



**Rumass** &Partners

## Static Mixers for Plastics Processing

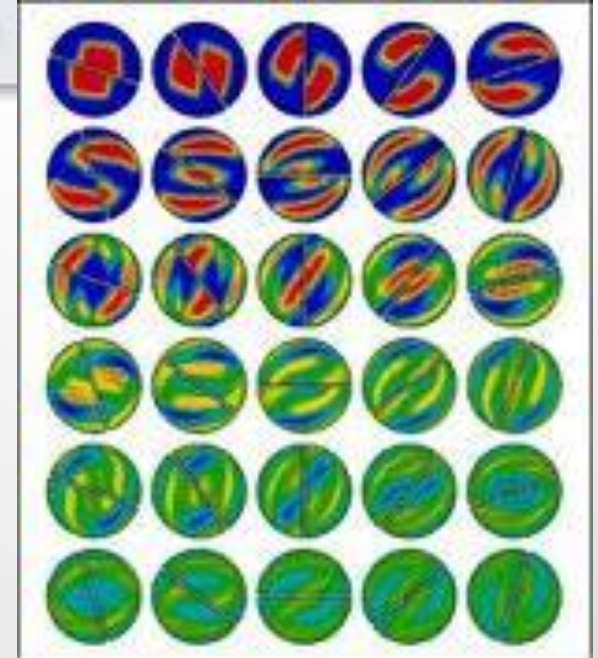
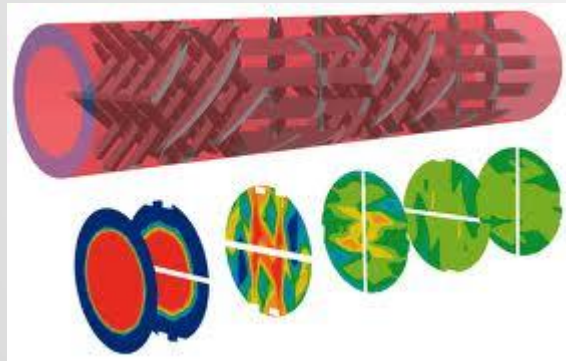
塑 胶 加 工 静 态 混 合

上海睿玛仕工业技术咨询有限公司





### Static Mixers for Injection Molding



## 静态混合器在塑胶加工中的应用范围

### Applications:

#### 应用范围

- Injection Molding Nozzle 注塑喷嘴
- Hot runner 热流道
- LSR 液体硅橡胶
- Foam injection molding 注塑发泡
- Extrusion (plates, films, profiles) 挤塑 (片材、薄膜、异型材)

### Polymers:

#### 适用塑胶

- Thermoplastics 热塑性塑料  
LDPE, HDPE, LLDPE, PP, PS, HIPS etc
- Engineering Polymers 工程塑料  
POM, PMMA, TPU, PET, PBT, SAN, ABS, LCP , PA etc.
- Filled Polymers 复合材料  
with glass-fibers, mineral fillers, etc. 玻纤(<8mm),矿物填料
- Foamed Polymers 发泡材料  
PS, PE, PP, PET,etc.



**3-part mixing nozzle 17/4**  
3段式混合喷嘴 17/4

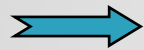


**3-part mixing nozzle 22/6**  
3段式混合喷嘴 22/6



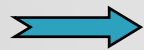
**Mixing nozzle 22/6 for shut-off  
with 2 adapter rings**  
截流混合喷嘴 22/6





## Homogenization of additives 添加剂均质化

- i.e. MB for color, flame retardant, laser 如色母粒/阻燃母粒/激光标记母粒
- excellent distribution of additives 添加剂分散出色
- equalise color depth / better color appearance 平均色深 / 改良色貌
- saving of masterbatch 节省色母粒
- Improved processing of regrinds 改进回料加工



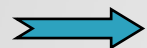
## Thermal Homogenization of temperature distribution 温度均匀化

