

# MATERIALS WEEK EUROPE



## The next speaker is...

**Khan Md Zakaria**

Electrical Engineer, HD and Press  
Specialist

**Magway Tech**

*Advancing NdFeB Magnet Manufacturing  
Through High-Efficiency Automation and  
Integrated Sintering Technologies.*



Scan below for  
Conference Agenda





# **ADVANCING NDFEB MAGNET MANUFACTURING THROUGH HIGH- EFFICIENCY AUTOMATION AND INTEGRATED SINTERING TECHNOLOGIES**

PRESENTAR: KHAN MD ZAKARIA



# About the Company

**Name :** Jiangxi Kaiyuan Automation Equipment Co., Ltd.

**Location:** Based in Ganzhou, Jiangxi—the "Rare Earth Kingdom".

**Establishment:** Founded in 2012; National High-Tech Enterprise.

**Scope:** Professional R&D, design, manufacturing, and global service for specialized NdFeB equipment..

**Flagship Product:** Rotary Hydrogen Decrepitation (HD) Furnace (Independently developed), Magnetic press.

**Strategic R&D:** Deep collaboration with the Chinese Academy of Sciences (Ganzhou Institute) and Jiangxi University of Science and Technology.





# Technical Innovation & Global Reach

**R&D Excellence:** 38 total patent applications, including 11 Invention Patents and 2 PCT international applications.

**Market Leadership:** High Chinese market share with technical indicators matching or exceeding international standards.

**Global Export:** Active operations in the United States, Japan, South Korea, Vietnam, Taiwan, and India.

**Key Clients:** Trusted partner to industry giants like TDK, Shin-Etsu, Star Group, JL MAG, San Huan, Innuovo, Ningbo YunSheng, and Anhui Earth-Panda.

# Manufacturing Line



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- 01** Industry Challenges

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- 02** One-Step Forming

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- 03** Multi-Cavity & Cylindrical Production

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- 04** Press-Sintering Integration

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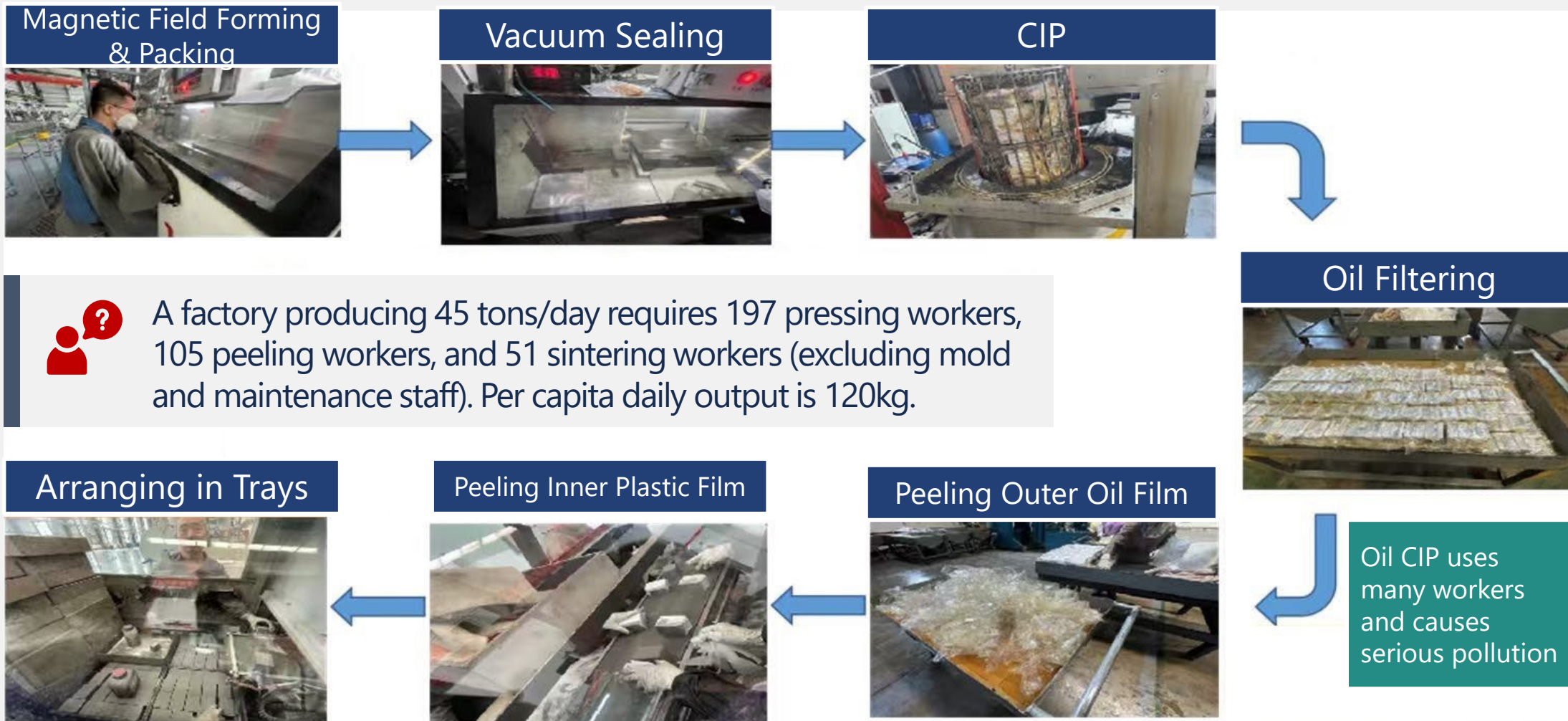
# PART 01

## Industry Challenges

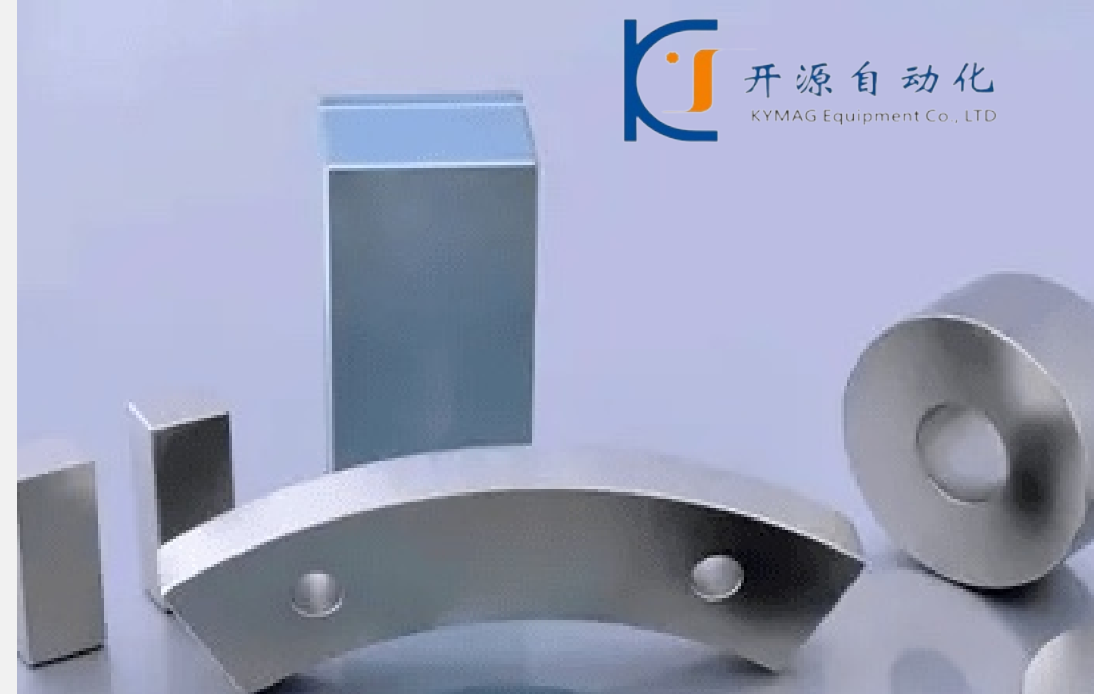
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Examining the inefficiencies, high labor costs, and quality risks of traditional NdFeB manufacturing processes.

