Gp Green Polymer Additives

Emery Oleochemicals

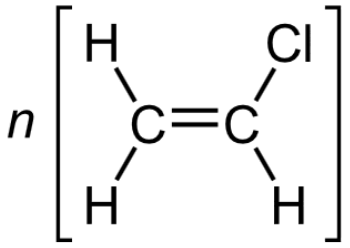
Additives for C-PVC
C-PVC添加剂

Chinaplas May 2017, Guangzhou

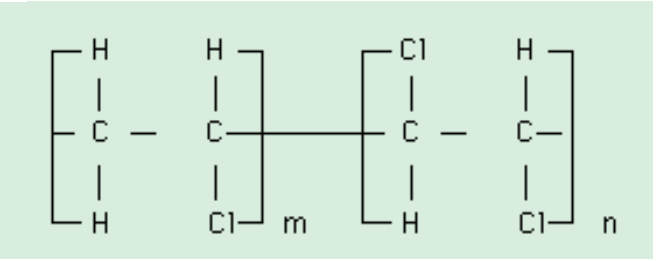
Difference between PVC and C-PVC and PVdC
PVC和C-PVC和PVdC的差异

Chemical composition / 化学成分

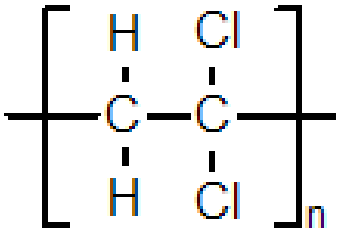
PVC
$-(CH_2\text{-}CHCL)_n-$



C-PVC
$-(CHCL\text{-}CHCL)_n-$



Polyvinylidene chloride
(PVdC)
聚偏二氯乙烯
$-(CH_2\text{-}CCL_2)_n-$



Difference of PVC and C-PVC and PVdC
PVC和C-PVC和PVdC的差异
Properties / 属性

Properties 属性	PVC	C-PVC	PVdC
Density 密度	1.4	1.5-1.6	1.7
CL content 氯化物含量(%)	57	64-67	70
Heat resistance 耐热性(℃)	60 - 80	100-120	130 - 150

Rheological behavior / 流变特点

PVC vs C-PVC

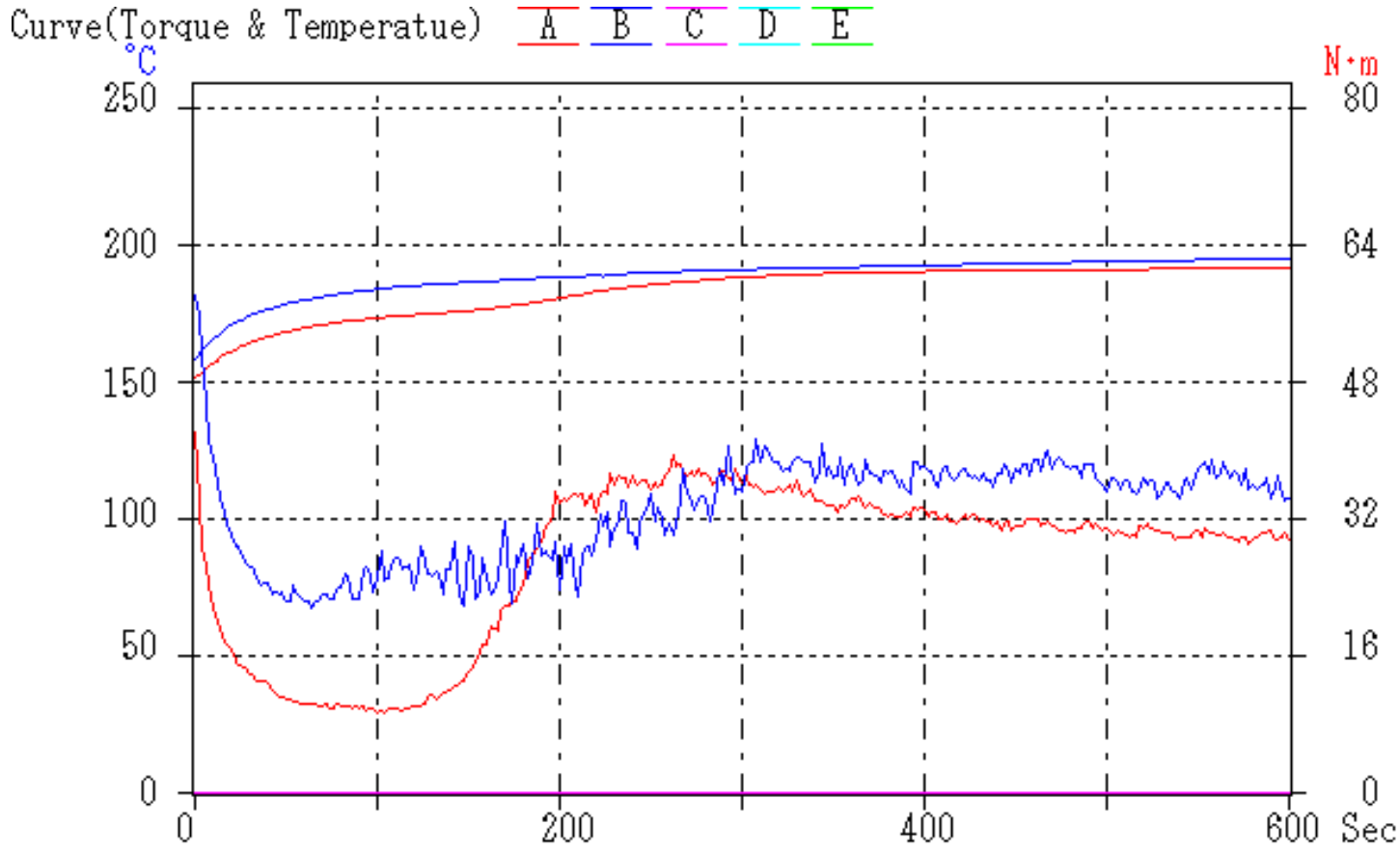
Test formulation 测试配方	Formulation 1 实验1	Formulation 2 实验2
PVC (K=66)	100	-
C-PVC (for Pipe)	-	100
Tin stabilizer 锡稳定剂	2.0	2.0
Processing aid 加工助剂	1.0	1.0
Lubricant 润滑剂	2.0	2.0
Bulk density (g/l) 体积密度	530	608
Vicat Softening point (℃) 维卡软化点	86.4	127.7