- avoid brilliant spots 防止亮斑
- better admixing of gels 凝胶更好的混合

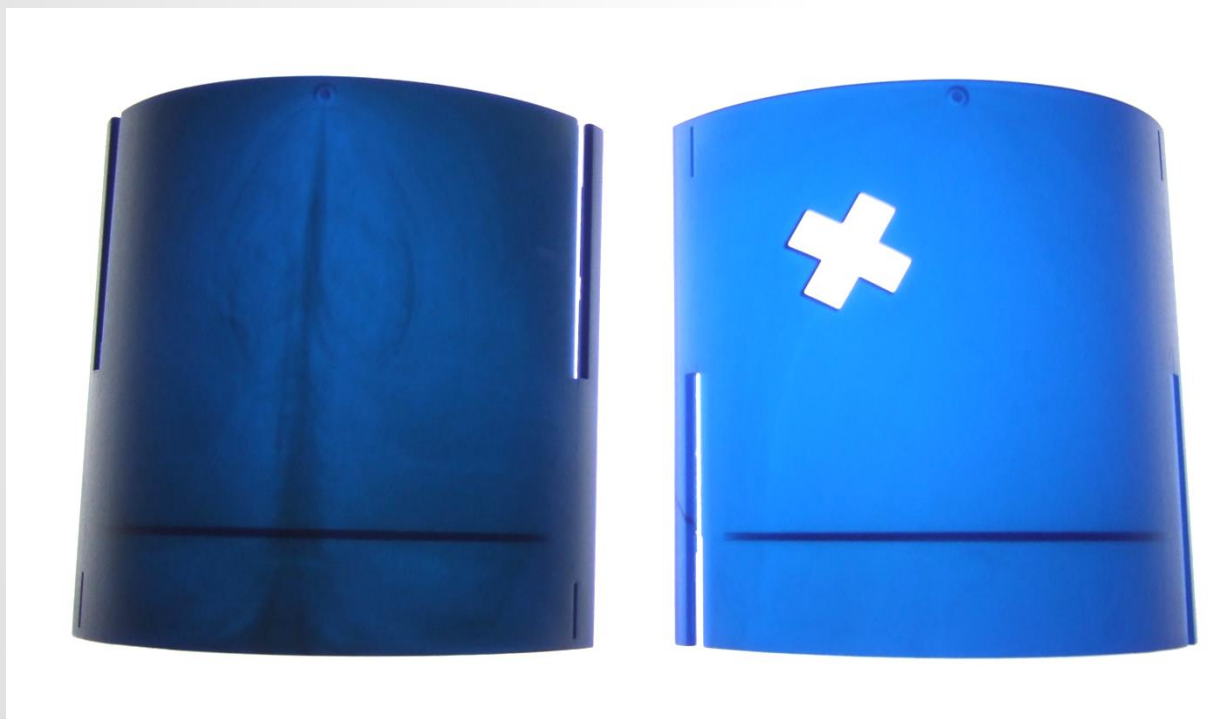


## Influence flow profile - Equalise velocity differences accross the flow channel 影响流型剖面 - 均衡整个流路的流速差

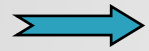
- balancing of hot runner system 平衡热流道系统
- avoid out-of-balance masses when producing rotating parts  
防止旋转注塑时产生不平衡的现象



