

European - Standard Mold Maintenance Technology & Practice

欧洲精密模具质量保养技术与模具清洗实战

By
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European - Standard Mold Maintenance Technology

欧洲精密模具质量保养技术

-- Cleaning & Maintenance of Molds and Cooling Channels 模具与水路清洗保养

-- Cleaning & Maintenance of 3D printed Mold inserts 异型水路清洗保养

-- Cleaning & Maintenance of TCU 模温机清洗保养

What is the real situation in mold maintenance? Germany VS China

模具保养的实际情况是怎样的？德国VS中国

“RESPONSIBILITY” “责任心”

“INTEREST” “兴趣”

“ACKNOWLEDGE” “专业知识”

“TEAMPLAYER and TRUSTSHIP” “团队精神与信赖关系”

“CRITICAL and SENSITIVE” “严谨与洞察力”



模 具 保 养

Mold Maintenance

模具表面及固定板必须重视保养。

Mold surface and clamping units must have good care and maintenance.



长期不清洗会导致注塑机失去精准度及质量

Injection molding machine will lose precision and quality without cleaning

模 具 保 养

Mold Maintenance

模具表面以及动定模板上污垢的组成
Contaminations on Mold surfaces and clamping units



从外到内的顺序 From outside to inside:

油污/防锈油残留 Grease/Anti-corrosion Agent

塑胶残留/瓦斯气/焦料 Deposit/Outgassing/Burnt resin

铁锈 Rust

长期不清洗会导致注塑机失去精准度及质量
Injection molding machine will lose precision and quality without cleaning

模 具 保 养

Mold Maintenance

德国模具保养步骤

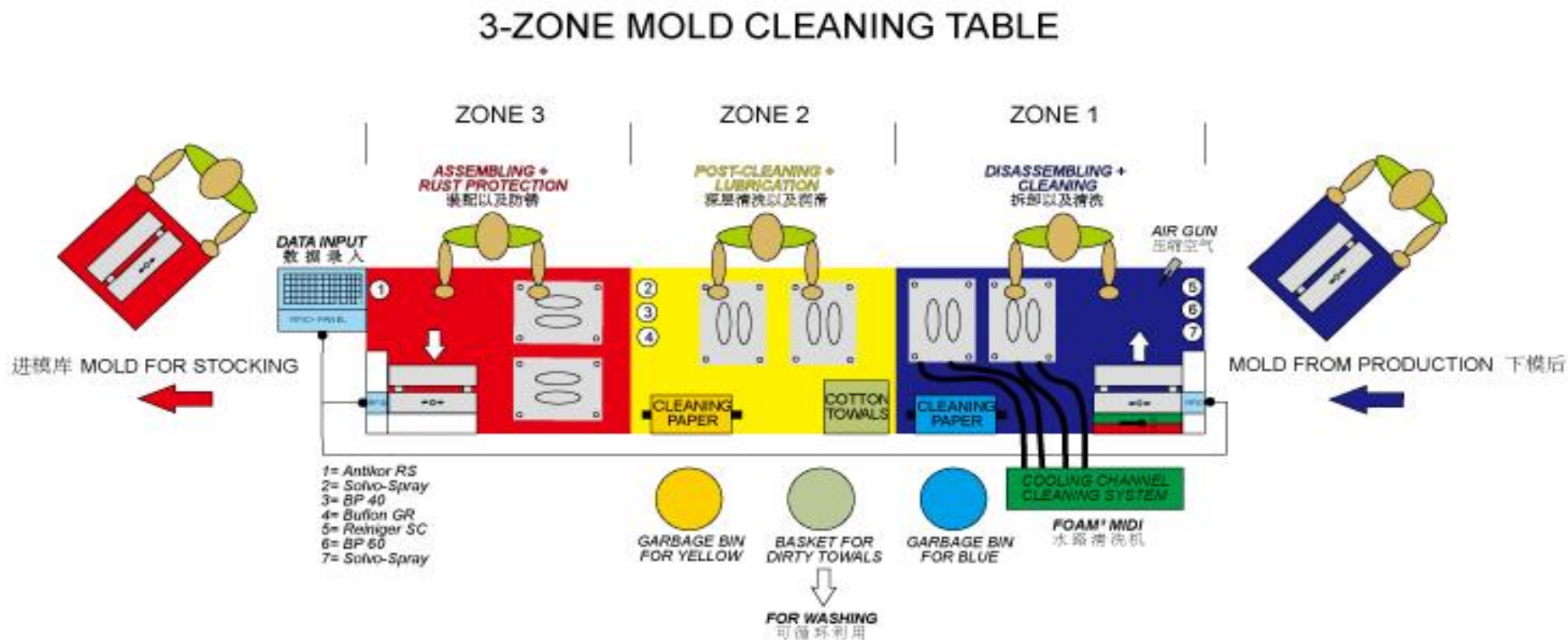
German Standard Mold Maintenance Procedure

1. 拆除整套模具 Disassemble the whole mold to pieces
2. 去油污 Degreasing
3. 清洗塑胶残留/瓦斯气/焦料 Remove Deposit/Outgassing/Burnt resin
4. 除锈 Derusting by Acid cleaner
5. 中和除锈剂 Neutralization of Acid cleaner
6. 压缩空气吹干模具 Blow Dry with Compressed Air
7. 整个模具防锈 Assemble and Anticorrosion protection
8. 记录保养/维修内容 Data logging for Maintenance
9. 送入模具仓库 Stocking

以上步骤都在下模以后完成，而非下次生产上模之前再做保养。

All above mentioned maintenances are performed after production, not before production.