Rheological behavior / 流变特点

PVC vs C-PVC

Extrusion results 挤出结果	Formulation 1 实验1	Formulation 2 实验2
Torque (Nm)扭矩	47.7	108.2
Pressure 1 (BAR) 压力	121.5	315.0
Pressure 2 (BAR) 压力	58.9	146.2
Temperature 1 (℃)温度 1	192	195
Temperature 2 (℃)温度 2	195	198

Plastgraf results / 流变图



A= Formulation 1

B= Formulation 2

Dynamic heat stability (after 10 min. Color)
动态热稳定性 （10分钟后颜色）

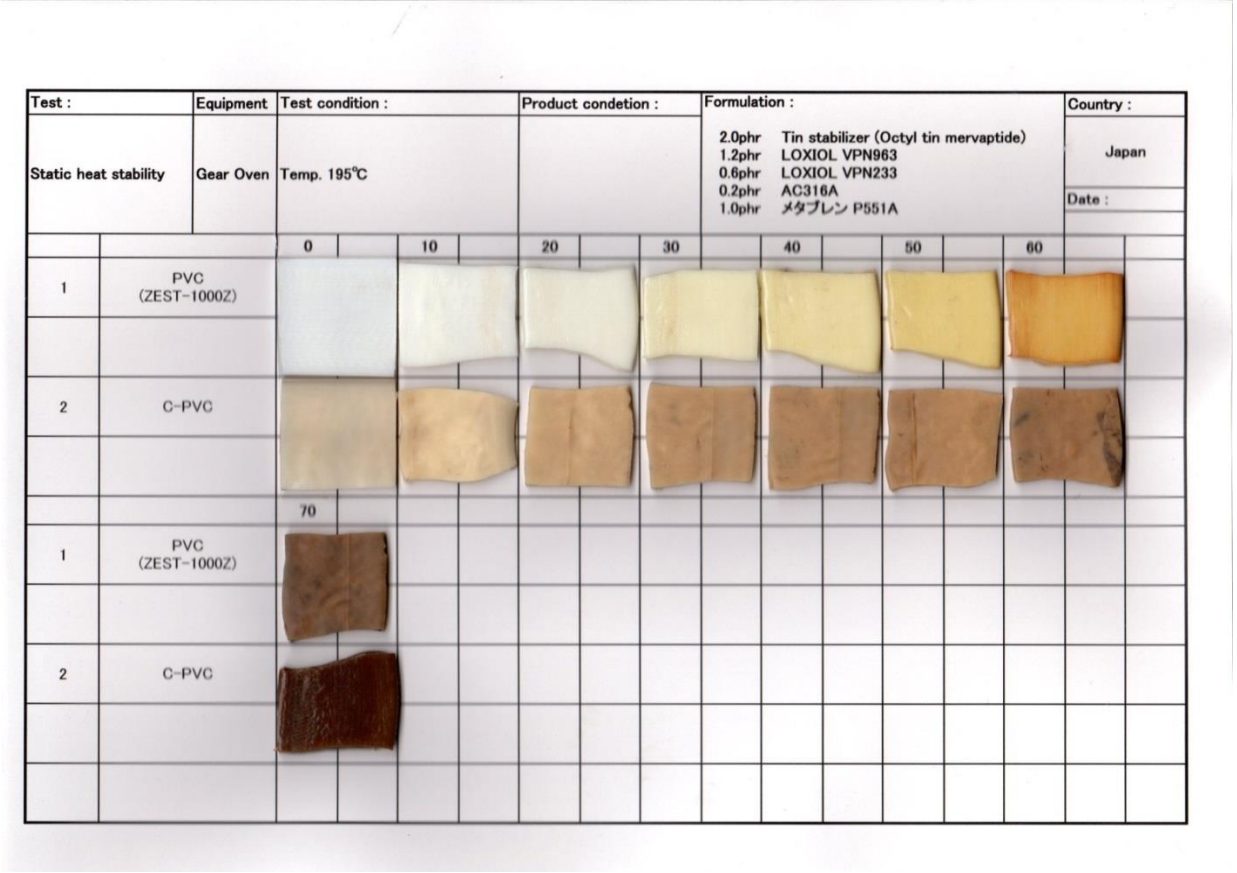
A= Formulation 1 / 实验1

B= Formulation 2 / 实验2

Static heat stability of extrusion sheet (@ 190℃ by oven)

挤压板的静态热稳定性 (@ 190℃烘箱)

Test :	Equipment	Test condition :	Product condetion :	Formulation :	Country :
Static heat stability	Gear Oven	Temp. 195℃		2.0phr Tin stabilizer (Octyl tin mervaptide) 1.2phr LOXIOL VPN963 0.6phr LOXIOL VPN233 0.2phr AC316A 1.0phr メタブレン P551A	Japan Date :



Conclusion / 结论
PVC vs C-PVC

- **C-PVC gives higher heat resistance (Vicat softening point) than PVC, so additives used should not have a big influence for heat resistance**
- C-PVC可以获得比PVC更高的耐热性（维卡软化点），所以我们考虑选择添加剂对耐热性影响不大
- **C-PVC is faster in fusion than PVC, so a higher dosage of external lubricant is needed in comparison to PVC to delay fusion time.**
