

Radici Engineering Plastic

---- A Key Partner in Auto Market

兰蒂奇工程塑料

---- 汽车工业重要合作伙伴

许晓东

市场开发经理

2014.3.28 上海

Contents

主要内容



- ❑ **RadiciGroup Introduction**
兰蒂奇集团简介
- ❑ **Case Histories in Auto Market**
兰蒂奇工程塑料在汽车行业的应用
- ❑ **Product Innovation and Technical Support**
产品创新与技术支持

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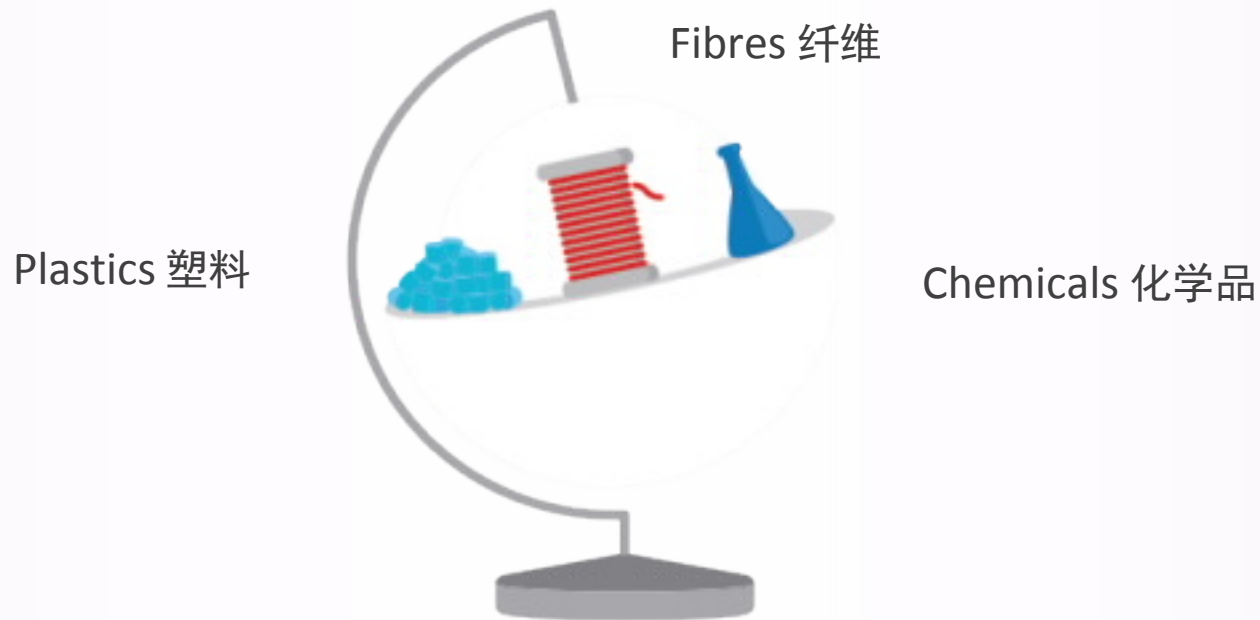
RadiciGroup World

兰蒂奇集团



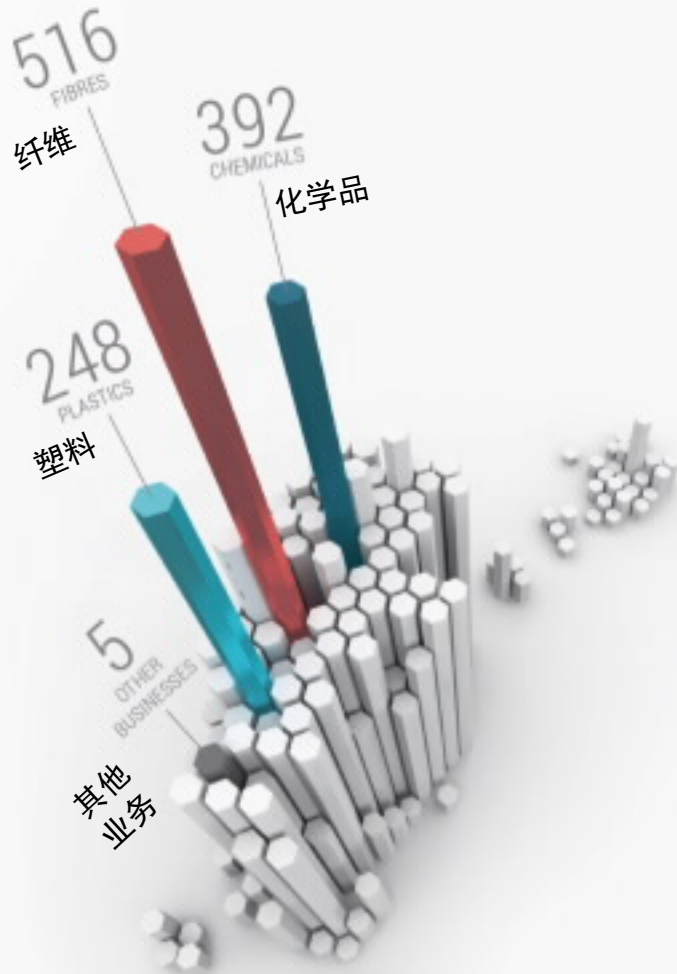
RadiciGroup is based in Europe and operates globally in diversified businesses focusing on:

