

Eco-plastics: A Natural Approach 环保塑料：天然解决方案

For E&E applications
July, 2010



Innovation Award - Bio-based Material of the year 2010 创新奖 - 2010年度生物基物料



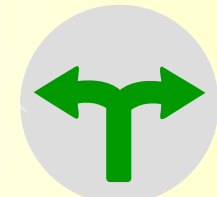
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Introduction 简介

- ① People are demanding green products
人们要求绿色产品
 - ② A better living environment
希望有更好的生活环境
- ② Governments are demanding green products
政府要求绿色产品
 - ③ Less pollution 减少污染
 - ④ Less demand on petroleum 减少石油用量
- ③ The industry is looking for green plastics
业界寻找绿色塑料
 - ⑤ The demand is clear 需求明显
 - ⑥ Price of petroleum based materials are surging
石化产品价格不断升高



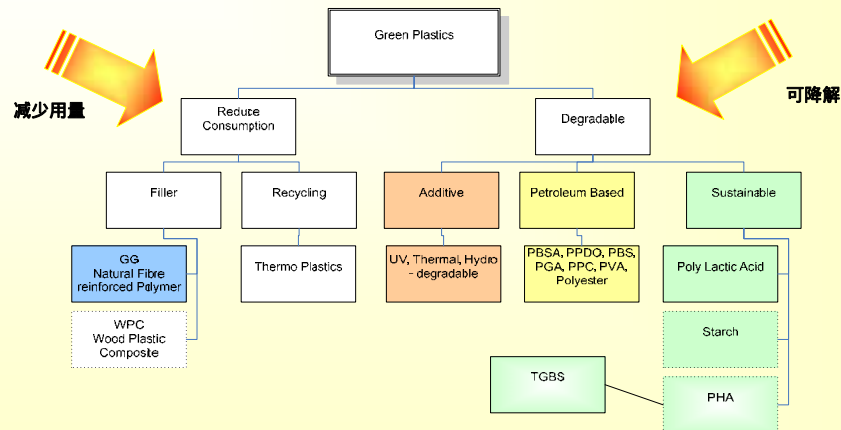
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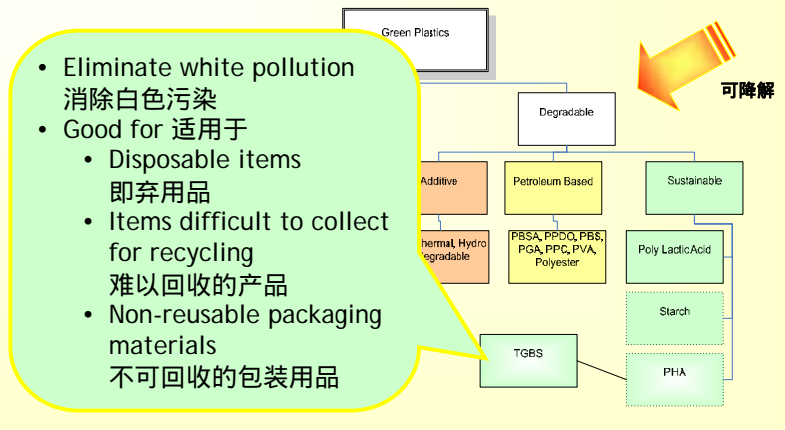
Green Plastics - two
solutions
绿色塑料 - 两种解决方法



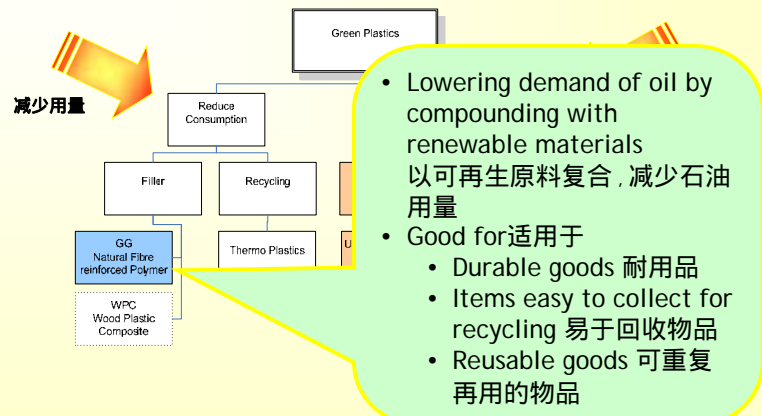
Green Plastics - two solutions 绿色塑料 - 两种解决方法