- C-PVC比PVC更快融合，因此需要加入比PVC更高的外部润滑剂用量来延长融合时间。
- **C-PVC heats up easier than PVC, so the additives used have to reduce the heat up by internal friction.**
- C-PVC比PVC容易加热，因此需要添加剂以通过内部摩擦来减少热量
- **Dynamic heat stability is not as good as PVC, so additives for improving the dynamic heat stability have to be used.**
- 动态热稳定性比PVC差，但热稳定性不大，因此还需要添加添加剂以提高动态热稳定性。

Additives for C-PVC / C-PVC添加剂

C-PVC gives higher heat resistance (Vicat softening point) than PVC, additives used should not have a big influence to heat resistance
C-PVC可以得到比PVC更高的耐热性（维卡软化点），所以我们应该考虑选择添加剂对耐热性影响不大

Test Formulation [phr]	测试配方	
C-PVC compound	粒	111.3
Lubricant	润滑剂	1.0

Lubricant / 润滑剂	Vicat softening point (° C) 维卡软化点
Blank / 空白	149.7
LOXIOL® 2307	147.1
LOXIOL® 2899	146.9
LOXIOL® G 70 S	146.7
OP Wax / OP蜡	145.2
LOXIOL® G 60	143.5

LOXIOL® 2307 influences the vicat softening point less than ester wax
LOXIOL® 2307对维卡软化点的影响较小

Additives for C-PVC / C-PVC添加剂

C-PVC is faster fusion than PVC, so a higher dosage of external lubricant is needed in comparison to PVC to delay fusion time.
C-PVC比PVC具有更快的融合性，因此需要添加比PVC更高的外部润滑剂用量来延长熔合时间