模具保养工作台示意图 Mold Maintenance Working Table



Separated zones prevent from cross contamination.
分开的功能区域，预防交叉污染。

Cooling Channel Cleaning 模具水路清洗



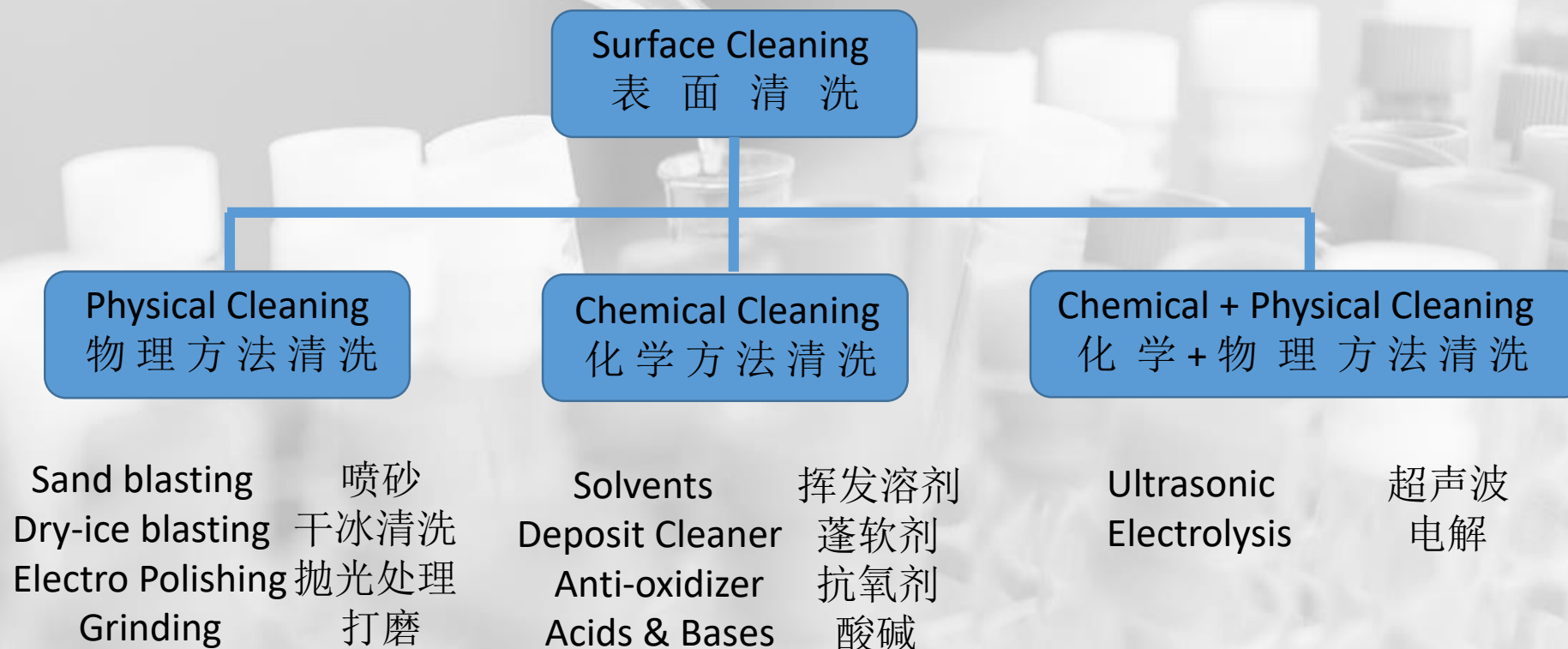
Different Mold Cleaning Systems

不同类型的模具清洗设备



Different Methods for Mold Cleaning

不同类型的模具清洗方法



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欧洲精密模具质量保养技术

- Cleaning & Maintenance of Molds and Cooling Channels 模具与水路清洗保养
- **Cleaning & Maintenance of 3D printed Mold inserts** 异型水路清洗保养
- Cleaning & Maintenance of TCU 模温机清洗保养

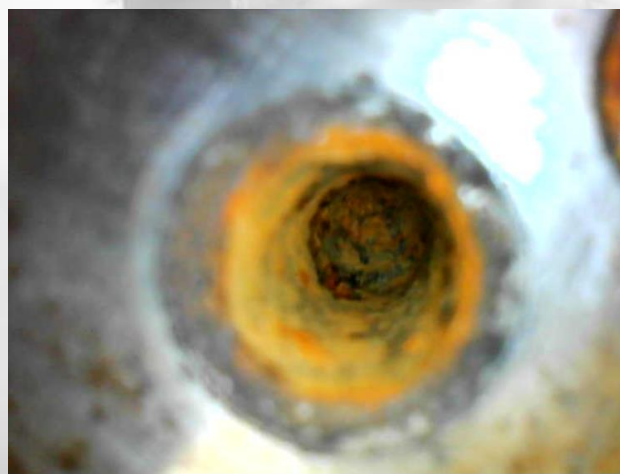
3D Printed Cooling Channel Cleaning

异型水路清洗

传统水路
Normal Cooling
Channel

直径8mm左右
Dia. about 8mm

多直角，
容易堆积水锈水垢
Lots of sharp edges,
easy for rust and
calcification

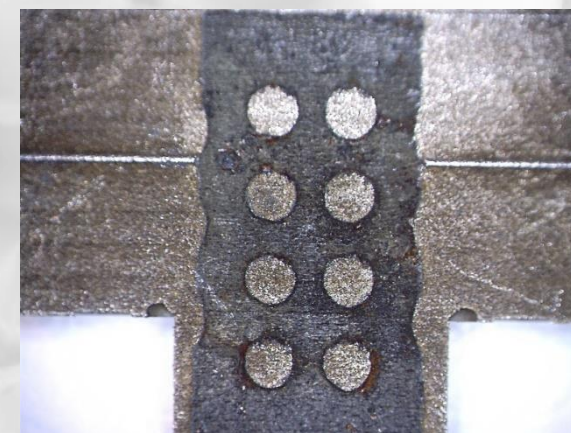
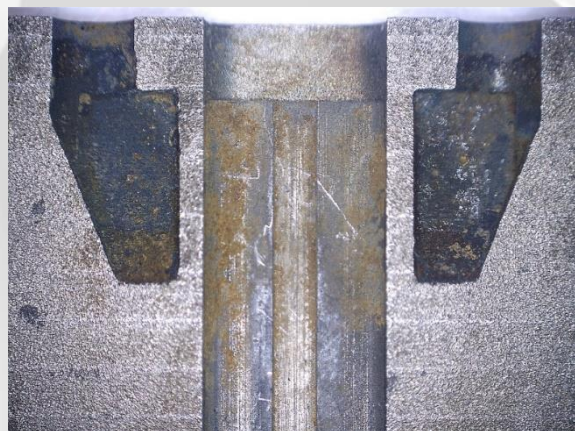


