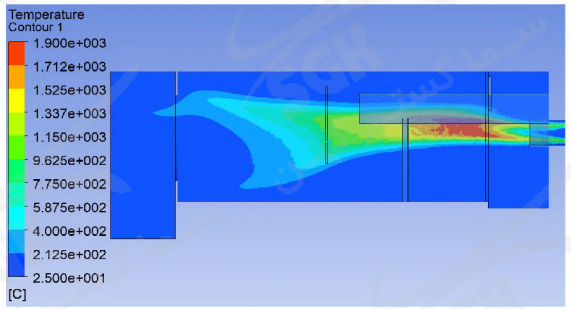
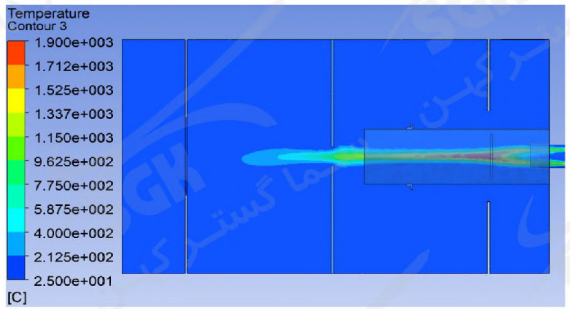
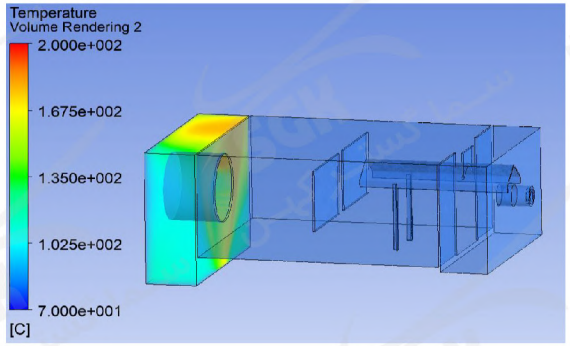
## Competitors