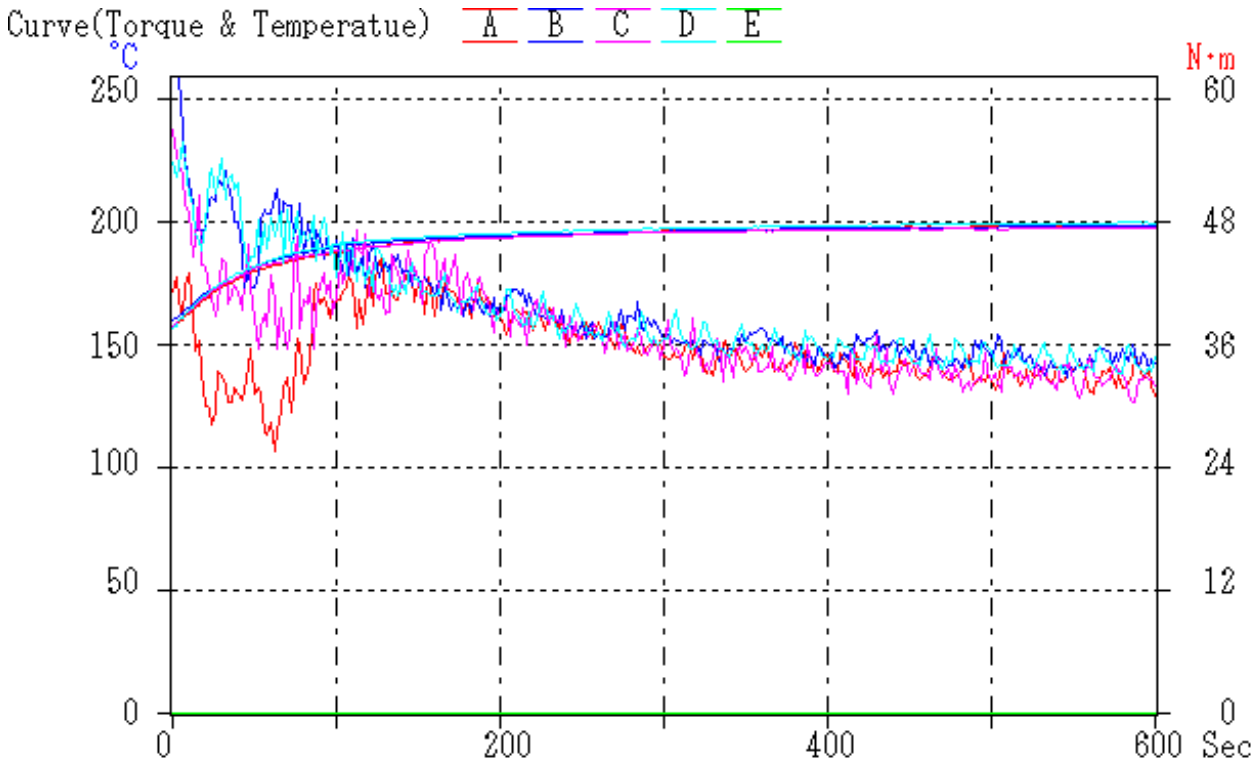
C-PVC heats up easier than PVC, so the additives used have to reduce the heat up by internal friction.
C-PVC比PVC容易加热，因此需要添加剂以通过内部摩擦来减少热量。

Formulation / 配方：102.5 phr C-PVC base compound + 1.0 phr Lubricants

Lubricant 润滑剂	Fusion time (Sec) 融合时间（秒）	Max torque (Nm) 最大扭矩（Nm）	10 min. Torque (Nm) 10分钟扭矩（Nm）	Temperature (℃) 温度（℃）
LOXIOL® 2307	2.2	45.0	34.0	200
LOXIOL® 2899	1.2	53.0	35.0	201
Paraffin wax	1.8	48.0	34.0	200
LOXIOL® 70 S	0.4	58.0	35.0	203
LOXIOL® G 32	0.3	67.0	35.0	203
OXPE Wax	2.0	47.0	34.0	200

LOXIOL® 2307 and 2899 gives delaying fusion time and reduce torque
LOXIOL® 2307和2899提供延迟融合时间并减少扭矩