Degradable Plastics for Disposables 可降解塑料适用于一次性用品



Eco-Plastics for Durable Goods 环保塑料适用于耐用品



Questions? 问题



- ① Are you going to make durable goods or disposable good?
准备生产的是即弃用品还是耐用品?
- ② What properties of the materials do you want?
要求物料性能为何?
- ③ What features do you want?
要求有甚么特点?
- ④ What designs are you going to choose?
会选择怎样的设计?
- ⑤ What are the selling points?
希望有甚么卖点?



A brand new Material 新的材料



Natural Fibre Reinforced Polymer 天然纤维加强塑料



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Primary feedstock serving the entire value chain 符合整条价值链的基础资源



- Cradle to Cradle granules for injection moulding application
生生不息的注塑级物料
- Fibres used: flax, kenaf, jute
天然纤维：亚麻、红麻、黄麻
- Plastics used: PP, PLA, PHB
塑料：PP, PLA, PHB
- Both standard- and tailor-made compositions
定制或特配产品
- Master batches
母料



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Natural Fibre Reinforced Polymers 天然纤维复合塑料



- | | |
|---|---|
| <ul style="list-style-type: none"> • Eco-friendly环保 • Substitute petroleum based materials - by 30% - 70%
减省石化材料部分达30-70% • Recyclable, by 7 times
可回收再用达7次 • Use as energy pellets at the end of life cycle
使用周期完结后可用作燃料 | <ul style="list-style-type: none"> • Reinforce by natural fibre
天然纤维加强 • improvements in mechanical properties
加强机械性能 • Improvements in thermal properties
加强热性能 • Improvements in insulation properties
加强阻隔性能 |
|---|---|

**Eco-friendly while providing performance of engineering plastic
环保并同时提供工程塑料的性能**

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GG NFRPP GG天然纤维复合聚丙烯



- Our granules compete with GF compounds:
与玻纤相比：
- lighter, stiffer, equally strong
轻、硬、强度相当
- normal flow behavior
正常流变
- Resistance against UV radiation
高抗紫外线能力
- Non abrasive
不磨损机器



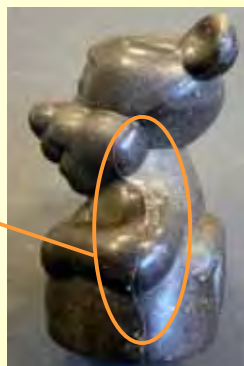
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Processing 加工

- ④ Can be processed in ordinary machineries
可在常规机器加工
- ④ 2nd process similar as PP
二次加工类似 PP
 - ④ Gluing 胶水黏贴
 - ④ Ultra-sound welding 超声焊接
 - ④ Painting 上色
- ④ Coloration 加色
 - ④ PP/PE Color master-batch 色母加色
 - ④ Natural color tone 色泽天然
- ④ Flexibility 弹性
 - ④ Dry mix with PP for "dilution" to tailor properties
可干混PP以稀释调至所需特性



Coloring 调色



Mechanical upgrading (stiffness x5, strength x2.5) 机械性能提升 (刚度 X5, 强度 X2.5)

	Virgin PP	PC/ABS	GFR PP composite	GG F022J FR-V0	GG N026J NFRPP
Fibre content [wt.%]	0	0	20	30	50
Density [kg/m ³]	905	1,120	1,220	1,250	1,110
Flexural modulus [MPa]	1,300	2,200	3,420	5,300	4,200
Flexural strength [MPa]	45	82	109	85	82
Tensile modulus [MPa]	1,670	2,200	3,650	5,800	5,400
Tensile strength [MPa]	35	52	61	59	62
Tensile elongation [%]	600	80	2.5	2.6	2.3
Impact strength [kJ/m ²], unnotched	NB	NB	42	19	21