异型水路
3D printed Cooling
Channel

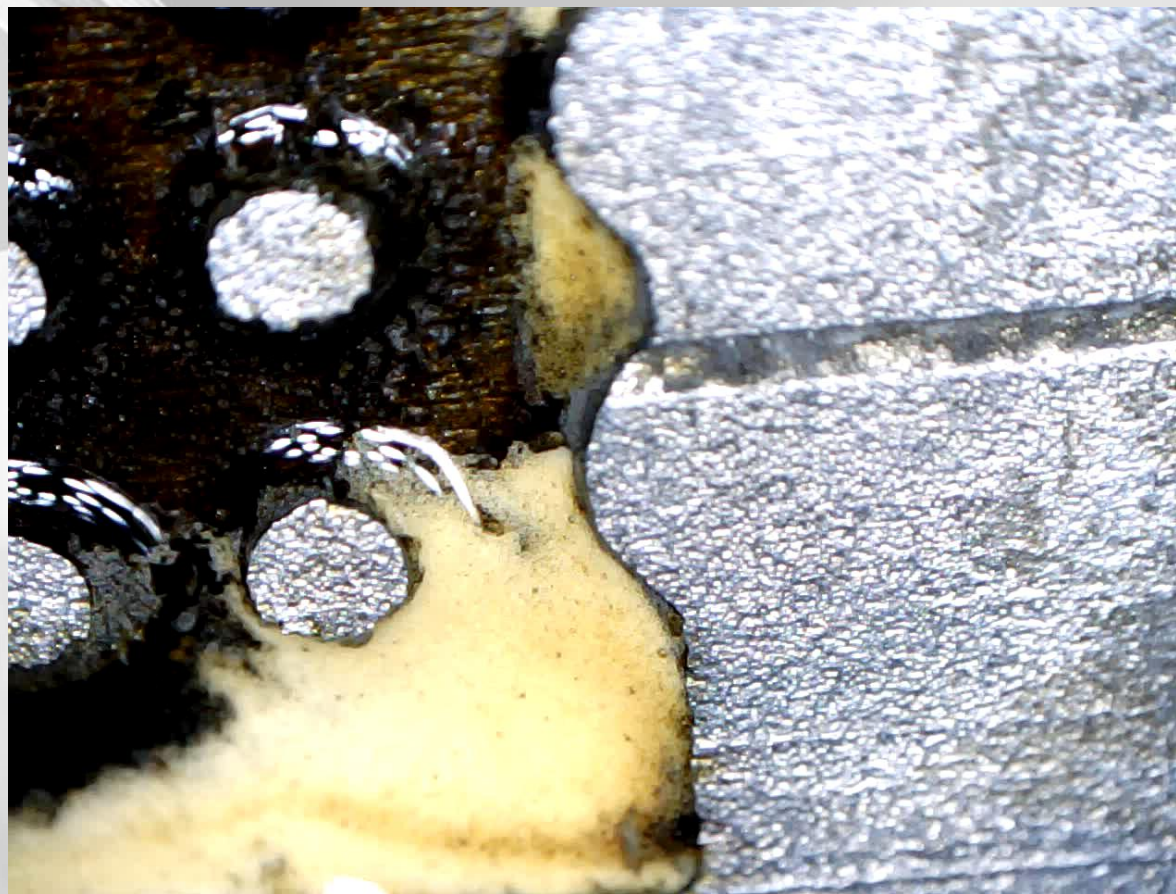
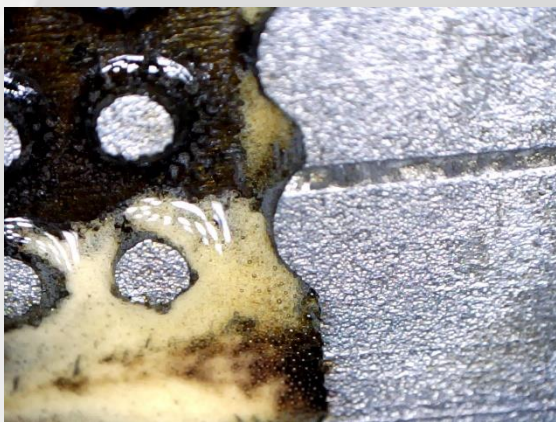
直径0.8-3mm左右
Dia. 0.8 - 3mm

表面光洁度较差，容易
结水锈水垢造成堵塞
Rough surface,
easy for rust and
calcification or even
blocking.

Cooling Channel with Scale and Rust 结有水锈和水垢的异型水路



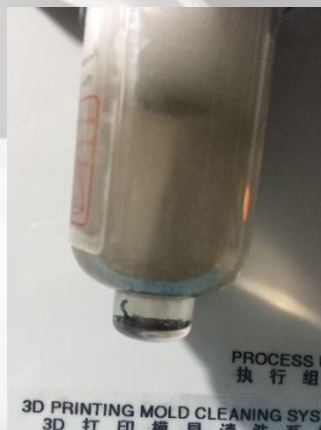
Cooling Channel Cleaning 异型水路清洗



Cooling Channel Cleaning 异型水路清洗

3D打印模具清洗系统

清洗过程中发现大量杂质，包括铁锈/水钙/油污/金属颗粒以及纤维等



铁锈及水钙溶解
铁锈：20%
水钙与镁离子：60%

金属
15%

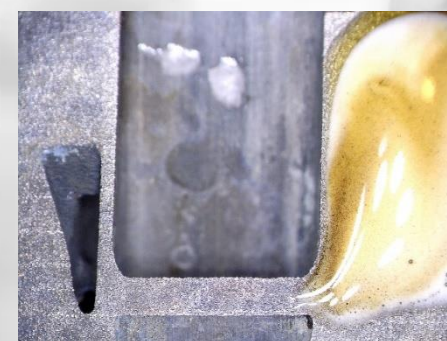
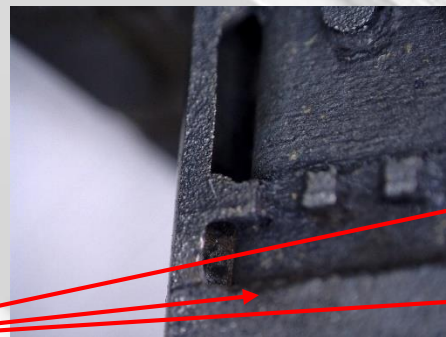
油污
约5%

纤维
少量

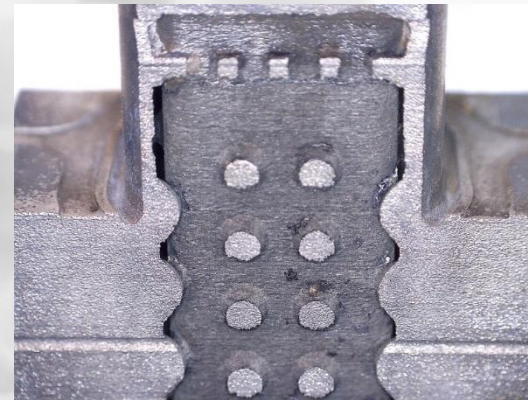
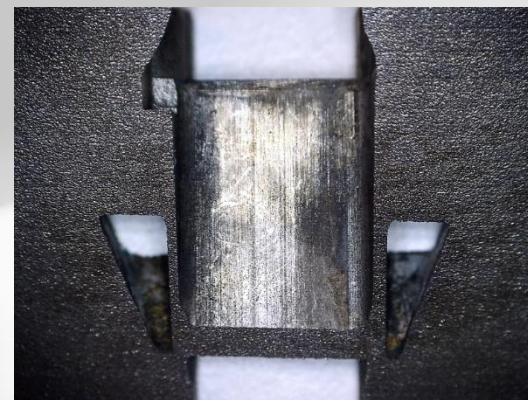
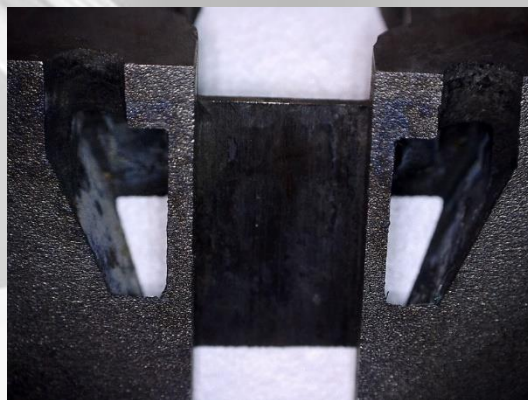
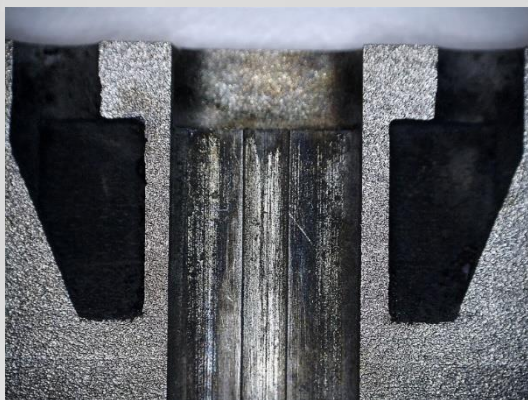
Cooling Channel Cleaning 异型水路清洗