## The Inefficiencies of Traditional NdFeB Manufacturing



## Industry Pain Points



### Quality Risks

Oil-based operations pose quality risks and cause hydraulic oil pollution.



### High Costs

High costs for vacuum bags and labor.



### Low Automation

Low automation level for oil CIP; difficult to implement press-sinter automation.



### Post-Sintering Waste

High material loss, low efficiency, and high cost in post-sintering cutting and grinding.



## Multi-Cavity Production

Boosts output by pressing multiple magnets in one cycle.



## One-Step Forming

Eliminates manual packing, oil CIP, and peeling to produce high-strength green compacts in a single automated step.



## Press-Sintering Integration

Connects press and furnace for zero-touch, seamless production.

**Delivering Labor Savings, Material Savings, Environmental Protection, Improved Efficiency & Quality, and Energy Savings**



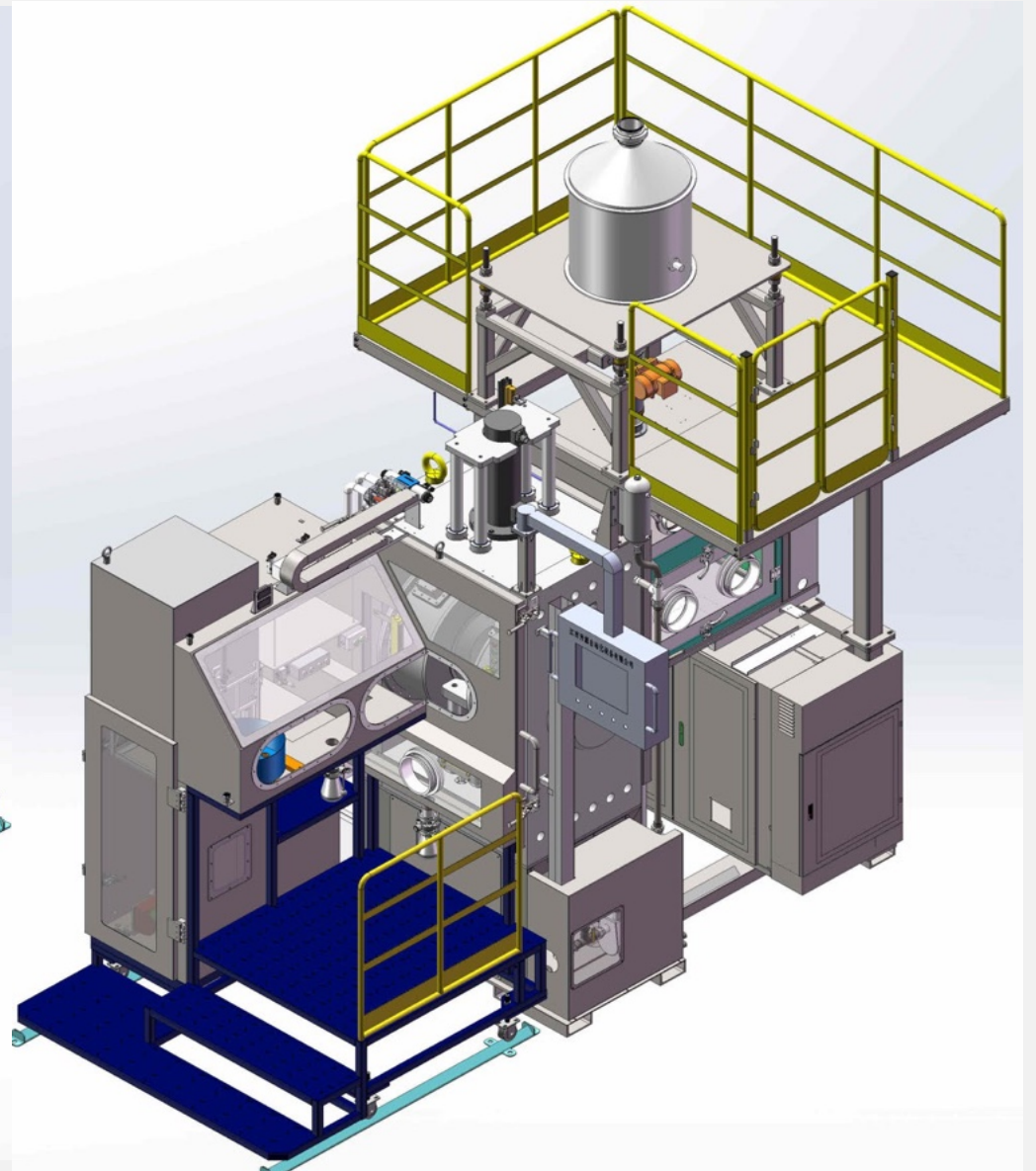
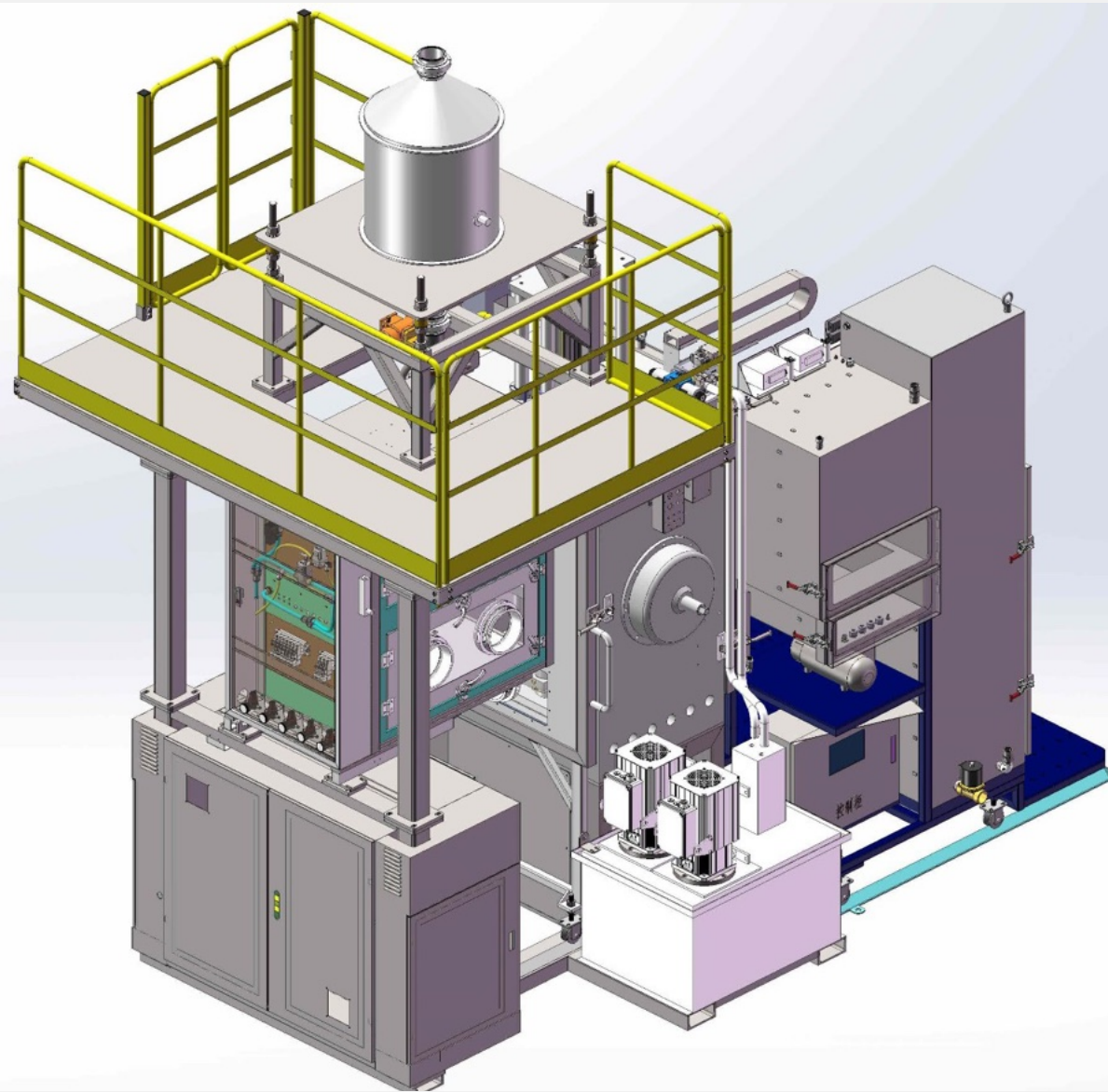
# PART 02