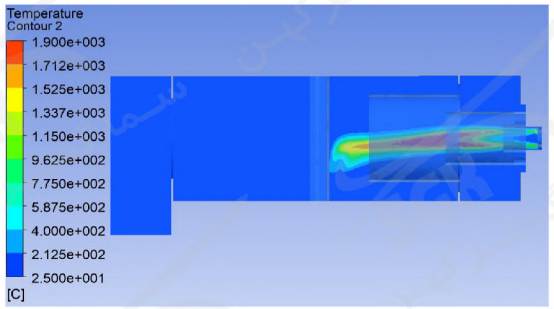


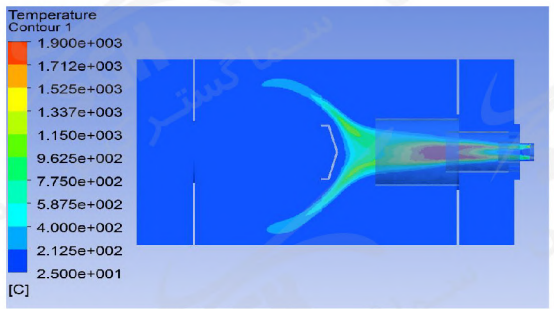



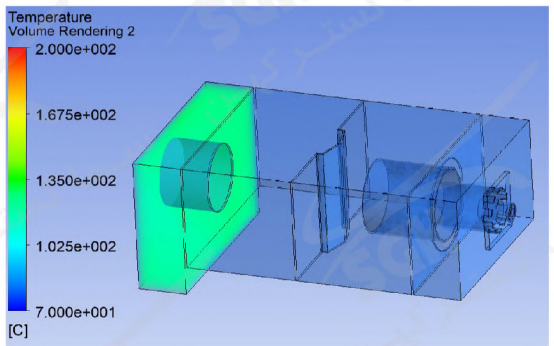




Temperature Field

## Zhengchang



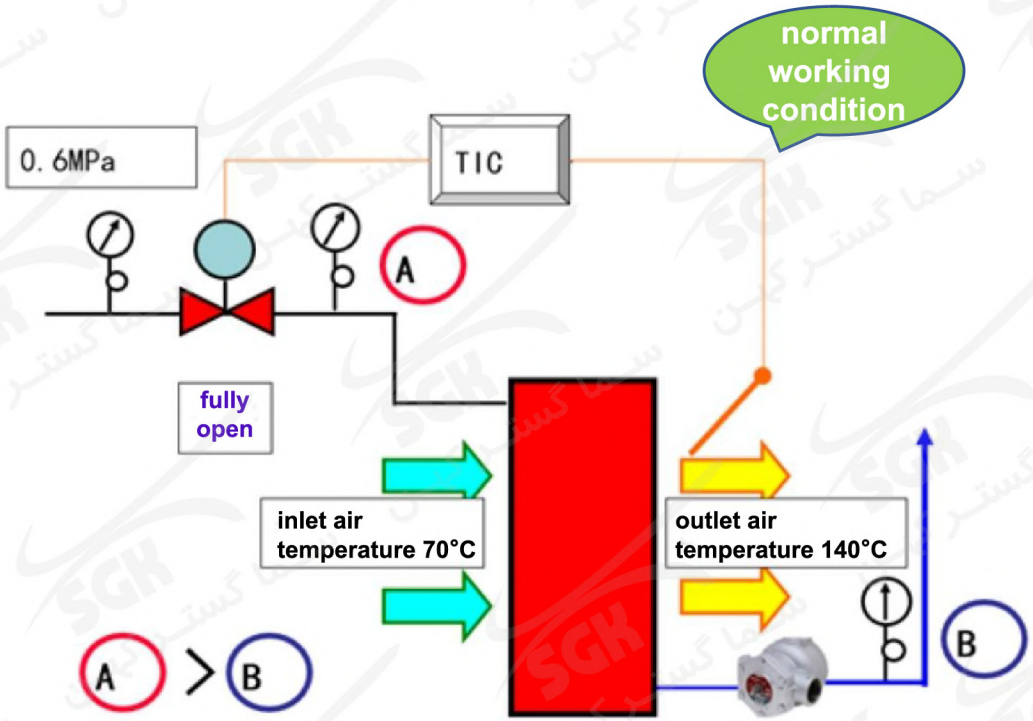



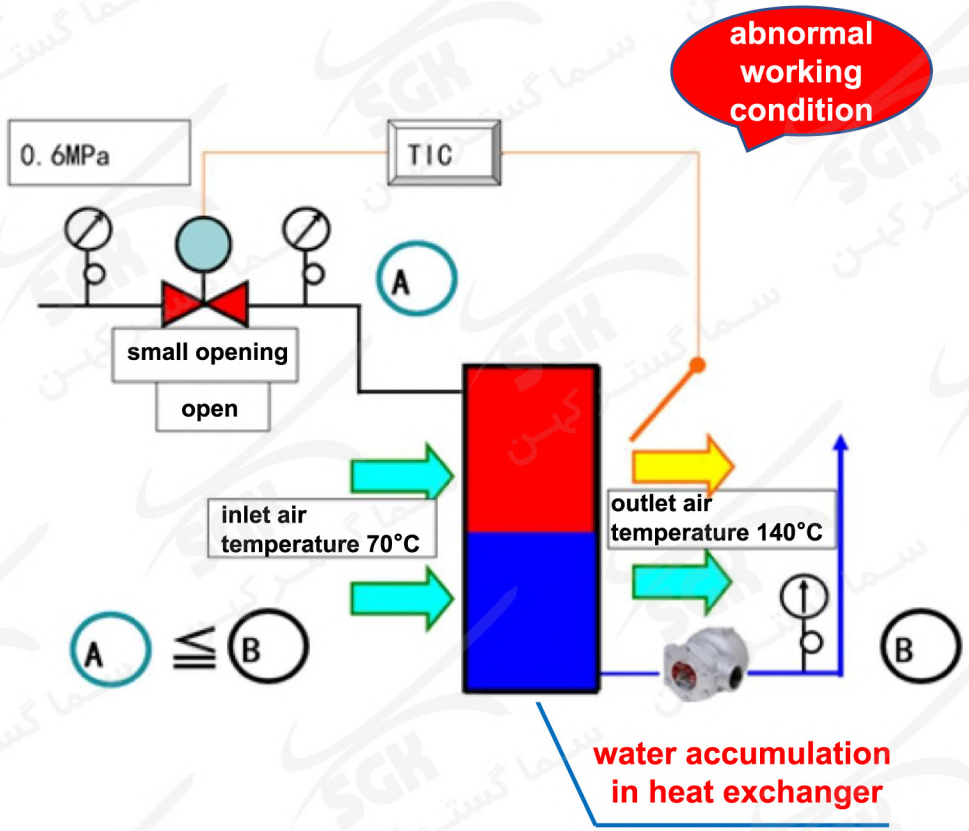




Temperature Field

The air mixing effect of Zhengchang equipment after combustion is more uniform than that of competitors.