Thin cooling
channel, dia. 1mm,
fully blocked by
scale & grease
顶部最细水路1mm
处全部是水钙和油
脂的堵塞

Cleaning Process
最细水路处清洗过程



Cooling Channel Cleaning 异型水路清洗



Disadvantages of contaminated cooling channels in Injection Molding Process

模 具 水 路 水 锈 水 垢 对 于 注 塑 工 艺 的 影 响

直接影响 – 导热差

Direct disadvantage – Bad heat transfer



冷却时间延长
Longer heating/cooling time



产品变形严重
Distortion of parts



多模穴不平衡
Unbalance in cavities

间接影响 Indirect disadvantage

生产效率下降，生产成本上升
Lower productivity, higher cost

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- Cleaning & Maintenance of 3D printed Mold inserts 异型水路清洗保养
- Cleaning & Maintenance of TCU 模温机清洗保养

TCU Cleaning 模温机现状



TCU Cleaning 模温机现状



加热棒 Heating Bar



铜管 Copper Pipe

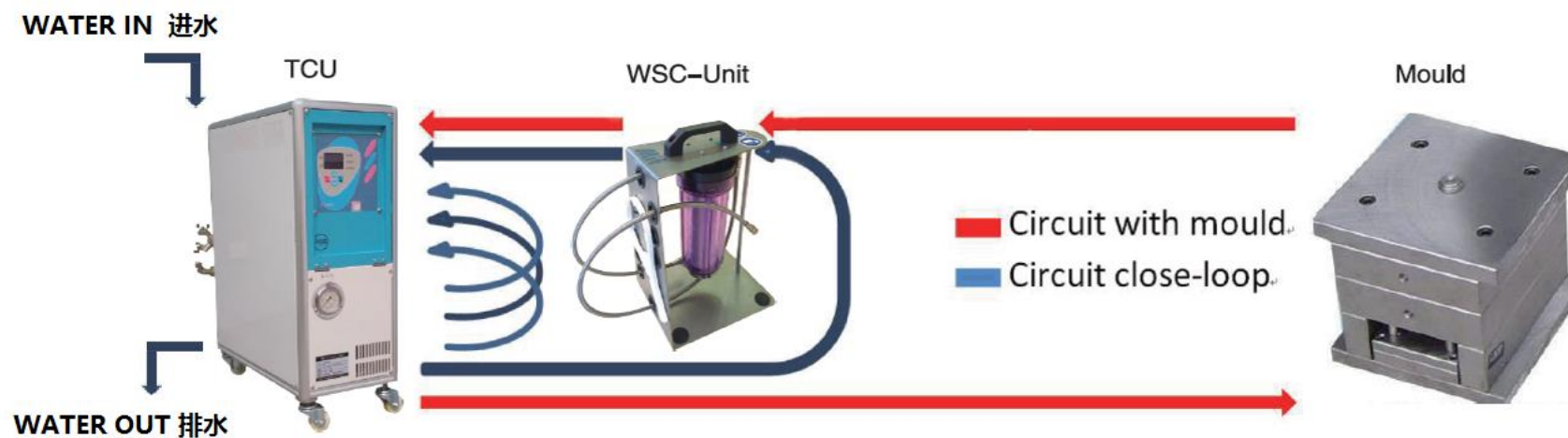
表面覆盖水锈水垢导致模温机升温速度慢
Covered with rust and calcium,
TCU heating up takes longer



叶轮 Impeller

水锈加速气蚀，缩短使用寿命
Rust accelerate cavitation,
shorten life time.

Buchem Water System Cleaning Solution Buchem 水系统清洗方案



加装一个简易WSC-Unit装置配合Buchem环保化学清洗可利用模温机轻松实现模温机的清洗保养以及模具水路的清洗。

Using a simple device WSC-Unit, together with Buchem environmental friendly chemical cleaning agents, cleaning and maintenance of TCU can be realized efficiently, mold cooling channels can also be derusted and decalcified.

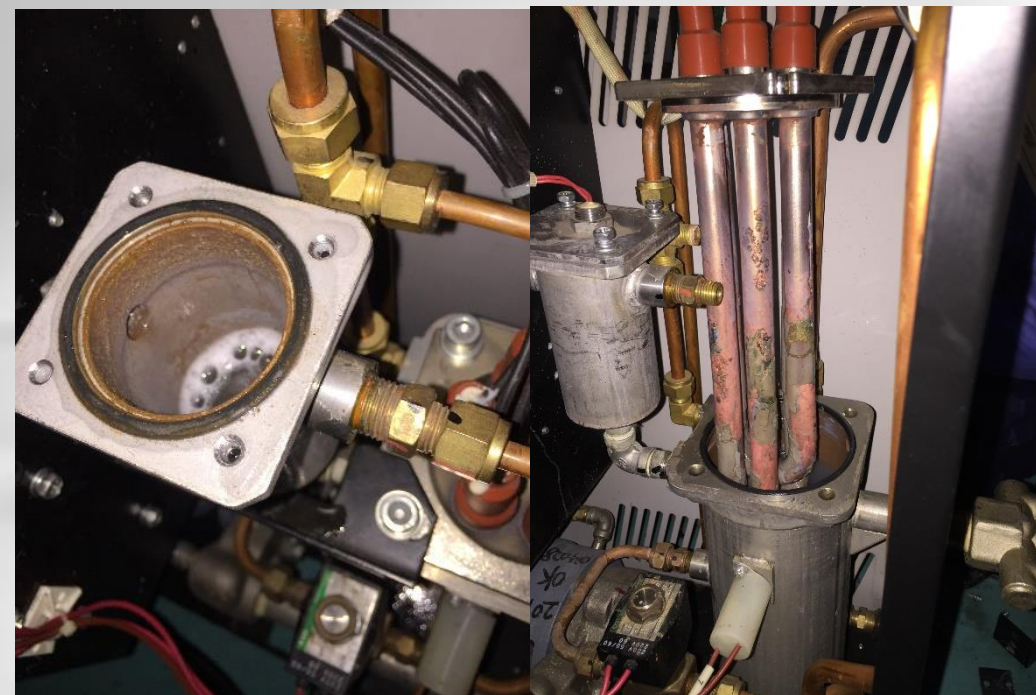
Case Study 1 案例 1

使用2年后的模温机，开放式水塔
2 year TCU with open water tower

Before cleaning 清洗前



After cleaning 清洗后



Case Study 2 案例 2

使用5年后的模温机，水质较好，1mm水垢
5 year TCU contaminated by 1mm calcium layer



Case Study 2 案例 2

使用5年后的模温机，水质较好，1mm水垢
5 year TCU contaminated by 1mm calcium layer



Case Study 2 案例 2

使用5年后的模温机，水质较好，1mm水垢
5 year TCU contaminated by 1mm calcium layer



Connect WSC-Unit, add-in
chemicals, circulate at 60°C
连接WSC清洗系统，加入清洗液后，
升温至60度，循环20分钟