兰蒂奇集团总部设在欧洲，多元化业务遍及全球，主要集中在以下几个领域：



Key RadiciGroup Numbers

兰蒂奇集团关键数据



Personnel: 3,200 employees

员工总数：3200人

2012 Aggregated Sales (millions of euros)

2012年销售总额（百万欧元）



RadiciPlastics Worldwide Presence

兰蒂奇塑料全球分布



EUROPE 欧洲

France 法国

Radici Plastics France SA

Germany 德国

Radici Plastics GmbH

Italy 意大利

Radici Novacips SpA
Villa d'Ogna

Radici Novacips SpA
Chignolo d'Isola

United Kingdom 英国

Radici Plastics UK Ltd-

ASIA 亚洲

China 中国

Radici Plastics (Suzhou) Co., Ltd.

India 印度

Radici Plastics Modi P. Ltd.

AMERICAS 美洲

Brazil 巴西

Radici Plastics Ltda.

USA 美国

Radici Plastics USA Inc.

Synergy & Integration: Production Capacity

聚酰胺上下游一体化：生产能力



195
KTons

ADIPIC ACID 己二酸
Radici Chimica SpA
Novara – IT

**Radici Chimica
Deutschland**
GMBH, Zeitz – DE

90
KTons

PA66
Radici Chimica SpA
Novara – IT

45
KTons

HMDA 己二胺
Radici Chimica SpA
Novara – IT

110
KTons

PA6
Radici Yarn,
Villa d'Ogna – IT

Radici Fil
Casnigo - IT

Synergy & Integration: Production Units

聚酰胺上下游一体化：原材料制备基地



PA 66

ADIPIC ACID 己二酸

NITRIC ACID 硝酸

SALT 66 尼龙66盐

HEXAMETHYLENEDIAMINE 己二胺

Radici Chimica SpA

Novara - IT



ADIPIC ACID 己二酸

NITRIC ACID 硝酸

CYCLOHEXANOL 环己醇

CYCLOHEXANONE 环己酮

**Radici Chimica Deutschland
GMBH**

Zeitz - DE



PA 6 Polymer

PA6/66 High Tenacity Yarn

Carpet Filament

Textile Filament

PA6 Staple

Radici Fil

Casnigo - IT



Radici Yarn

Villa d'Ogna - IT

PA6.10-PA 6.12

Radici Chimica SpA

Novara - IT

Synergy & Integration: Production Units

聚酰胺上下游一体化：工程塑料生产基地



AMERICAS 美洲



Radici Plastics USA Inc.
USA



Radici Plastics Ltda
BRAZIL

EUROPE 欧洲



Radici Novacips SpA
Villa d'Ogna – ITALY



Radici Novacips SpA
Chignolo d'Isola– ITALY



Radici Plastics GmbH -
GERMANY

ASIA 亚洲



Radici Plastics (Suzhou) Co.,
Ltd.
CHINA

Investment in fast-growing regions. Application development support worldwide.