# Equipment Configuration —— Steam Heat Exchange System

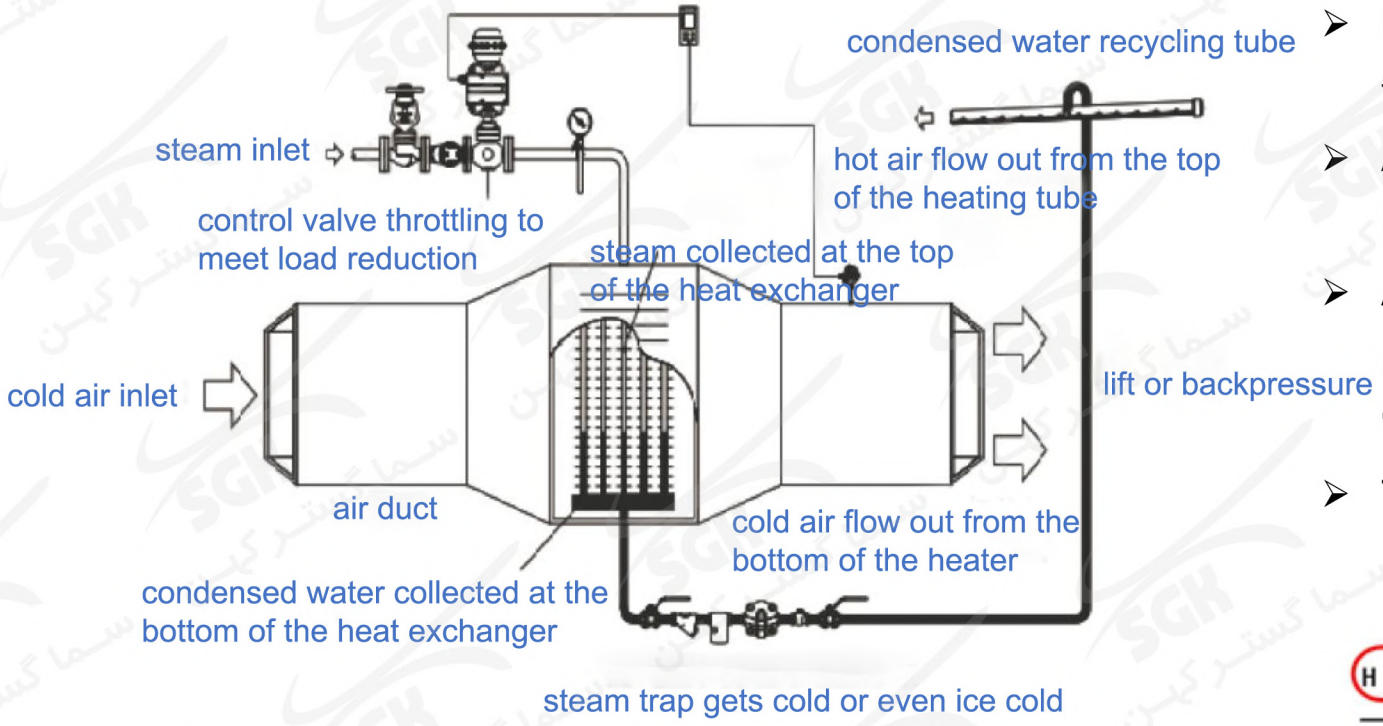


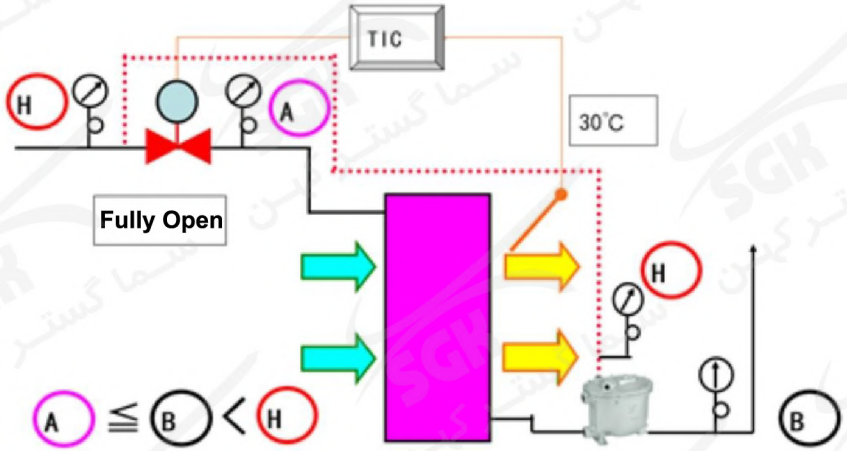

**As the core part of the dryer, the steam heat exchange system is often ignored...