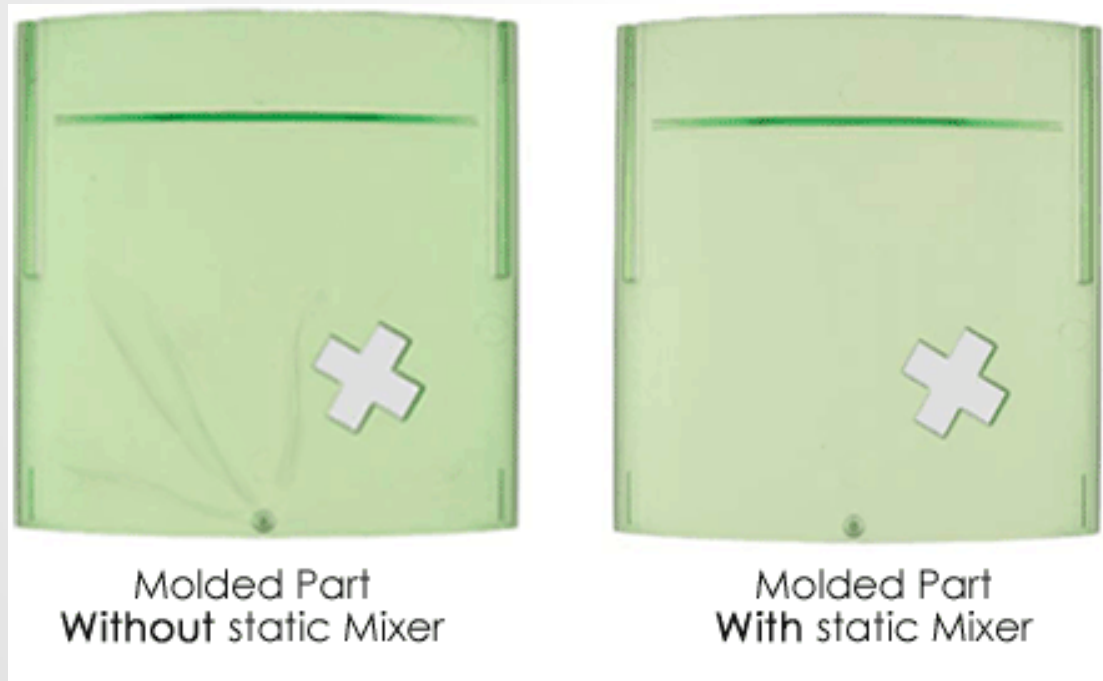
Direct comparison: part produced with and without static mixer  
直观比较：使用及未使用静态混合器的产品



Mixing performance of 4 mixing elements 22/4 at same machine parameters  
同样的设备参数，使用规格22/4的4节混合器效果对比



Direct comparison: part produced with and without static mixer  
直观比较：使用及未使用静态混合器的产品





➡ Direct comparison: part produced with and without static mixer  
直观比较：使用及未使用静态混合器的产品