## One-Step Forming

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Introducing KYMAG's automated pressing technology that eliminates manual handling and produces high-quality green compacts in a single step.

# Standard Automatic Press



**Dual pumps, dual motors, compact design, convenient platform**

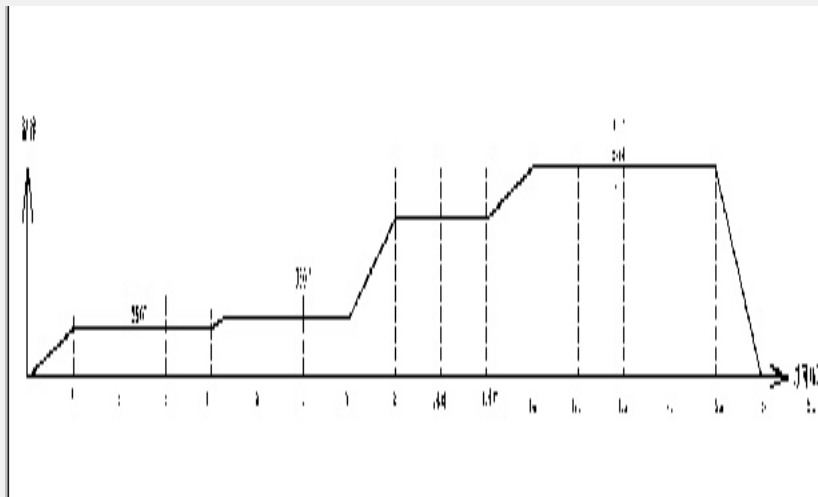
# One-Step Forming - Key Innovations

## Innovation 1: JK-6 Binder

Reduces powder activity, improves jet mill efficiency, minimizes oxidation, and enhances flowability.

Provides both lubrication and binding, increasing density, green compact strength and minimizing cracking.