UL94 Test 测试

- ④ Test according to UL94
测试按UL94规格
- ④ GG F023H
 - ④ 40% Nature Fibre (Hemp)
40%天然纤维
- ④ Flame Retardant
阻燃剂
 - ④ Halogen, aluminum, magnesium free
无卤素、铝、镁



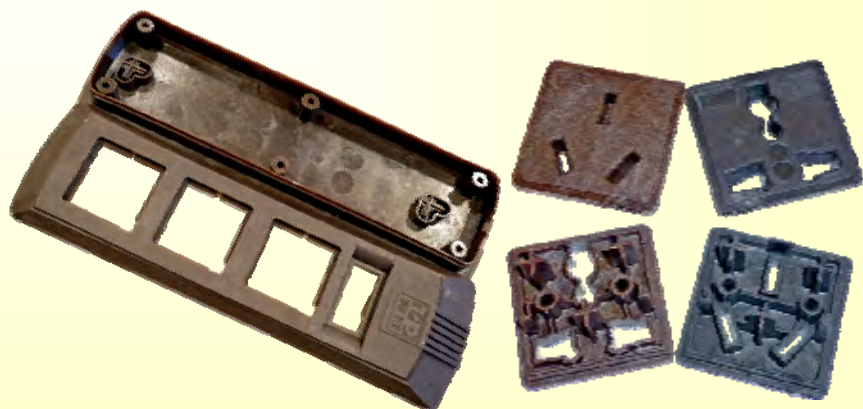
GG F023H = V0



Fine Details
成形良好



Fine Details
成形良好



Application for E&E 用作电器



- Eco-friendly 环保
- Wood replacement 代木
- Easy processing 易于加工
- Good details 成形良好
- Good strength 高强度
- Durable 耐用
- Safe 安全
- Outdoor or indoor use 室内外可用
- Flexible (dilution from master-batch) 弹性使用 (可厂内稀释)
- Low cost (低成本)



Examples : E&E
 案例：电子产品

- ④ Housings for electronic applications
 电子产品外壳
- ④ V0 fire retardant
 V0阻燃级
- ④ Eco-friendly FR additives
 环保型阻燃剂
- ④ Natural touch and feel
 天然物料外观和手感



Innovative Sustainable Materials
 Bio-based / Biodegradable
 崭新环保物料
 生物基 / 生物可降解



崭新环保物料
 生物基 / 生物可降解



Compostability
 可堆肥认证

- ④ Certify feasibility of treating in composting facility
 证明可以堆肥处理

Organization	Din Certco	AIB Vincotte	BPI/USCC	FSWA	Avfall Norge	JBPA
Location	Germany	Belgium	USA	Finland	Norway	Japan
Standard	EN13432 / ASTM D6400	EN13432	ASTM D6400 / ASTM D6868	EN13432	EN13432	GreenPla Certification Scheme
Logo						



OK Bio-based by Vincotte (Belgium)
 生物基成份认证

- ④ Certifying the proportion of "new" carbon.
 证明“新”碳的成份比例

Between 20 and 40 % Biobased	Between 40 and 60 % Biobased	Between 60 and 80 % Biobased	more than 80 % Biobased



Bio-degradable Materials - are they all the same? 生物可降解材料 - 是否全部一样？



	Nature	Production	Raw Materials
GG P021J	Bio-based Only renewable carbon source	Agro-fibre + PLA compounding	Nat. Fibre + PLA
PHA		Fermentation	Sugar / Starch
PLA		Fermentation & synthesis	Starch
Starch		Plasticising	Starch
CA	Bio-based source with fossil components	Extraction / synthesis	Wood / Chemical
PBAT	Oil based	Synthesis	Fossil based
PBS		Synthesis	Fossil based

*Most of the sugar/starch for fermentation are of industrial grade.