## Direct coloring process with and without static mixer

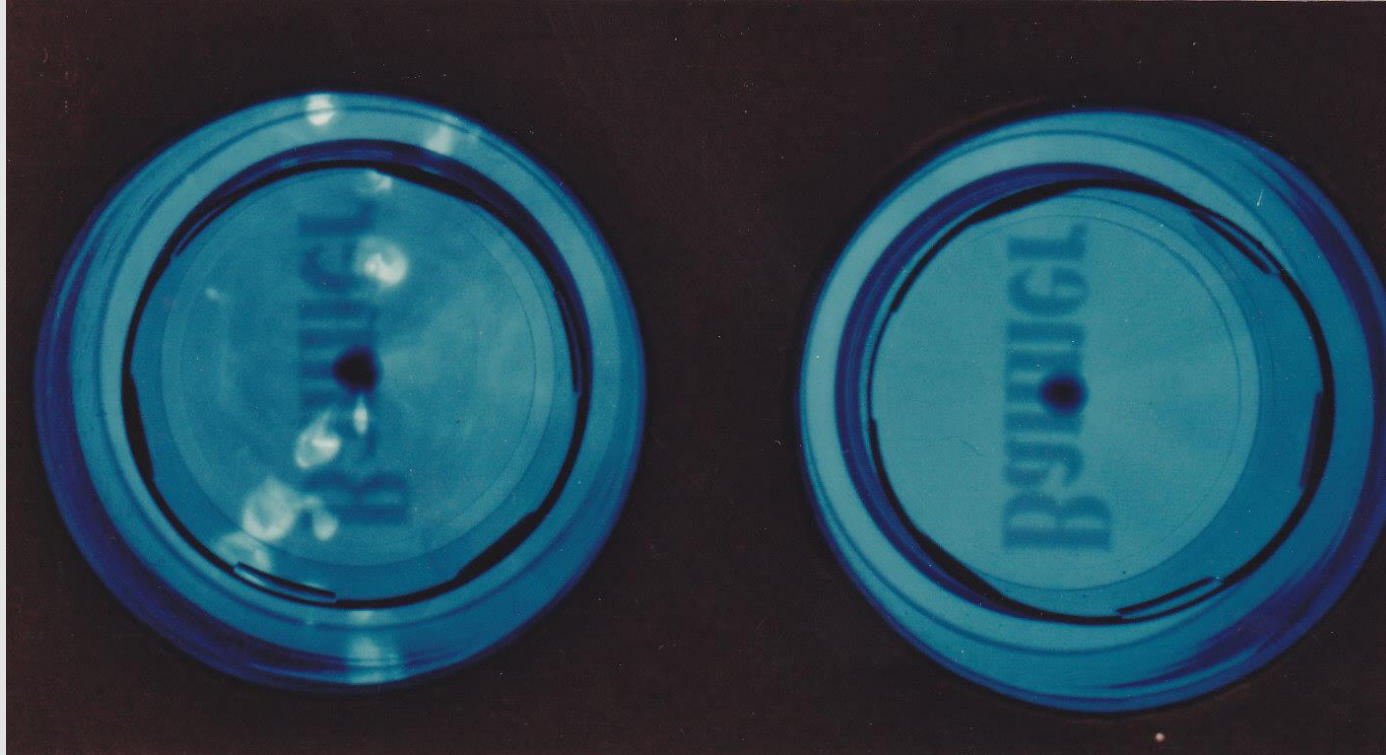
使用及未使用静态混合器进行直接着色

DVD Manufacturer in China, using Milliken Masterbatch

中国 DVD 生产商，使用 Milliken 色母料







Without Mixer 使用前

With Mixer 使用后



Allrounder 370A



ZYM 17\_6



ABS

0.5% 色母粒

1% 色母粒

1. 未使用混合器：色母添加量2%  
MB dosage 2% w/o static mixer
2. 提高注塑压力，1.2秒完成射胶，未见明显压力损失  
Injection finished in 1.2s, pressure drop almost none





### Visualization of Velocity distribution in laminar flow of Injection molding Machine

可视化注塑机  
层流中的流速分布

by laminar dispersing  
层流分散

Dispersing of a insoluble  
low viscous component  
in a laminar flow  
在层流中分散不溶低粘性液体

Viscosity ratio: 1 : 50'000

粘度比 1 : 50000

flow ratio 1 : 100

流量比 1 : 100

## 层流中的流速分布

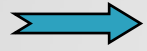


Laminar mixing is  
Achieved by repeated  
division, transposition and  
recombination of the melt  
over the cross section.  
层流中的混合通过熔胶  
截面不断的重复分流、  
换位以及并流形成

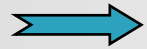
Material: Epoxy  
材料：环氧树脂

Flow ratio 1 : 1  
流量比 1 : 1

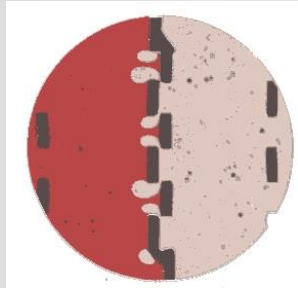




Homogeneity increases with the number of mixing elements used  
均匀度随着混合单元的数量而增加



The excellent heat and mass transfer characteristics are not influenced by varying throughputs 出色的热传质特性不随产量而改变