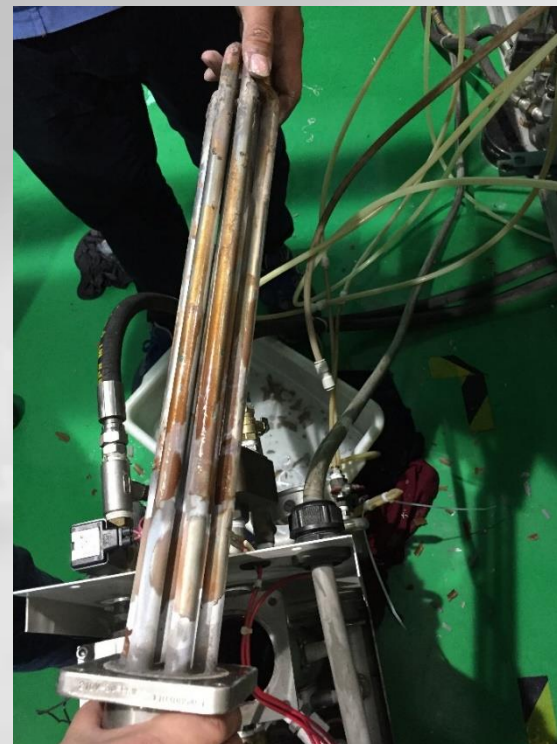
As soon as the chemicals circulate through
TCU, the reaction with rust and calcium starts
开启循环后，
清洗剂马上与水垢和铁锈反应

Case Study 2 案例 2

使用5年后的模温机，水质较好，1mm水垢
5 year TCU contaminated by 1mm calcium layer



Calcium deposit in the filter jar
after cleaning
WSC系统过滤罐内水钙杂质



Heating bar after cleaning
加热棒以及加热桶内大量水钙和
水锈溶解，金属恢复原本外观。

Example of Mold Cleaning System

模具清洗系统实务图



Example of Mold Cleaning System

模具清洗系统实务图



Example of Mold Cleaning System

模具清洗系统实务图



	1 (旧)	2 (旧)	3 (新)	4 (新)
清洗前 P	3.0 bar	3.2 bar	3.4	3.5
F	0.64/min	0.8	0.63	0.45
清洗后 P	3.0 bar	2.6	2.7	2.8
F	0.854/min	1.2	1.0	0.8
P: 压力 F: 流量				

Analyze 清洗总结

模温机清洗前后升温速度对比

TCU Heating up comparison before and after cleaning

清洗前 Before Cleaning

模具表面升温 (30°C-100°C)

Mold surface temp (30°C-100°C)

7 分钟 mins

清洗后 After Cleaning

模具表面升温 (30°C-100°C)

Mold surface temp (30°C-100°C)

5 分钟 mins

清洗方法比较 Cleaning Process Comparison

传统除锈/水垢方法

- 拆除冷却铜管/清理电磁阀
- 使用铜刷清洁加热器
- 清洁后装回确认是否漏水及运作是否正常
- 耗时: 1.5hr-2hr
- 人员: 须全程在场
- 清洁部分: 冷却铜管/加热器/电磁阀

WSC清洗方法

- 只需装上含WSC- 1以及WSC-2的过滤罐
- 让模温机bypass运转30分钟即可
- 耗时: 45 mins
- 人员: 装上后即可离开
- 清洁部分: 冷却铜管/加热器/电磁阀/加热桶/泵/模具/模具管路/接头

Traditional process for cleaning

- Disassemble copper pipes/Clean solenoid valve
- Clean heating bar with brass brush
- After cleaning, all parts need to be assembled and pass leakage test
- Time consumption: 1.5hr-2hr
- Staff: Need to be present for the whole process
- Components cleaned: Cooper pipe/Heating Bar/Solenoid Valve

WSC Cleaning Procedure

- Fill the filter jar with WSC-Phase 1 and WSC-Phase 2
- Run the TCU on bypass for 30 mins
- Time consumption: 45 mins
- Staff: Can leave for other works when installation is finished
- Components cleaned: Cooper pipe/Heating Bar/ Solenoid Valve / Heating tank / Pump/Mold/ Mold Cooling Channels/Pipe fittings