**key features:** Completely evaporates during sintering with no residue.



## Innovation 2: Magnetic Field Automatic Press

**Fast & Uniform Powder Feeding:** Ensures consistent filling.

**Dual-Motor Servo Control:** Precisely controls pressing speed, position, and pressure for high consistency.

**Variable Pressure Demolding:** Uses air pressure to gently release parts, ensuring no internal cracks.



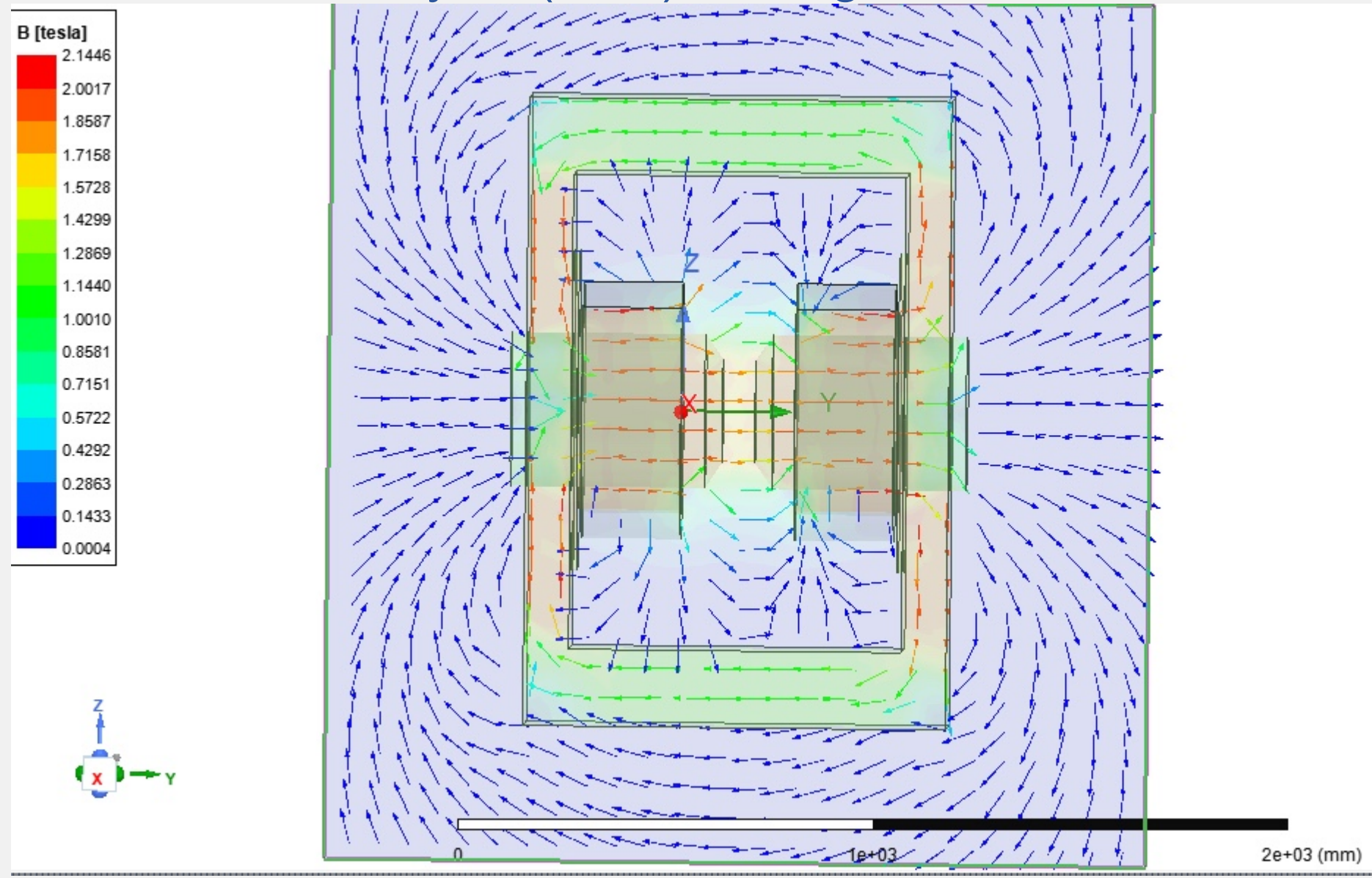
# One-Step Forming

## Key Advantages

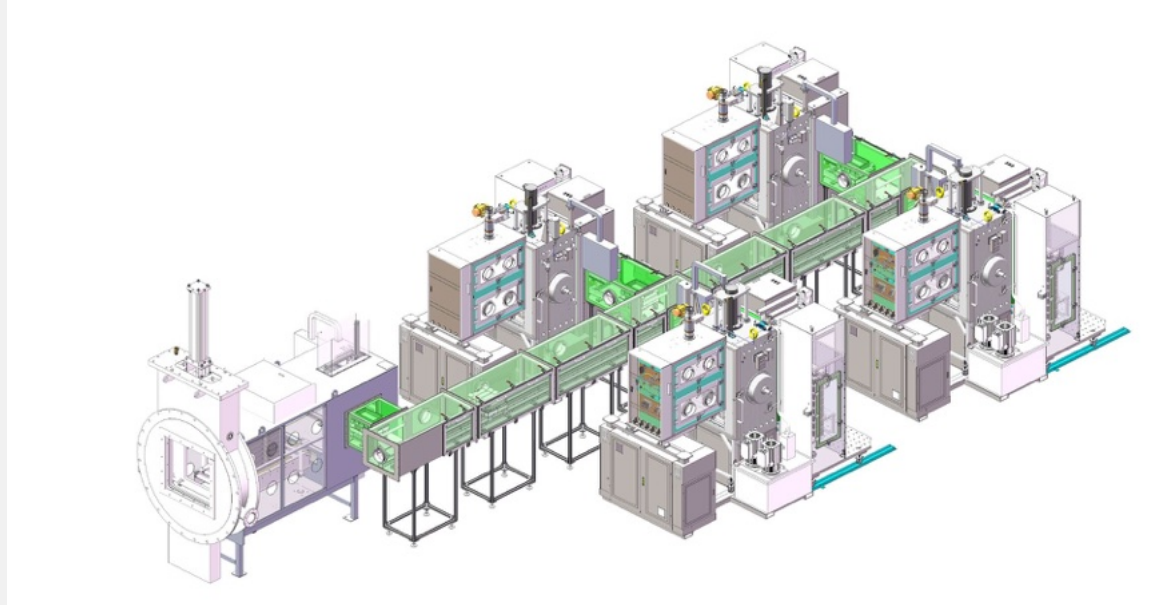
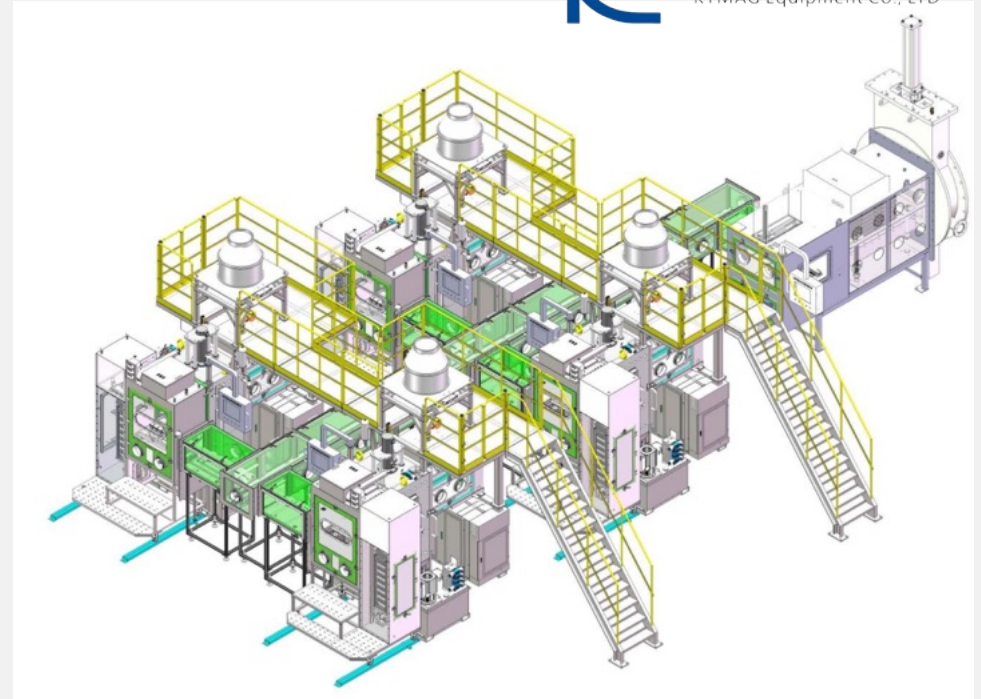
- **Ultra-Fast Cycle Time**  
A cycle time of 25–35 seconds.
- **Exceptional Stability**  
Dual servo motors and proportional servo protection ensure high demolding stability.
- **Low Energy Consumption**  
Power consumption per cycle is less than 0.06 kWh.
- **Low Nitrogen Usage**  
Nitrogen consumption is approximately 4 cubic meters per hour
- **Rapid Mold Changes**  
Special tool-free mold changes and purging in under 1 hour. Molds are compatible with semi-auto presses.
- **Significant Material Savings**  
Only 50-100g of powder waste per day due to a clean design.
- **Large Pressing Capability**  
Can form magnets up to 1kg in a single step.
- **High Green Density**  
Green density > 4.3 g/cm<sup>3</sup>, with low post-sintering wear.



# Finite Element Analysis (FEA) of Magnetic Field



# One-Step Forming Equipment On-site





# PART 03

## Multi-Cavity & Cylindrical Production

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Showcasing high-efficiency molding techniques to produce multiple magnets (blocks or cylinders) simultaneously, maximizing output.

# Multi-Cavity Production

## Key Features

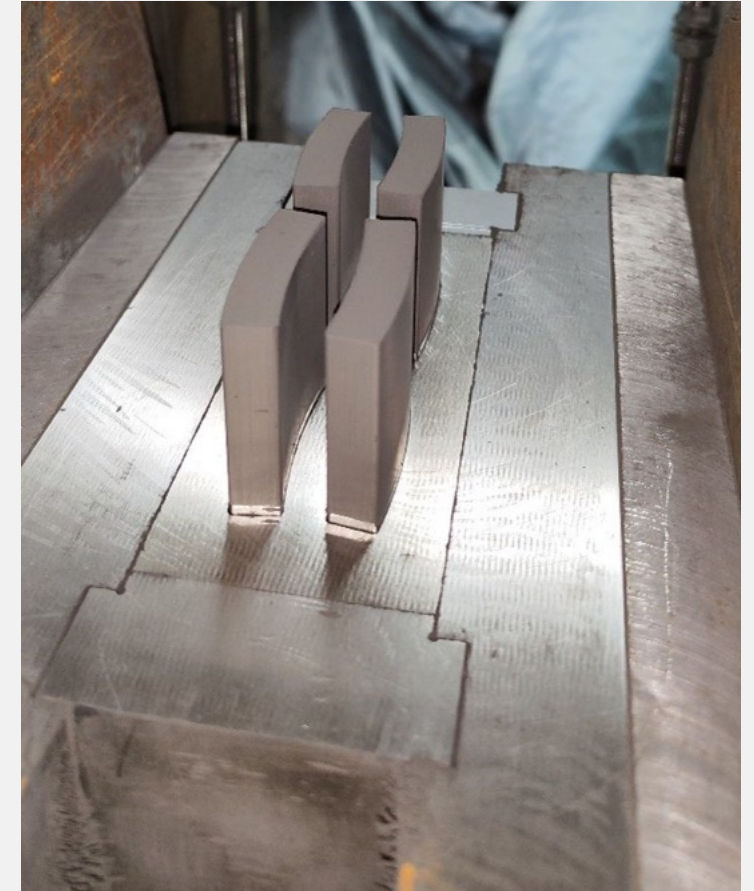
**Improved Powder Uniformity:** Vibration-assisted feeding ensures even powder distribution across all cavities.