在经济高速增长地区追加投资，支持全球应用开发

The Radici Plastics Brands

兰蒂奇塑料商品名



- **RADILON® A** (PA66)
- **RADILON® S** (PA6)
- **RADILON® D** (PA6.10)
- **RADILON® CA** (PA66/6 Copolymers)
- **RADILON® CS** (PA6/66 Copolymers)
- **RADIFLAM® A** (PA66 flame retardant)
- **RADIFLAM® S** (PA6 flame retardant)
- **RADIFLAM® B** (PBT flame retardant)
- **RADITER® B** (PBT & PET)
- **HERAFORM®** (POM)
- **HERAFLEX® A & E** (TPE's)
- **HERAMID® A** (PA66, re-compounded)
- **HERAMID® S** (PA6, re-compounded)



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Automotive Sectors

汽车各组成部分

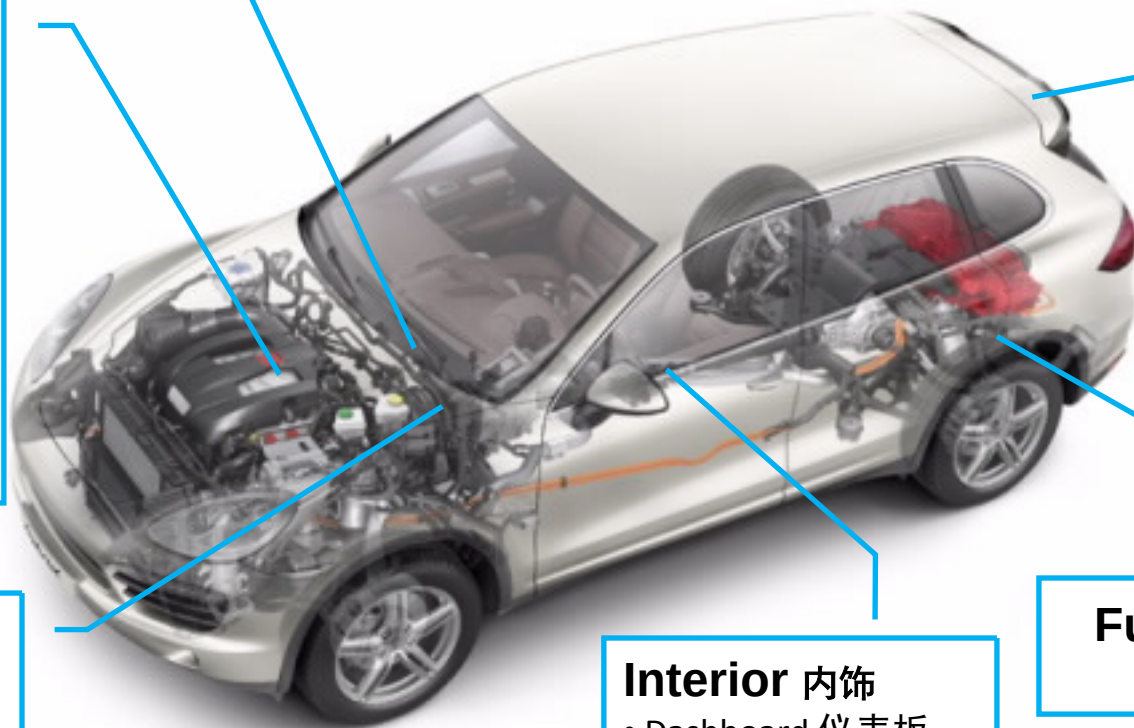
Under the bonnet 发动机罩内部件

- Cooling & Heating system 冷却&热系统
- Air Intake system 进气系统
- Fuel System 燃油系统
- Oil Circuit 润滑油路
- Valve & Beauty Covers 气门室&引擎装饰盖
- Fan/Shrouds 风扇/护罩