Additives for C-PVC / C-PVC添加剂



A: LOXIOL® 2307

B: LOXIOL® 2899

C: Paraffin wax

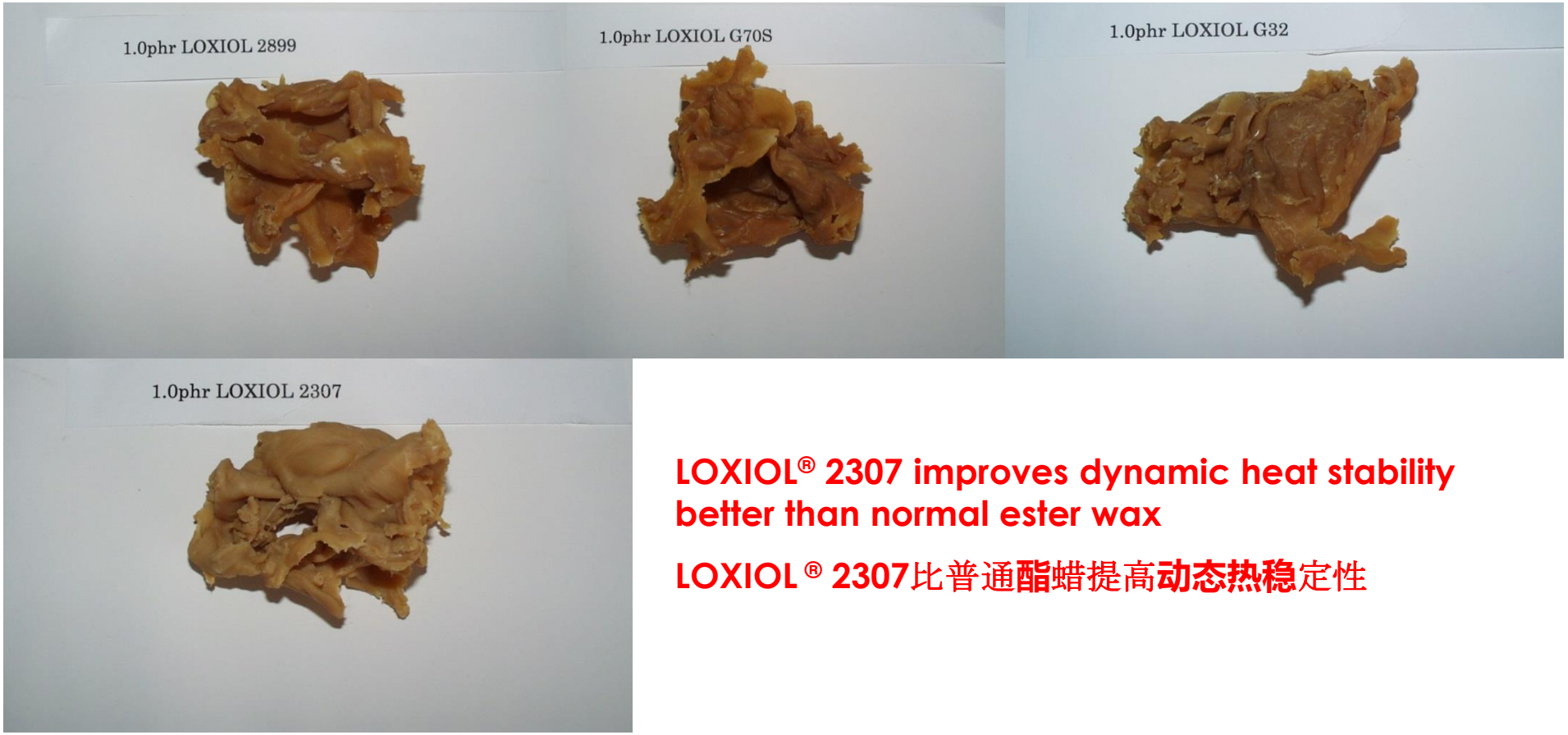
D: LOXIOL® G 70 S

LOXIOL® 2307 delays fusion time and reduces torque like hydrocarbon wax
LOXIOL® 2307延长了融合时间，并减少了像烃蜡那样的扭矩

Additives for C-PVC / C-PVC添加剂

Dynamic heat stability is not as good as PVC, so additives for improving the dynamic heat stability has to be used.