At Mixer Inlet

混合器入口



After 1 Mixing Elements

通过第一个混合单元



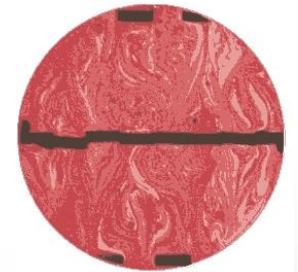
After 2 Mixing Elements

通过第二个混合单元



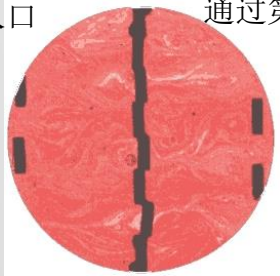
After 3 Mixing Elements

通过第三个混合单元



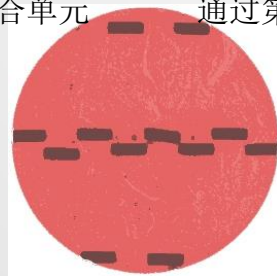
After 4 Mixing Elements

通过第四个混合单元



After 5 Mixing Elements

通过第五个混合单元



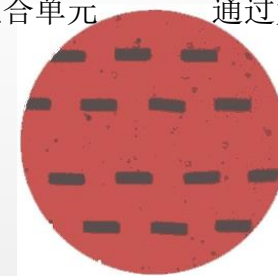
After 6 Mixing Elements

通过第六个混合单元



After 7 Mixing Elements

通过第七个混合单元

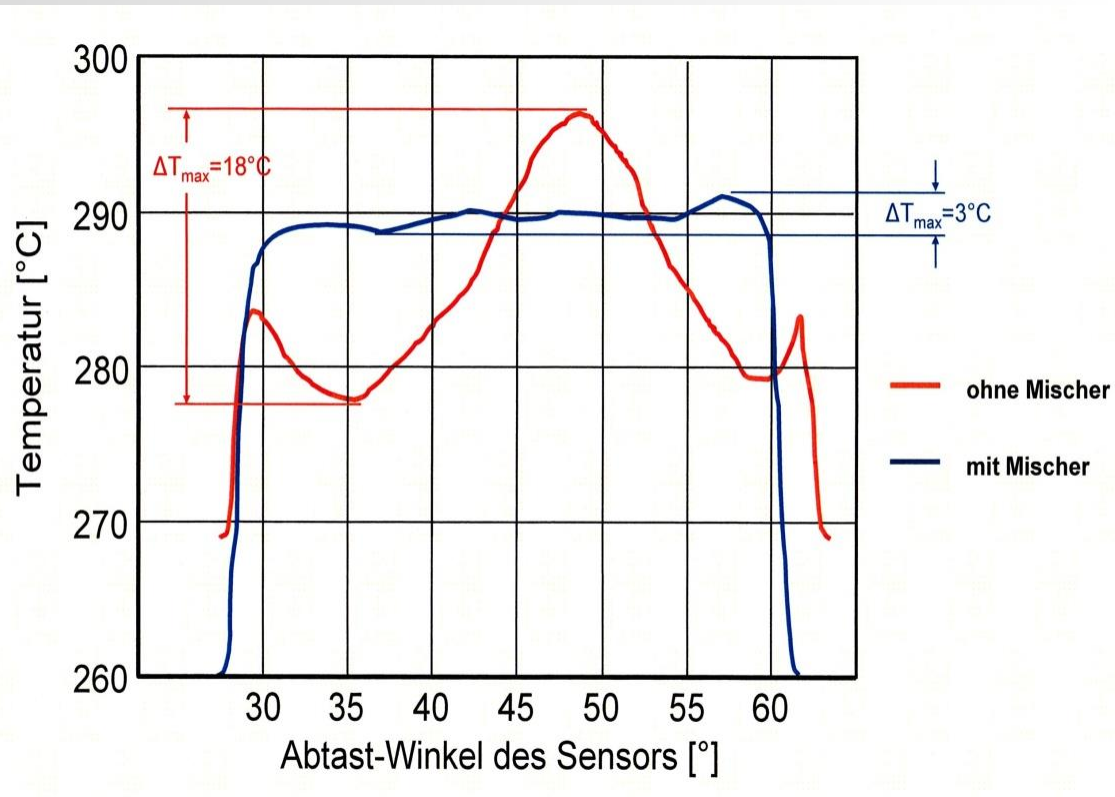


After 8 Mixing Elements

通过第八个混合单元

## Temperature distribution (sample) with and without mixers

### 温度分布(样例)使用及未使用静态混合器



- **Balanced filling process**  
平衡充模
- **Balanced cooling performance**  
(→no distortion)  
平衡冷却(→无变形)
- **Constant part weight**  
稳定产品重量
- **High reduction of scrap rate**  
大幅降低废品率
- **Polymer melt with a low  $\Delta T$**   
缩小熔胶温度差范围
- **Equalized velocity flow profile**  
均衡熔胶流速