Introduction of Practice

实 战 介 绍

-- Cleaning & Maintenance of TCU 模温机清洗保养

-- Cleaning & Maintenance of Molds 模具清洗保养



WSC-Unit for TCU cleaning

WSC-Unit 水系统清洗装置

由德国Buchem公司
日本Matsui及Rumass
研发WSC系列
模温机清洗产品
Developed by
Buchem/Matsui/Rumass

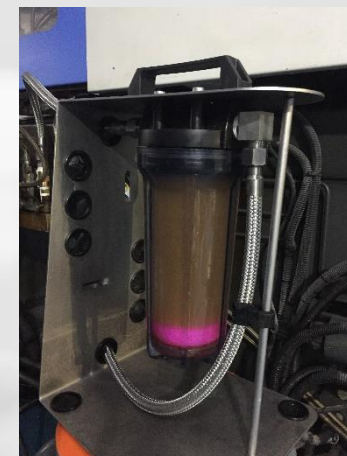
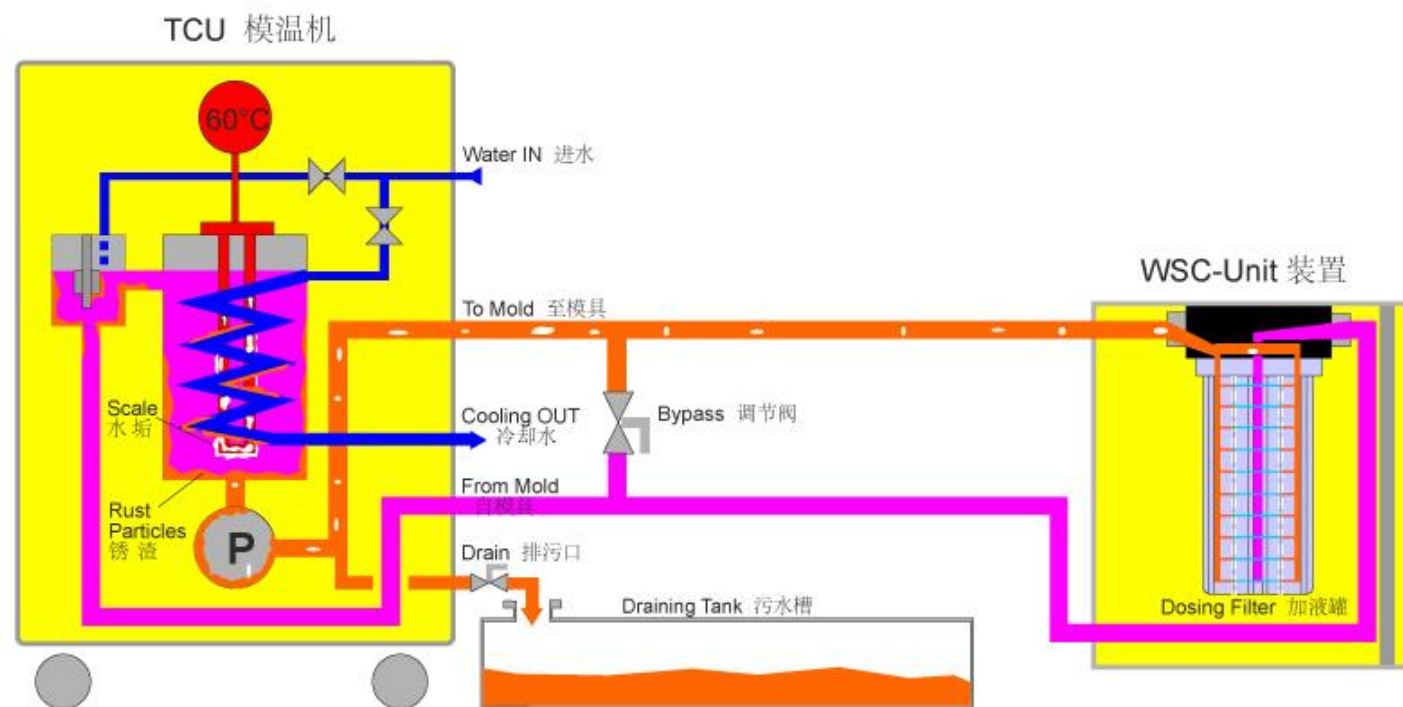


How to use WSC-Unit

WSC-Unit水系统清洗装置使用步骤

TCU-Cleaning with WSC Phase 1 模温机清洗 -- WSC Phase 1水系统除锈除垢液

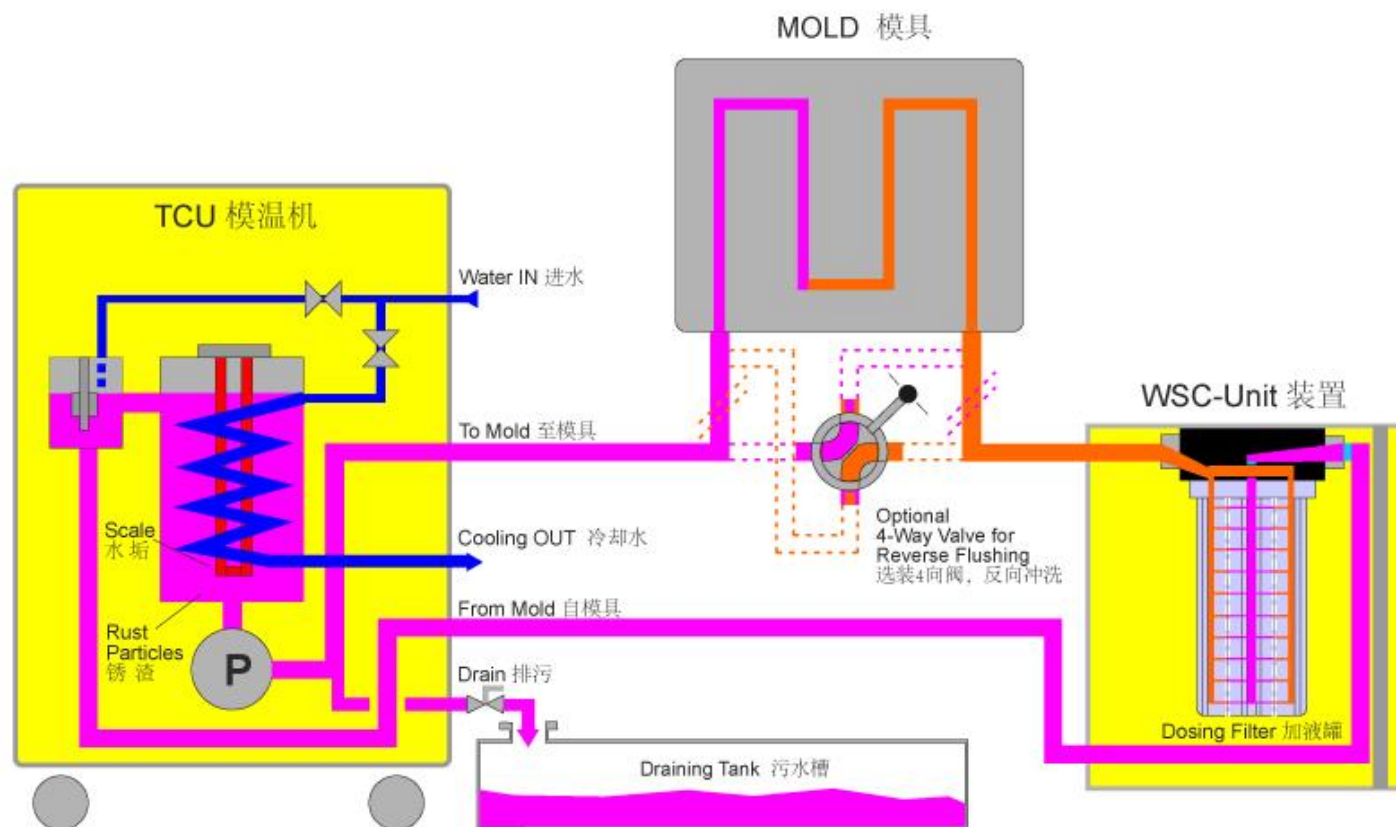
- Rust Removing 除锈
- Scale Removing 除垢



How to use WSC-Unit

WSC-Unit水系统清洗装置使用步骤

MOLD-Cleaning with WSC-Unit and WSC Phase 1
模具清洗 -- WSC-Unit 装置以及WSC Phase 1水系统除锈除垢液