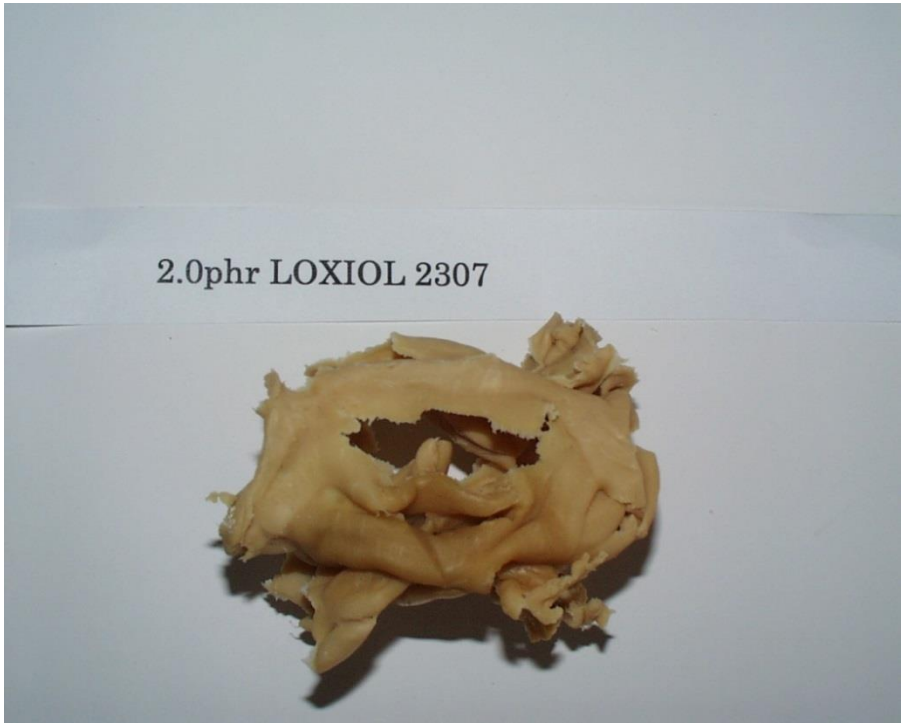
动态热稳定性不如PVC，因此必须使用用于提高动态热稳定性的添加剂。



LOXIOL® 2307 improves dynamic heat stability better than normal ester wax

LOXIOL® 2307比普通酯蜡提高动态热稳定性

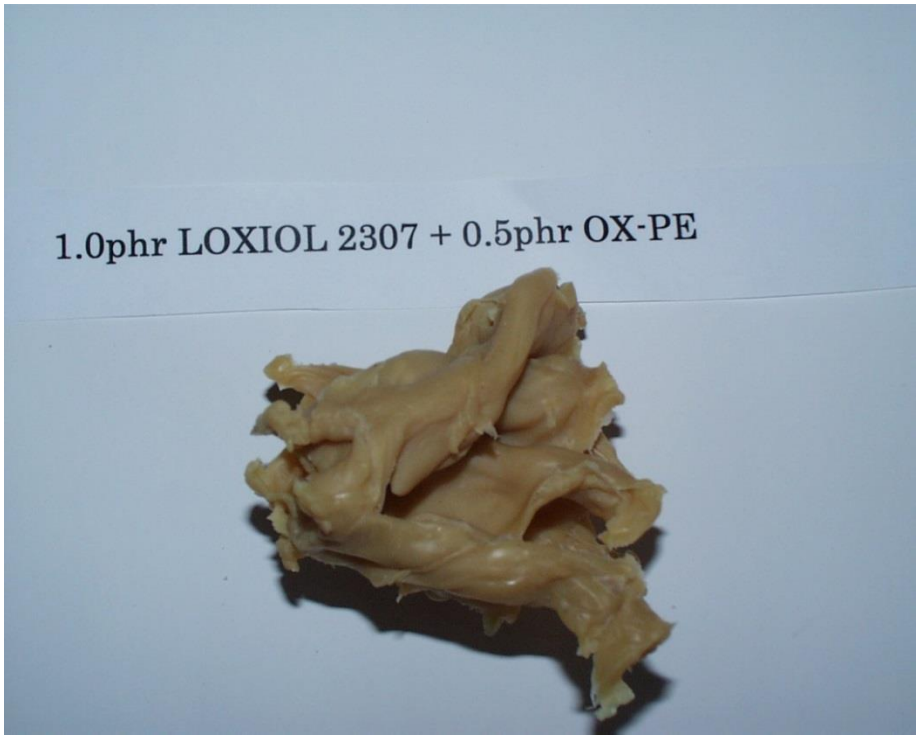
Additives for C-PVC / C-PVC添加剂



2.0phr LOXIOL® 2899

2.0phr LOXIOL® 2307

If increasing the dosage, difference is very clear!
如果增加剂量，差异很明显！



1.0phr LOXIOL® 2899 + 0.5phr OX PE

1.0phr LOXIOL® 2307 + 0.5phr OX PE

And combination with OX- PE wax are more effective!
并且与OX-PE蜡的组合更有效 ！

Additives for C-PVC / C-PVC添加剂

Dynamic heat stability is not as good as PVC, so additives for improving the dynamic heat stability have to be used.