**Flexible, Quick-Change Molds:** Semi-automatic press molds are used, enabling quick changeover and production of various shapes including blocks, arc segments, and cylinders.

**High Precision & Consistency:** Dual-motor servo control, with pressing speed, position, and pressure operating according to a pre-programmed sequence.

**Weight deviation:** 1% for blocks/arc segments; 5% for cylinders.

**Variable pressure demolding:** A pneumatic proportional valve gradually reduces force on the workpiece during demolding, ensuring uniform stress release and no internal cracks.

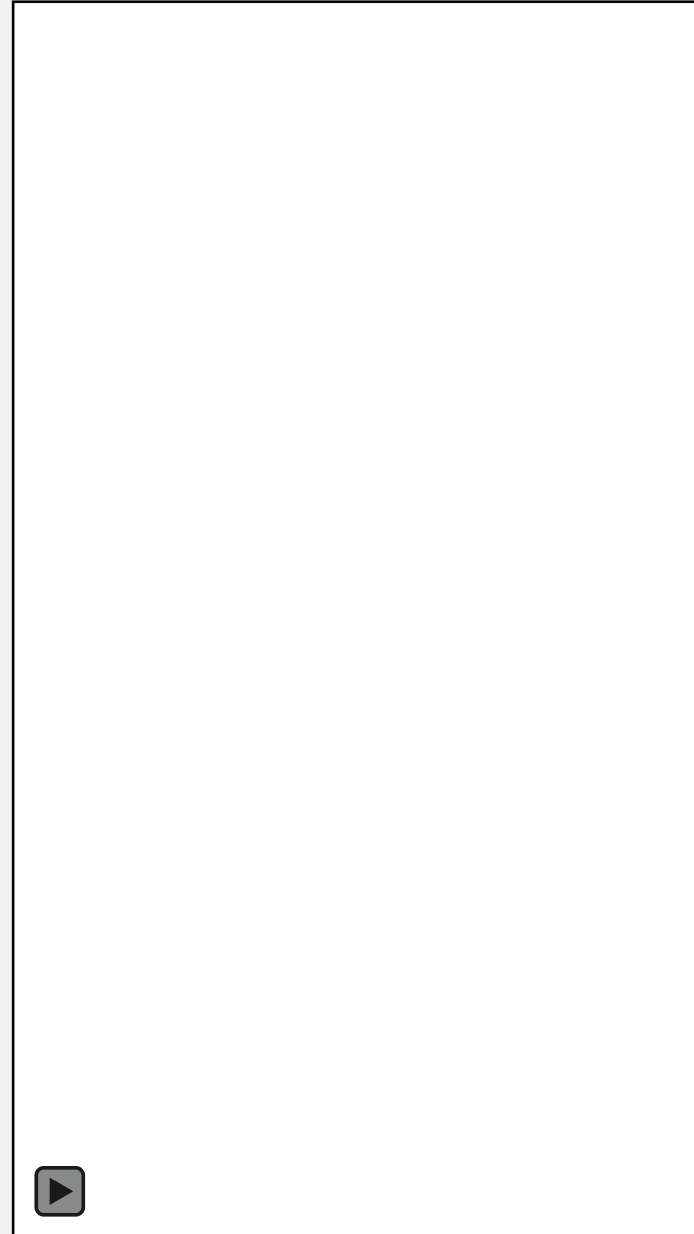
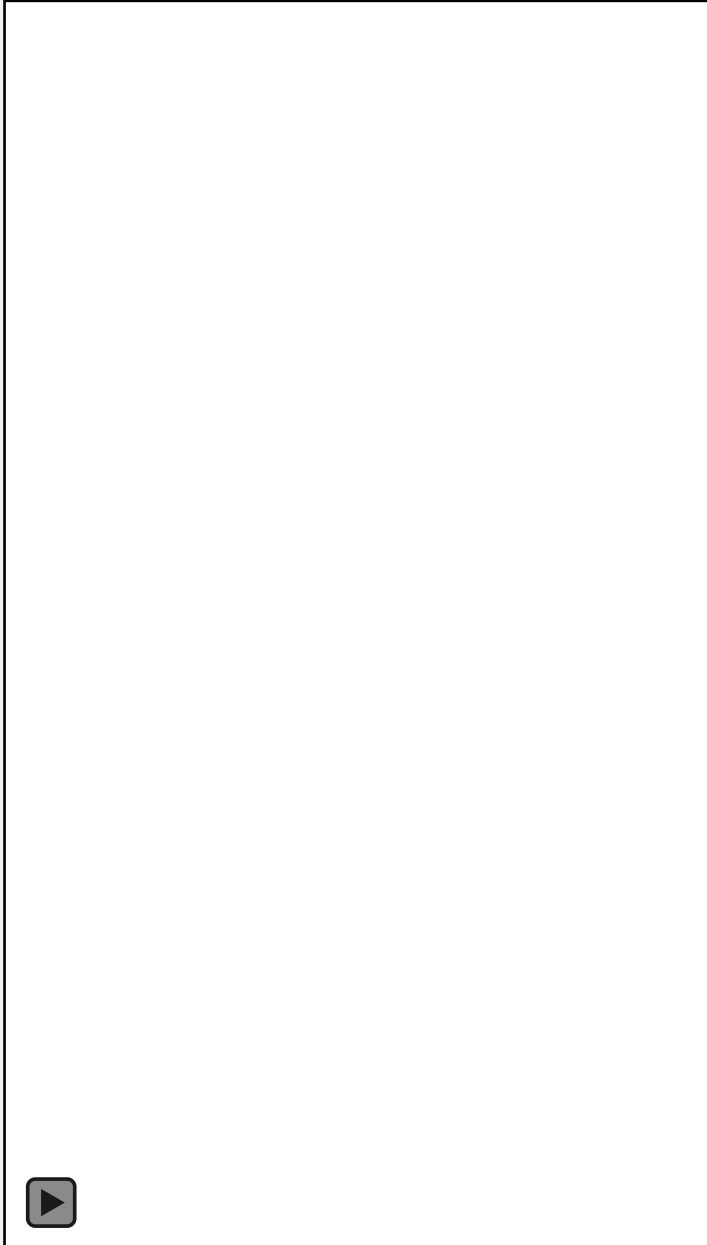