## Self Cleaning 自我清洁

By mixing the boundary layer into the centre of the cross section, a faster colour change is achieved  
将熔胶外层混合到中间，  
实现快速换色





3-4 shots can complete color change 3-4模即可完成换色



## Pay back due to shorter cycle time 缩短注塑周期节约成本

### 案例1 / 德国, 奥地利

产品:	包装盒
机台:	12000 kN
螺杆直径:	130 mm
塑胶:	PPC
混合器:	ZYM 30_4
产品重量:	2500 g
注塑周期 (未使用混合器):	120秒.
注塑周期 (使用混合器):	110秒.
注塑周期缩短:	8.3 %
每周生产时间:	108小时
色母粒用量 (未使用混合器):	2 %
色母粒用量 (使用混合器):	2 %
投资回本时间:	2 周

### 案例 2 / 意大利

产品:	宠物用品
机台:	5000 kN
螺杆直径:	80 mm
塑胶:	PP
混合器:	ZYM 17_4
产品重量:	1100 g
注塑周期 (未使用混合器):	39秒.
注塑周期 (使用混合器):	36.5秒.
注塑周期缩短:	6 %
每周生产时间:	120 h
色母粒用量 (未使用混合器):	1.5 %
色母粒用量 (使用混合器):	1.5 %
投资回本时间:	1 周

## Pay back due to shorter cycle time and reduced color cost 缩短注塑周期并节约着色成本

### 案例 3 / 意大利

产品:	包装
机台:	Sandretto
螺杆直径:	60 mm
塑胶:	ABS
混合器:	ZYM 17_6
产品重量:	200 g
注塑周期 (未使用混合器):	34 秒.
注塑周期 (使用混合器):	30 秒.
注塑周期缩短:	11.7 %
每周生产时间:	120 小时
色母粒使用量 (未使用混合器):	3 %
色母粒使用量 (使用混合器):	1.6 %
投资回本时间:	1 周

**Static mixer is the preferred choice of the OEMs and the following companies:**  
静态混合器是以下设备生产商及用户的首选：

## OEMs:

- o Wittmann Battenfeld
- o Engel
- o Netstal
- o Cincinnati

- o Weltech Machinery
- o Sacmi /Negri Bossi
- o Mitsubishi
- o Sandretto

- o Arburg
- o CML
- o Haitain
- o Husky
- o Demag

- o Krauss-Maffei

**Master Batch producer  
recommend static mixing  
technology: 推荐静态混合  
技术的色母粒制造商:**

- o Clariant
- o PolyOne
- o U.C.C.
- o Finke
- o Milliken Masterbatch

- o DOW
- o BASF / BASF Color
- o Reedy
- o Viba
- o Holland Color

## Based on the product segments: 按产品种类分:

- ▶ **Automobile:** Honda Motors, Audi, VW, Mercedes, Ford, Fiat, SAAB, Volvo, 延锋伟世通, etc.  
**汽车:**
- ▶ **Households: 家用:** Tupperware, Sulo, Samsonite, Zyliss, 爱马仕, etc.
- ▶ **Electrical Appliances:** Changhong, Polytron TV, Philips, Grundig, Epson, Zeiss, Lyca, Electrolux, Moulinex, Miele, Chimei, Foxconn, Flextronics, Phillip, 西诺塑料, etc.  
**电 器:**
- ▶ **Toys: 玩具:** Lego, Matel, etc.
- ▶ **Consumer Products:** Unilever, Nivea, Alpla, Guala Closures, Crown Plastics, SIG, Grandarte, Menshen, Bericap, Gillette, 环亚, 金冠, 井上新艺, 泰马克, etc.  
**消费品(包装):**





***Thank you !***

**谢 谢!**