动态热稳定性比PVC差，但热稳定性不大，因此还需要添加添加剂以提高动态热稳定性。

Without LOXIOL® 2307
没有 LOXIOL® 2307

+ 1.0phr LOXIOL® 2307

+ 0.5phr Ox. PE

LOXIOL® 2307 and Oxidized PE-wax has improving dynamic heat stability
LOXIOL® 2307和氧化PE蜡具有改善的动态热稳定性

APPLICATIONS / 应用

C-PVC pipes, fittings, plates and sheets C-PVC
管，配件，板和板
PVC pipes, window profiles, fittings in tin, calcium/zinc, and calcium-organic stabilized formulations
PVC管，窗型材，管件，钙/锌和钙有机稳定配方

ADVANTAGES / 优点

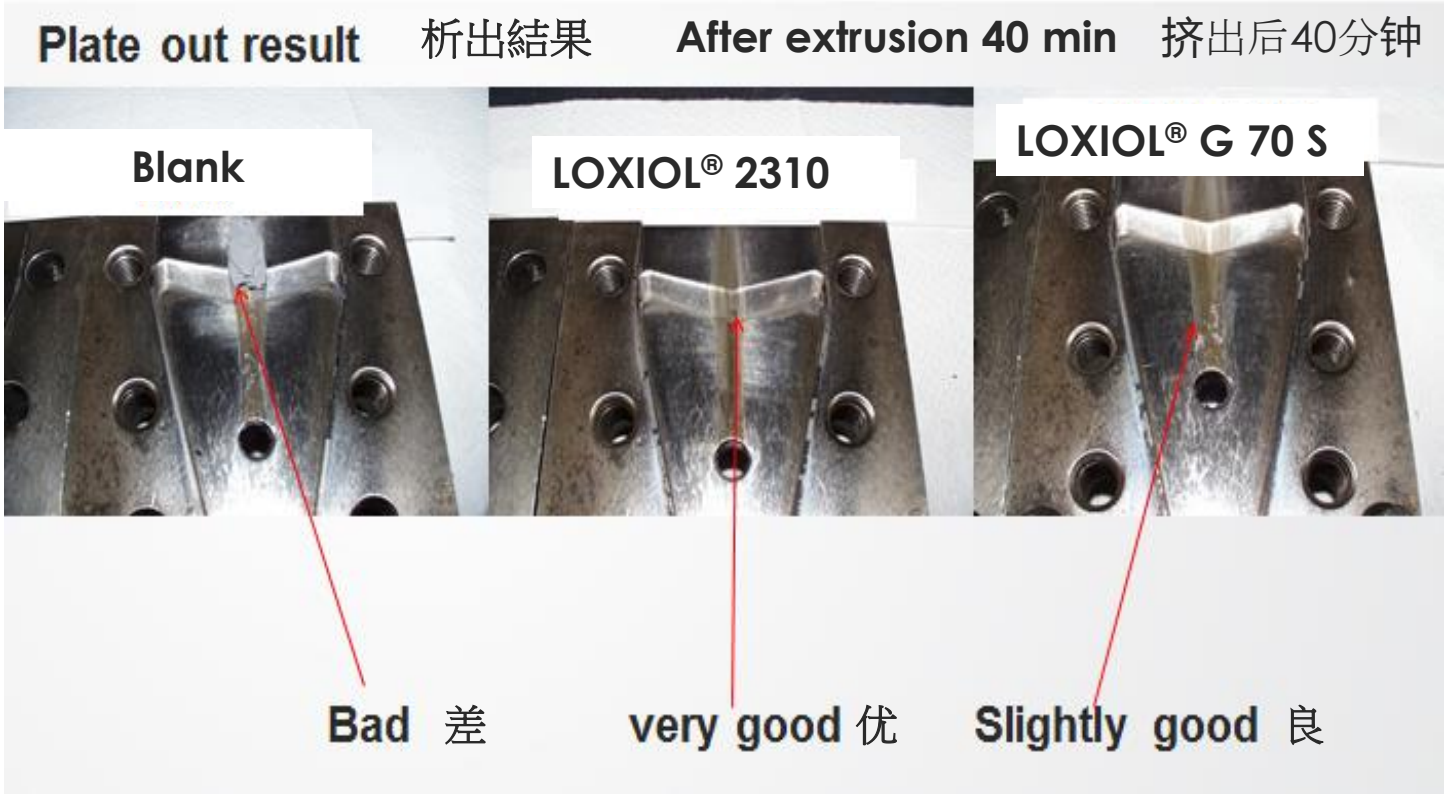
- Superior advantages in production of bright, white end products
  明亮，白色终端产品生产的优势
- Outstanding glossy surface properties
  卓越的光泽表面性能
- Lowest influence on the Vicat softening point
  对维卡软化点的影响最小
- Increased productivity and cost savings by improved long run properties, reduced cleaning and change over time due to very low plate-out occurrences
  低析出，改善长期运行性能，减少清洁和停產，提高生产力和成本节省