# Multi-Cavity Production



**Cycle time for cylinders:** 36 seconds  
**Cycle time for blocks:** 45 seconds

# Multi-Cavity Production Video





# PART 04

## Press-Sintering Integration

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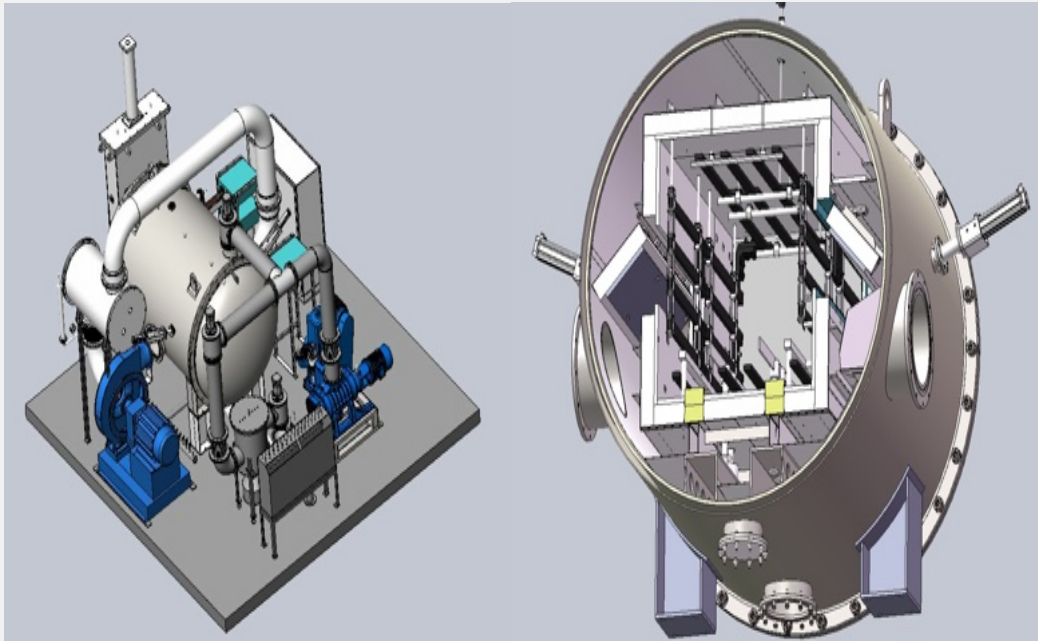
The ultimate automation solution, seamlessly connecting pressing and sintering into a single, fully automated production line with zero human touch.

# Press-Sintering Integration

## Innovation 3: Sintering Furnace with Dewaxing

Prevents organic vapor from condensing on the furnace walls, drastically reducing contamination of vacuum pumps and pipelines, and extending the furnace's service life.

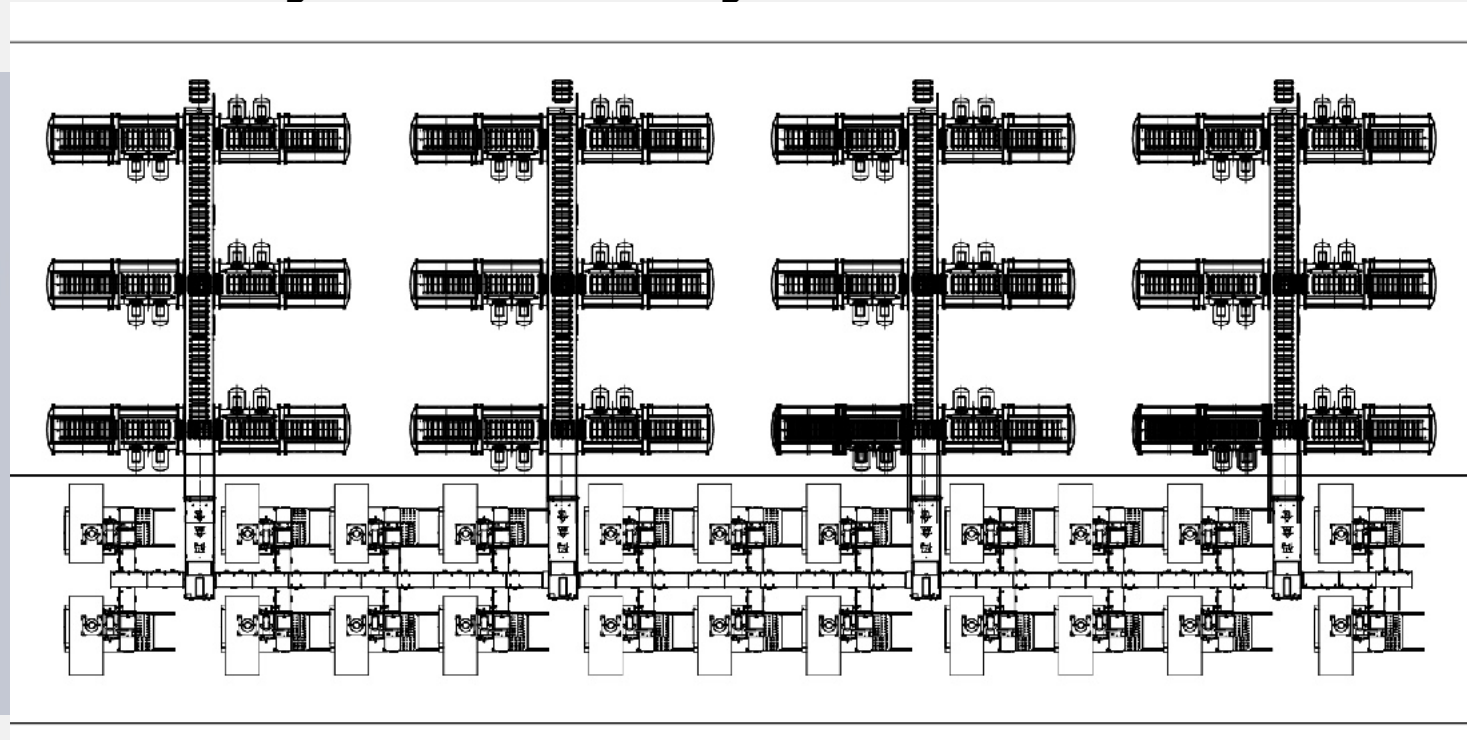
External View      Internal View



## Innovation 4: One-Step Forming Production Line

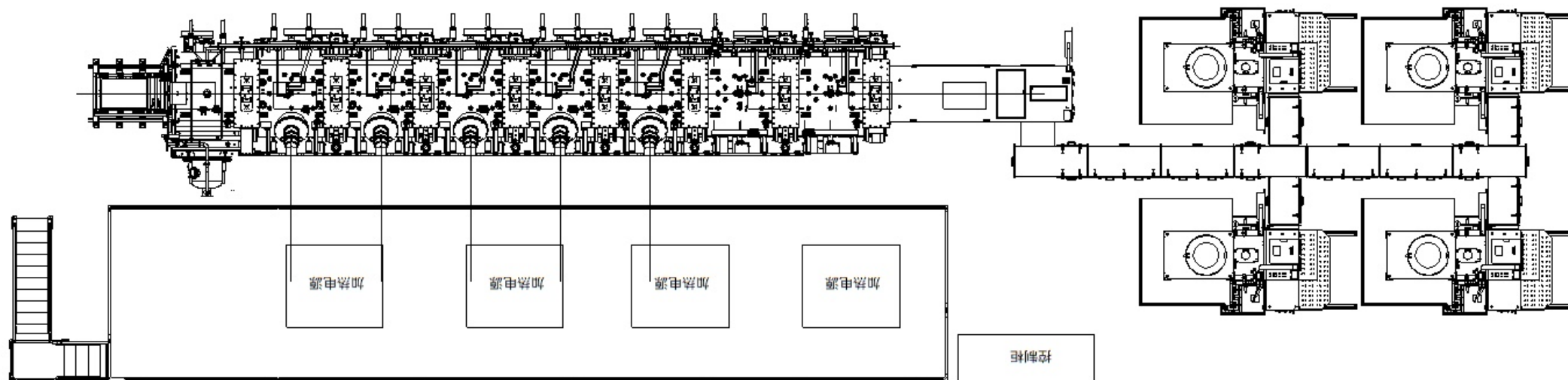
Multiple presses are connected via sealed channels. AGVs transport green compacts to the stacking chamber, where robotic arms automatically stack them.