**


**“water accumulation", "water leakage", "slow heating", "increased steam consumption", "frozen"...**

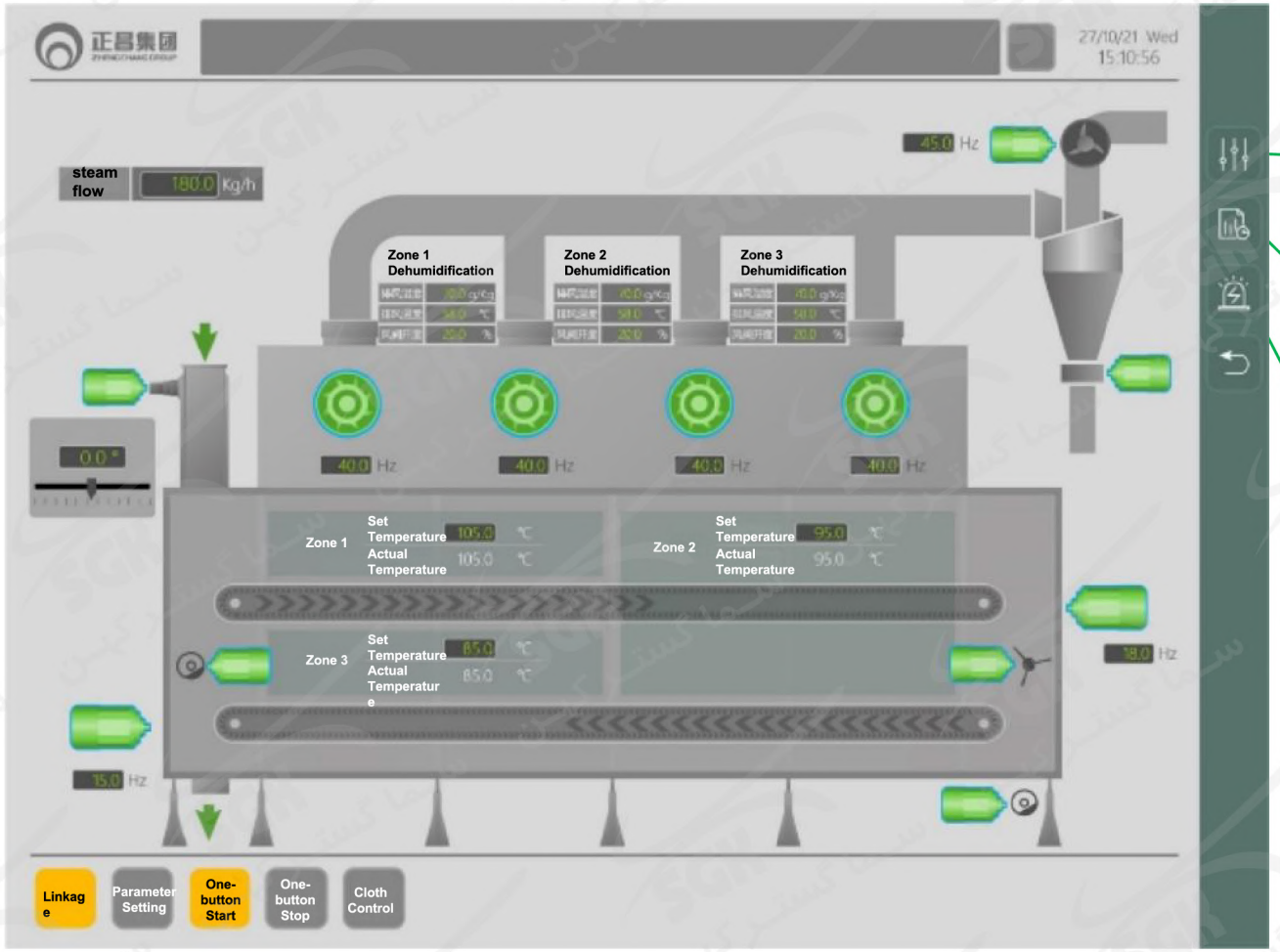
# Equipment Configuration —— Steam Heat Exchange System