Parameter / 参数	Value / 值	Test Method / 测试方法
Dropping Point (° C) / 滴点	80 - 90	DIN ISO 2176/AOCS Cc 18-80*
Acid value (mg KOH/g) / 酸值	0 - 15	DIN EN ISO 2114/AOCS Te 1a-64:1997*

Very good performance for improving plating out
低析出

Test formulation 测试配方	Blank	Blank +LOXIOL® 2310	Blank + LOXIOL® G70S
C-PVC for Pipe	100	100	100
Tin Stabilizer	2.5	2.5	2.5
Processing aid	2.0	2.0	2.0
PE-wax	1.2	1.2	1.2
Polyol ester	1.8	1.8	1.8
LOXIOL® 2310	-	0.3	-
LOXIOL® G 70 S	-	-	0.3

Very good performance for improving plating out
低析出



APPLICATIONS / 应用

C-PVC pipes, fittings, plates and sheets
C-PVC管，配件，板和板
PVC pipes, window profiles, fittings in tin, calcium/zinc, and calcium-organic stabilized formulations
PVC管，窗型材，管件，钙/锌和钙有机稳定配方

ADVANTAGES / 优点

- Improving plating out performance by small dosage
  高效,低析出
- Increased productivity and cost savings by improved long run properties,
  通过改善长期性能，提高生产效率和节省成本
- Reduced cleaning and change over time due to very low plate-out occurrences
  由于非常低析出，减少了清洁和停產时间

Parameter / 参数	Value / 值	Test Method / 测试方法
Dropping Point (° C) / 滴点	71 - 80	DIN ISO 2176
Acid value (mg KOH/g) / 酸值	172 - 190	DIN EN ISO 2114
Iodine value (gI/100g) / 碘值	0 - 4	DIN 53241
Saponification value mg KOH/g / 皂化值	180 - 192	DIN EN ISO 3681
Hydroxyl value (mg KOH/g) / 羟值	145 - 165	DIN 53240

LOXIOL® 2308
LOXIOL® 2309

APPLICATIONS / 应用

C-PVC pipes, fittings, plates and sheets
C-PVC管，配件，板和板
PVC pipes, window profiles, fittings in tin, calcium/zinc, and calcium-organic stabilized formulations
PVC管，窗型材，管件，钙/锌和钙有机稳定配方

ADVANTAGES / 优点

- Improves the material flow
  改善材料流动
- Increased productivity and cost savings by improved long run properties,
  通过改善长期性能，提高生产效率和节省成本
- Reduced cleaning and change over time due to very low plate-out occurrences
  由于非常低析出，减少了清洁和停產时间
- Specially for producing of C-PVC fitting as internal lubricants with small influence on the Vicat softening point
  特别用于生产C-PVC配件作为对维卡软化点影响小的内部润滑剂

LOXIOL® 2308
Technical data / 技术数据

Description 描述	Wax ester 蜡酯	
Appearance 表观	White powder, fine grained 白色粉末，细粒	
Application 应用	Processing of rigid and plasticized PVC 硬和 軟PVC的加工	
Properties 属性	Internal and external lubricant 内部和外部润滑剂 Low sensitivity to dosage compared to purely external lubricants 与纯外部润滑剂相比，对剂量的敏感性低	
	Very low odour 气味极低	
	Dropping point / 滴点	52 – 56 °C
Dosage / 剂量	Rigid / 硬PVC	0.5 – 1.5 %
	C-PVC	1.0 – 2.0 %

LOXIOL® 2309
Technical data / 技术数据

Description 描述	Solid saturated partial fatty acid ester of glycerol 甘油固体饱和脂肪酸偏酯	
Appearance 表观	White, free-flowing, slight odour 白色，自由流动，微气味	
Application 应用	Processing of rigid and plasticized PVC 硬和軟PVC的加工	
Properties 属性	Dispersing agent for pigments and fillers 颜料和填料分散剂 Internal lubricant for PVC PVC内润滑剂 Suitable for calendaring and injection molding 适用于压延和注射成型	
	Dropping point / 滴点	55 – 62 °C
Dosage / 剂量	Rigid / 硬PVC	0.5 – 1.5 %
	C-PVC	1.0 – 2.0 %


Questions
提问时间?
THANK YOU 谢谢