After pressing, the chamber moves to the sintering furnace for docking and automatic loading.

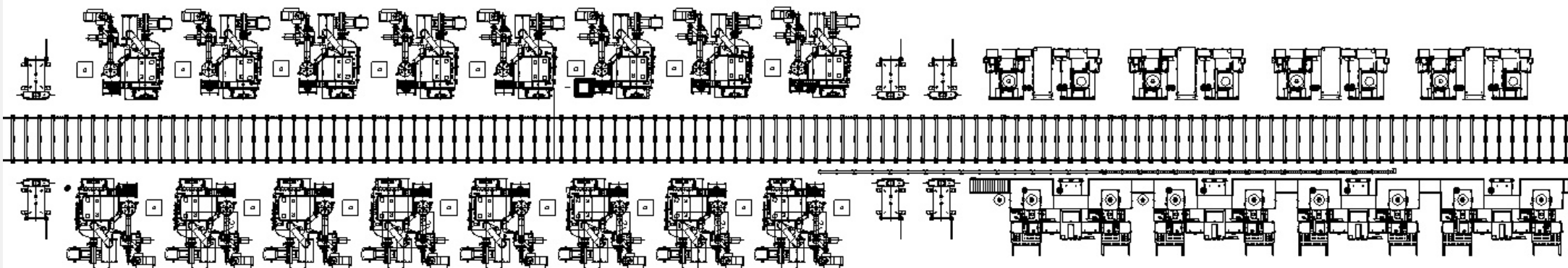


# Press-Sintering Integration

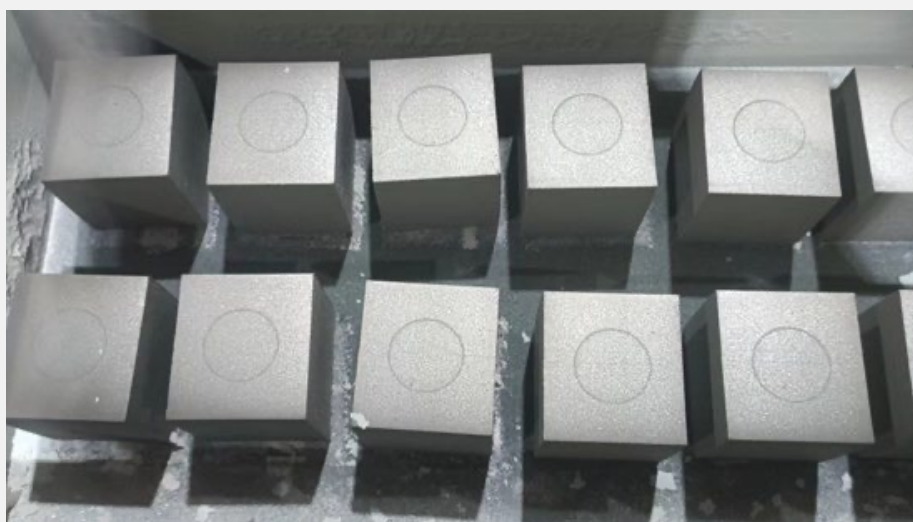
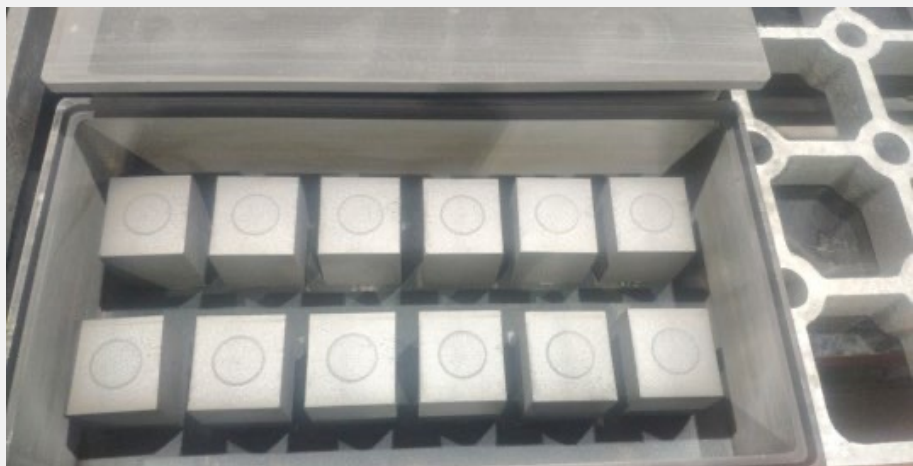
## 4 presses connected to a continuous sintering furnace



## 2 presses per group connected to a single-chamber sintering furnace



# Finished Product



# Certifications & Patents



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发明名称: 磁结铁磁永磁体表面扩散镀层的方法  
发明人: 董永安  
专利号: ZL 2019 1 0658222.5  
专利申请日: 2019年07月21日  
专利权人: 江西开源自动化设备有限公司  
太原开元智能装备有限公司  
地址: 341000 江西省赣州市赣州经济技术开发区金盏路南侧, 工业二西路东侧合兴处理车间  
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发明人: 董永安  
专利号: ZL 2018 1 0750619.1  
专利申请日: 2018年07月11日  
专利权人: 江西开源自动化设备有限公司  
地址: 341000 江西省赣州市赣州经济技术开发区金盏路南侧, 工业二西路东侧合兴处理车间  
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发明人: 董永安; 郑方  
专利号: ZL 2019 1 0609739.3  
专利申请日: 2019年09月29日  
专利权人: 太原开元智能装备有限公司  
江西开源自动化设备有限公司  
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发明人: 郑方; 董永安; 刘大健; 李平凯; 陈峰  
专利号: ZL 2022 1 0680323.4  
专利申请日: 2022年06月16日  
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专利号: ZL 2018 1 0750620.4  
专利申请日: 2018年07月11日  
专利权人: 江西开源自动化设备有限公司  
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专利号: ZL 2020 1 0133028.6  
专利申请日: 2020年02月29日  
专利权人: 江西开源自动化设备有限公司  
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发明人: 郑方; 董永安  
专利号: ZL 2019 1 1207401.5  
专利申请日: 2019年12月11日  
专利权人: 江西开源自动化设备有限公司  
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(22) 国际申请日:  
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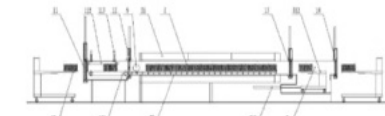
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(72) 发明人: 董永安 (DONG, Yong'an); 中国山西省太原市国际路73号太原不锈钢产业园区A区16号, Shansi 030008 (CN).