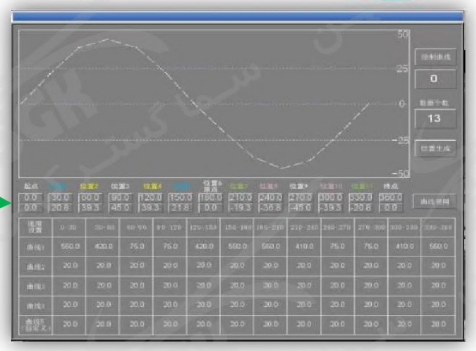



- Equipped with **imported brand steam traps** to improve the reliability of the steam pipeline.
- **Avoid selection of excessive heat exchanger** with low heat exchange efficiency and water accumulation.
- **Actively pressurized steam traps** can be configured to recover condensed water waste heat to solve the "stagnation" phenomenon of the heat exchange system.
- The steam consumption per ton is 170-210 kg.

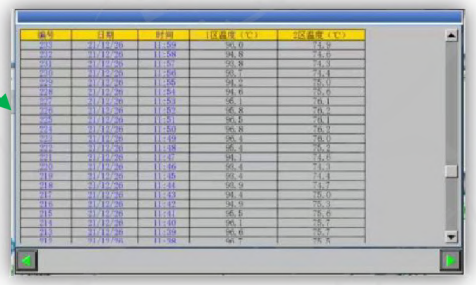


# Equipment Configuration —— Intelligent Control System

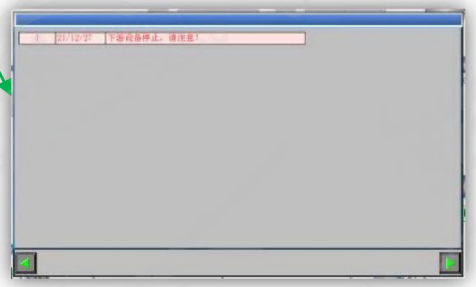


Cloth Control



Production Information Query



Fault Inspection

- The system has the functions of parameter setting, one-button switch, fabric control, production information query, fault inspection, moisture monitoring, energy consumption monitoring and other functions.

# SHWZ/T Horizontal Dryer Configuration

| Key Component | Standard Configuration | Optional Configuration |
|---|---|---|
| Geared Motor | SEW | Brand of the same grade |
| Motor | Siemens | Brand of the same grade |
| Bearing | SKF | Brand of the same grade |
| Ventilation Panel | 304 stainless steel perforated plate | Polyester mesh belt |
| Heating System | Imported brand steam heat exchanger or natural gas burner | |
| Steam Valve | Spirax Sarco | Armstrong |
| Temperature and Humidity Sensor | Imported brand | |

# First-class Brand Outsourcing Parts Suppliers

SEW EURODRIVE
SKF
spirax sarco
Lind Weit
A-B QUALITY Allen-Bradley
LEFOO
Honeywell
OMRON
Danfoss
WITTENSTEIN
Endress+Hauser
People for Process Automation
MOSYE TECHNOLOGIE
BELIMO
Schneider Electric
Armstrong
RIELLO

# Application in Engineering Site


Shandong xiaowantong


Shandong xiaowantong

# Application in Engineering Site



Huaian Shichang


Lianyungang Jiurui

正昌粮机股份
ZHENGCHANG CEREAL AND FEED MACHINERY

# Thank You!


**江苏正昌粮机股份有限公司**

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