Bio-degradable Materials - are they all the same? 生物可降解材料 - 是否全部一样？



	GG P021J	PHA	modified starch	PLA	Synthetics
Source	Bio-based	Bio-based	Bio-based	Bio-based	Oil based
Mechanical prop.	Good	Flexible	weak	brittle	good
Thermal prop.	Good	Good	weak	weak	weak
Processability	V. Good	Good	poor	poor	+/-
Durability	Good	Good	poor	heat sensitive	good
Biodegradability	Good	Good	good	composting	good
Price	\$\$	\$\$\$	\$	\$\$	\$\$\$\$



Natural Fibre Reinforced PLA: GG P021J - Advantages 天然纤维加强聚乳酸的好处



Source 来源	Renewable 可再生	Agro-fibre + PLA (100% bio-based) 植物纤维 + 聚乳酸 (全生物基)
Mechanical 机械性能	Good 好	Stiffness + good impact strength 高刚性 + 高抗冲击强度
Thermal 热性能	Good 好	HDT higher than PLA HDT 比 PLA 高
Processability 加工性	Excellent 非常好	processable in existing production machines 可在原有机器加工 Easy to handle 容易处理
Durability 耐用性	Good 好	No degradation during usage 使用期间不降解
Bio-degradability 生物可降解性	Good 好	Fully bio-degradable 可生物降解
Green Aspect 环保性	Good 好	Zero carbon emission. 零碳排



Natural Fibre Reinforced PLA: GG P021J - Properties 天然纤维加强聚乳酸的性能



		GG P021J 天然纤维加强聚乳酸	GG N023J 天然纤维加强聚丙烯	NW 3001D 聚乳酸
Density 密度	g/cm ³	1.29	1.04	1.24
Melt Flow Index 熔指	g/10 min		7	10-30
Flexural Strength 弯曲强度	MPa	116	79	83
Flexural Modulus 弯曲模量	MPa	6,400	3,300	3,828
Charpy Impact, unnotched 简支梁抗冲击强度, 无缺口	KJ/m ²	14	22	0.16 J/m Izod D256



Natural Fibre Reinforced PLA:
GG P021J - Highlights
天然纤维加强聚乳酸的特性



- 100% bio-based 全生物基
- Bio-degradable 可生物降解
- Good mechanical properties 良好机械性能
- Good processability 良好加工性
- Good handling 容易处理
- Good surface finishing 良好外观



Natural Fibre Reinforced PLA:
GG P021J - Flower Pots
天然纤维加强聚乳酸 - 花盆



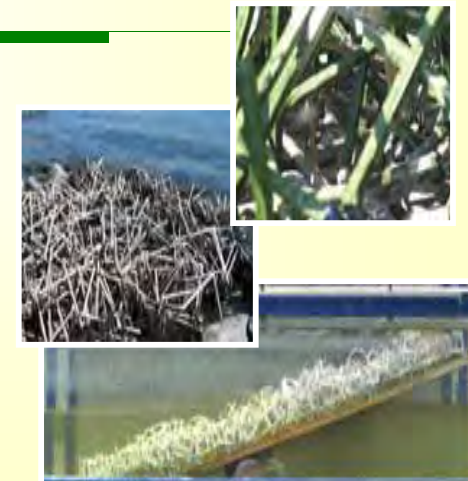
Natural Fibre Reinforced PLA:
GG P021J - Razor Holder
天然纤维加强聚乳酸 - 刮胡刀把手



Development in Holland:
荷兰正开发项目



- Dyke reinforcement 堤岸加强
- Riverbank erosion blockage 预防河岸侵蚀
- Artificial reef 人造礁石
- Fundament for coral growth 珊瑚礁基层



Current Status 现况

- ④ Mass production in HK 在香港量产
- ④ Current projects: 现时项目
 - ④ Automotives 汽车
 - ④ Fuse Holder 保险丝底座
 - ④ Battery Tray 电瓶托盘
 - ④ Underlayer 车底盘衬底
 - ④ Constructions 建材
 - ④ Structural parts for WPC's 木塑用结构件
 - ④ Injection molded accessories 注塑成形配件
 - ④ Toys 玩具
 - ④ Green Toys 环保玩具
 - ④ E&E applications 电器产品
 - ④ Casings for appliance 电器外壳
 - ④ Casings for transformers 变压器外壳



Pricing 价格

- ④ NFRPP positions along mechanical properties line-up
天然纤维加强塑料价格与其性能序列大概一致
- ④ Price can be lower when production scaling up
产量提高价格会降低



谢谢!
Thank You!

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