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(81) 指定国 (除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BR, BS, CA, CB, CF, CG, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, EC, EE, EG, ES, FI, GB, GR, GT, HK, HU, IL, IN, JP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX,

(54) Title: EXTERNALLY HEATED VACUUM CONTINUOUS SMELTING FURNACE  
(54) 发明名称: 一种外热式真空连续熔结炉



# Certifications & Patents



**质量管理体系证书**

注册号: BJTG23Q30686R0S

兹证明  
**江西开源自动化设备有限公司**

统一社会信用代码: 913607030516265484

注册地址: 江西省赣州市赣州经济技术开发区金龙路7号装配车间 邮编: 341003

经营地址: 江西省赣州市赣州经济技术开发区岗边大道赣州综合保税区A-2地块1# 邮编: 341003

质量管理体系符合 GB/T19001-2016/ISO9001:2015 标准

质量管理体系适用范围:  
金属粉末压机的制造

发证日期: 2023年03月03日 证书有效期至: 2026年03月02日

签发人: 

北京通贯检验认证有限公司  
地址: 北京市通州区北惠木厂街1号院1号楼5层504



证书号第597924号

**发明专利证书**

发明名称: 一种永磁材料加工装置

发明人: 廖永安, 邱方

专利号: ZL 2018 1 0850419.4

专利申请日: 2018年07月28日

专利权人: 江西开源自动化设备有限公司

地址: 341000 江西省赣州市经开区迎宾大道99号

授权公告日: 2023年06月09日 授权公告号: CN 108798738 B

局长 申长雨



证书号第599206号

**发明专利证书**

发明名称: 一种粉末磁体材料自动化生产线

发明人: 廖永安, 邱方

专利号: ZL 2018 1 0850418.X

专利申请日: 2018年07月28日

专利权人: 江西开源自动化设备有限公司

地址: 341000 江西省赣州市经开区迎宾大道99号

授权公告日: 2023年06月23日 授权公告号: CN 10862528 B

局长 申长雨



证书号第606125号

**发明专利证书**

发明名称: 一种粉末磁体机构及一种多件磁体机构

发明人: 黄振峰, 邱方, 廖永安, 刘军

专利号: ZL 2022 1 0280393.0

专利申请日: 2022年03月22日

专利权人: 江西开源自动化设备有限公司

地址: 341001 江西省赣州市经济技术开发区金龙路7号装配车间

授权公告日: 2023年06月09日 授权公告号: CN 114526798 B

局长 申长雨



证书号第6144830号

**发明专利证书**

发明名称: 一种磁场压机设备

发明人: 邱方, 刘军, 廖永安, 李平, 廖永安

专利号: ZL 2021 1 1642148.1

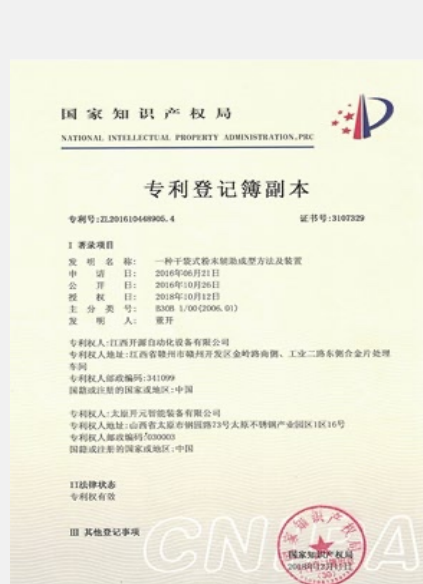
专利申请日: 2021年12月09日

专利权人: 江西开源自动化设备有限公司

地址: 341001 江西省赣州市经济技术开发区金龙路7号装配车间

授权公告日: 2023年07月14日 授权公告号: CN 11430959 B

局长 申长雨



国家知识产权局  
NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION, P.R.C.

**专利登记簿副本**

专利号: ZL201610448996.4 证书号: 3107329

I 著录项目

发明名称: 一种干式粉末成型型方法及装置

申请日: 2016年06月29日

公开日: 2016年10月26日

授权日: 2018年10月12日

主分类号: B30B 1/00 (2006.01)

发明人: 廖开

专利权人: 江西开源自动化设备有限公司

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专利权人邮政编码: 341099

国籍或注册的国家或地区: 中国

专利权人: 太原开元智能装备有限公司

专利权人地址: 山西省太原市钢园路73号太原不锈钢产业园区1区16号

专利权人邮政编码: 030003

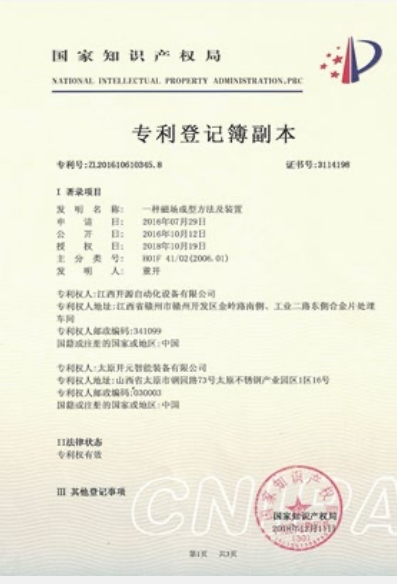
国籍或注册的国家或地区: 中国

II 法律状态

专利权有效

III 其他登记事项

局长 申长雨



国家知识产权局  
NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION, P.R.C.

**专利登记簿副本**

专利号: ZL201610610045.8 证书号: 3114198

I 著录项目

发明名称: 一种磁成型方法及装置

申请日: 2016年07月29日

公开日: 2016年10月12日

授权日: 2018年10月19日

主分类号: B30B 41/02 (2006.01)

发明人: 廖开

专利权人: 江西开源自动化设备有限公司

专利权人地址: 江西省赣州市经开区金岭南路南, 工业二路东御合金片处理车间

专利权人邮政编码: 341099

国籍或注册的国家或地区: 中国

专利权人: 太原开元智能装备有限公司

专利权人地址: 山西省太原市钢园路73号太原不锈钢产业园区1区16号

专利权人邮政编码: 030003

国籍或注册的国家或地区: 中国

II 法律状态

专利权有效

III 其他登记事项

局长 申长雨

# Certifications & Patents



# Certifications & Patents

United States of America

To Promote the Progress



of Science and Useful Arts

The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this United States

# Patent

grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Katherine Kelly Vidal

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

US 11,967,455 B2

**METHOD FOR PREPARING RARE EARTH PERMANENT MAGNET BY HOT PRESS**

**ABSTRACT**

The present invention relates to a method for preparing a rare earth permanent magnet by hot pressing. The method includes: (a) preparing a mixture of a rare earth metal powder, a binder, and a matrix; (b) hot pressing the mixture to form a rare earth permanent magnet; and (c) sintering the rare earth permanent magnet. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa.

**TECHNOLOGICAL FIELD**

The present invention relates to the field of rare earth permanent magnets.

**BACKGROUND**

Rare earth permanent magnets are widely used in various fields. The traditional method for preparing rare earth permanent magnets is sintering. However, the sintering method has the disadvantages of high energy consumption and long cycle time. The hot pressing method is a new method for preparing rare earth permanent magnets. The hot pressing method has the advantages of low energy consumption and short cycle time. However, the hot pressing method has the disadvantages of high temperature and high pressure. The present invention provides a method for preparing rare earth permanent magnets by hot pressing. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa.

**SUMMARY**

The present invention provides a method for preparing rare earth permanent magnets by hot pressing. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa. The method is characterized in that the hot pressing is performed at a temperature of 1000-1200°C and a pressure of 10-30 MPa.

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**THANK  
YOU**



Contact Us

**Any Question ?**