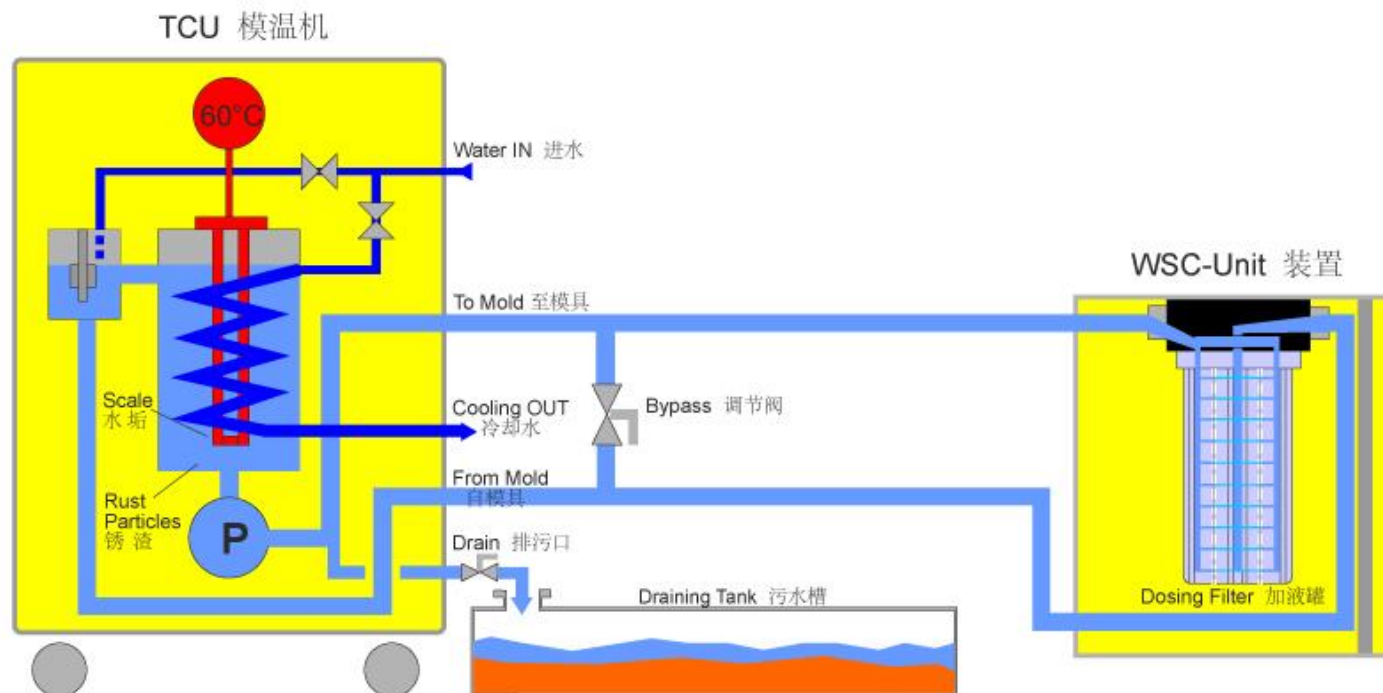


How to use WSC-Unit

WSC-Unit 水系统清洗装置使用步骤

TCU-Cleaning with WSC Phase 2 模温机清洗-- WSC Phase 2水系统中和清洗液

- Post Cleaning 彻底清洗
- PH-Neutralisation 酸碱中和



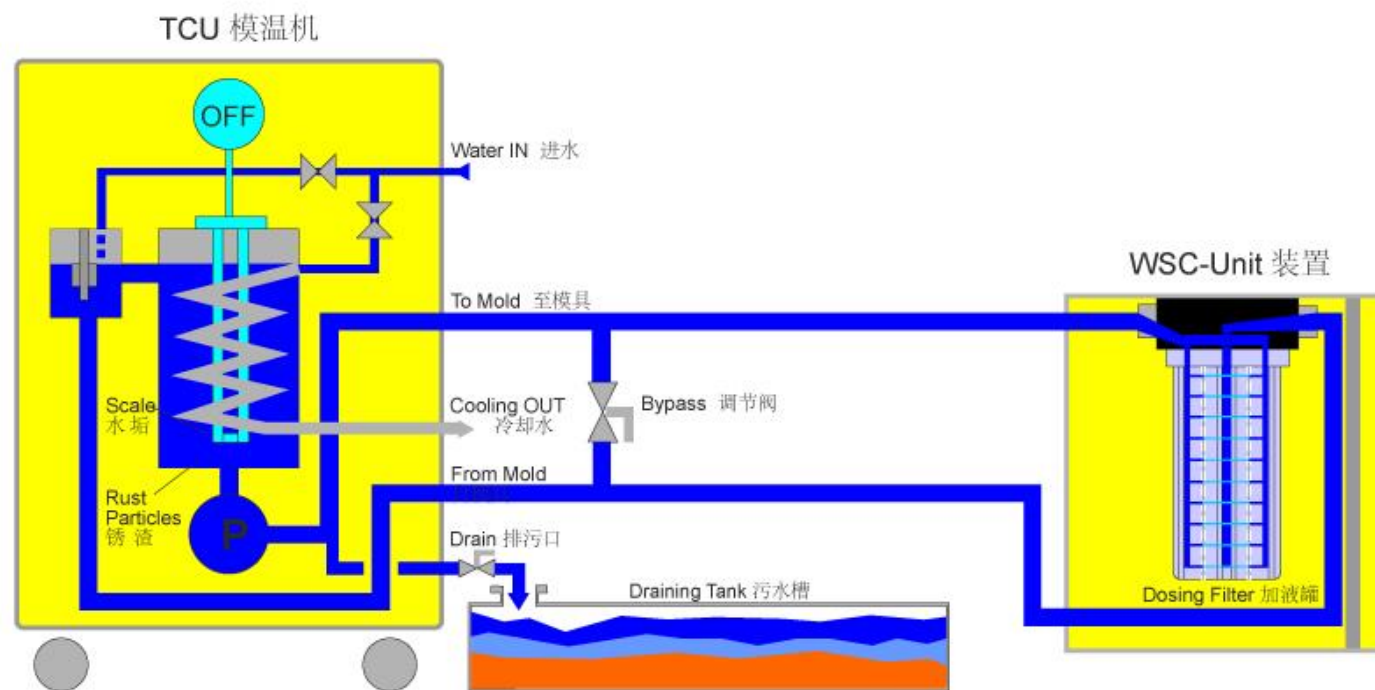
How to use WSC-Unit

WSC-Unit水系统清洗装置使用步骤

TCU-Cleaning with Water (Step 3)

模温机清洗 冲洗 (第3步)

- Flushing 冲洗
- Defoaming 消泡



WSC-Unit水系统清洗装置使用步骤

8个步骤完成清洗：8 Steps for a clean system:

1. 排出循环水并连接装有新滤网的**WSC-Unit**装置。Emptying the old process water out of the system and connect the **WSC-Unit** with a new filter.
2. 在滤网罐中装满**WSC-Phase 1**清洗剂（1.2升）并盖紧。Fill the whole tub of the filter assembly with **WSC-Phase 1** (1.2L) and screw on.
3. 整个系统加满水，在60° C状态下循环20-30分钟，（调节阀打开50%）。Fill-up the whole system with water and run the cycling process with 60° C (bypass 50% open) for 20-30 minutes.
4. 排出所有液体 Drain the reacted mixture.
5. 在滤网罐中装满**WSC-Phase 2**清洗剂（1.2升）并盖紧。Fill the whole tub of the filter assembly with **WSC-Phase 2** (1.2L) and screw on again.
6. 整个系统加满水，在60° C状态下循环15分钟，（调节阀打开50%）。Fill-up the whole system with water and run the cycling process with 60° C (bypass 50% open) for 15 minutes.
7. 排出所有液体，包括滤网罐，移除滤网罐。Drain the reacted mixture also the filter tub, remove the filter cartridge.
8. 整个系统过冷水冲洗（调节阀打开50%），直至排出的液体不再有泡沫。Flush the complete system with cold water (bypass 50% open) until there is no foam anymore.

如果模具和模温机结垢情况太严重，请重复步骤1-4！

If the mold and the TCU are extreme dirty or rusty, please do step 1 - 4 twice!

Buchem清洗剂产品水路保养成本分析 (针对每台模温机水路清洗保养)

序号	产品名称	单位	使用周期	产品价格 (RMB)	每次成本 (RMB)	每台模温机清洗 保养一年成本 (RMB)	备注
1	WSC-Unit Buchem 水系统清 洗装置 (含水流 指示器)	1套	保修半年, 正常使用 不容易损坏	3300		3300	建议半年保养一次
2	清洗装置滤芯	1只	视水路污染情况而定 (太脏就需更换)	30	30	30*4	
3	WSC-Phase 1 Buchem 水系统除 锈除垢液	10升/桶	平均1.2升/次	770	92.4	92.4*2	
4	WSC-Phase2 Buchem 水系统中 和清洗液	10升/桶	平均1.2升/次	770	92.4	92.4*2	
5	正常操作一年成本总计					489.6	按照清洗装置正常 操作的情况下, 不 需要更换清洗装置

效益分析

預期效益



MARKET SOLUTIONS

A公司某模具為一模96穴

Cycle time起初為10.3秒 產能174,757/年

【一年後】變cycle time變為11.2秒，產能降為 160,714/年

【清洗後】cycle time恢復至10.5秒，產能提升至171428/年 **提高7%**

免開第二套模具 省\$200萬

B公司某訂單需求為20k

Cycle time起初為60秒，16天。

【兩年後】cycle time變成95秒，延長至26天

【清洗後】cycle time回到63秒，17天。**差35%**

增加10天3班人力，一人月薪8K，3人10天8K。

所以一年可賺回 96 K

Introduction of Practice

实 战 介 绍

-- Cleaning & Maintenance of TCU 模温机清洗保养

-- Cleaning & Maintenance of Molds 模具清洗保养

5 Steps for Mold Surface & Clamping Unit Cleaning 模具表面以及动定模板5步清洁法

步骤1: 去除油污
产品: **Solvo-Spray**脱脂剂

方法: 1. 从模具顶部均匀喷涂
2. 油污自动溶解, 用布擦干



Step 1: Degreasing
Product: **Solvo-Spray**

Method: 1. Spray from the top
2. Grease will flow down,
wipe clean

步骤2: 去除塑胶残留及焦料
产品: **Reiniger SE**模具清洗剂

方法: 1. 从模具顶部少量均匀喷涂
2. 等待30秒钟
3. 用百洁布划圈擦拭
4. 用布擦干

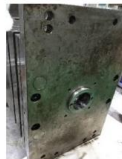


Step 2: Remove plastic deposite and burned material
Product: **Reiniger SE**

Method: 1. Spray on the deposit
2. Wait for 30 seconds
3. Wipe in circle with sponge
4. Wipe clean

步骤3: 去除铁锈
产品: **BP 60**除锈剂

方法: 1. 用百洁布沾除锈剂
2. 直接划圈擦拭生锈处
3. 用布擦拭



Step 3: Derust
Product: **BP 60**

Method: 1. Dip/pour on the sponge
2. Scrub in circle
3. Wipe away the dirt

步骤4: 彻底清洗并中和
产品: **BP 40**全效清洗剂

方法: 1. 请用清水1:1稀释, 装于喷雾瓶
2. 喷涂整个表面
3. 用布擦干并用气枪吹干
4. 等待10分钟后进行防锈



Step 4: Nutrilization
Product: **BP 40**

Method: 1. Dilute 1:1 with water in spray bottle
2. Spray on the whole surface
3. Wipe dry and air gun dry
4. Wait 10 mins before rust
prevention

步骤5: 防锈
产品: **Antikor RS/CL**防锈润滑油

方法: 1. 确保模具干燥
2. 孔和缝变化角度喷涂
3. 从模具顶部少量均匀喷涂
4. 等待30秒形成保护膜
5. 这款产品也可用于顶针润滑



Step 5: Rust prevention
Product: **Antikor RS/CL**

Method: 1. Make sure mold is dry
2. Spray in different angles in holes
3. Spray the mold from top
4. Wait for 30s until dry
5. Can also be used as lubricant for ejector pins

Fun Facts about Chemicals

化学品的有趣对比



VS.



除锈剂（磷酸）

What are the differences in Spray Cans? 喷雾罐的区别

Good quality Aerosol Products 优质喷雾罐产品

- ✓ 15bar guaranteed can quality
- ✓ Concentrated ingredients
- ✓ Formulation with multi-ingredients
- ✓ Proved raw material suppliers
- ✓ Special nozzles for each application
- ✓ Complete MSDS
- ✓ REACH/RoHS/NSF conformity
- ✓ GHS labels on packaging & cans
- ✓ Contact info on packaging & cans

气罐 15bar压力安全保证
浓缩成分配方
配方含多种有效成分
全球品牌原料供应商
每种用途采用不同喷头设计
正式完整材料安全性能表
符合REACH/RoHS/NSF标准
外包装及罐体有GHS标示
外包装及罐体有联系方式

What is GHS label?

什么是**GHS**标示？(全球化学品统一分类和标签)

序号	危险特性	象形图	序号	危险特性	象形图	序号	危险特性	象形图
1	爆炸危险		2	燃烧危险		3	加强燃烧危险	
4	加压气体		5	腐蚀危险		6	毒性危险	
7	警告		8	健康危险		9	危害水环境	

Common misunderstandings of Chemicals

各 类 化 学 品 常 见 误 区

- | | | |
|---|-------------------|---|
| ☐ Chemicals without GHS labels are safe? | 没有危险品标示的化学品就是安全的? | X |
| ☐ Chemicals with smell is hazard? | 有气味的化学品一定有害吗? | X |
| ☐ Chemicals without smell is harmless? | 没有气味的化学品一定是无害的吗? | X |
| ☐ Aerosols must have GHS labels? | 喷雾罐产品一定有危险品标识吗? | √ |
| ☐ Chemicals must have MSDS? | 所有化学品都必须附有MSDS吗? | √ |
| ☐ More chemicals give better effect? | 用量越多效果越好吗? | X |



Introduction of **buchem** CHEMIE + TECHNIK GmbH & Co. KG

德 国 Buchem 化 工 技 术 有 限 公 司 简 介



Thank you !

谢谢 !