Transmission and Gearshift 传动和变速系统

Electric / Electronic parts 电子电器

Exterior 外饰



Interior 内饰

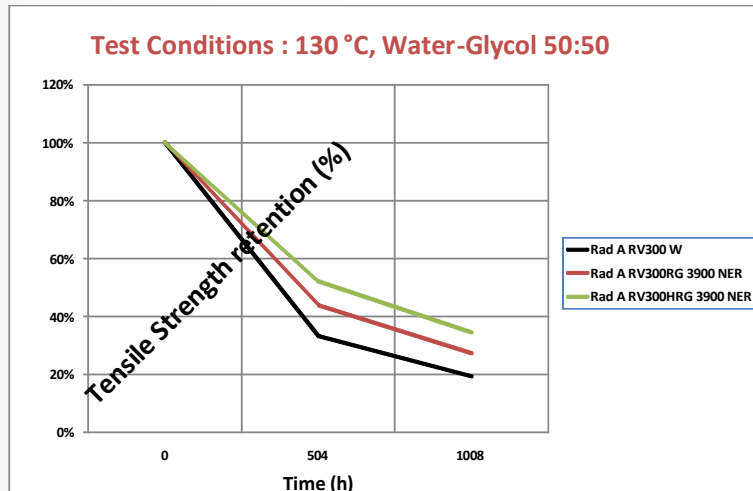
- Dashboard 仪表板
- Other 其他

Fuel System 燃油系统

Under Bonnet – C&H System

发动机罩内部件 – 冷却&热系统

- Cooling pipes and connections 冷却管路及接头
- **RADILON A RV300RG Black**
RADILON A RCV3015RKC
- WIT / GIT technology 水辅/气辅技术
- Superior hydrolysis resistance 优异的耐水解性能



Under Bonnet – Air Intake System

发动机罩内部件 – 进气系统



- **Air Intake Manifold 进气歧管**
- **RADILON S RV(300÷350)W Black (PA6)**
RADILON A RV(300÷350)W Black (PA66)
- **Process: Injection Molding + Vibration Welding**
工艺: 注塑成型+振动摩擦焊接
- **Heat stabilization 热稳定性**



Under Bonnet – Air Intake System

发动机罩内部件 – 进气系统

- Hot side Turbo Air Ducts

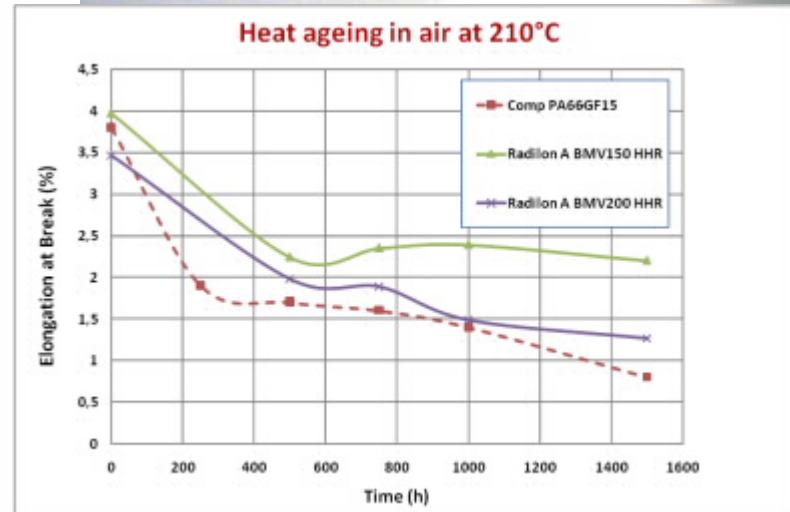
涡轮增压管热端

- **RADILON A BMV150HHR**
Black

- Process: 3D Suction Blow Molding 工艺: 3D抽吸吹塑

- Superior Heat Stabilization (HHR), maintains good mechanical properties until 210°C of CUT.

优异的热稳定性(HHR), 长期工作温度210°C下仍能保持良好的机械性能。



Under Bonnet – Air Intake System

发动机罩内部件 – 进气系统

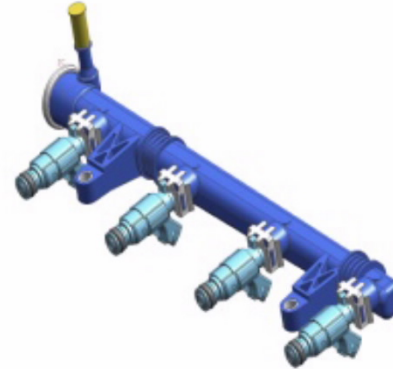
- **Air Resonator Box**
空气谐振腔
- **RADILON A N66MG19HSL**
Black
ALSO SUITABLE (FOR HIGHER T)
RADILON A RV350HHR Black
- **Process: Injection Molding +**
Welding
工艺: 注塑成型+焊接



Under Bonnet – Fuel System

发动机罩内部件 – 燃油系统

- **Fuel Rail 油轨**
- **RADILON A RV350W Black**
- Process: Injection Molding
工艺：注塑成型
- Heat stabilized 热稳定性
- **Quick Connectors for Fuel lines**
燃油管路快速接头
- **RADILON D RV300W Black**
RADILON D CF150W Black
- This application requires good properties retention after heat ageing, good



Under Bonnet – Fuel System

发动机罩内部件 – 燃油系统



- Fuel Filler Pipe 加油管
- **RADILON S BMX200K 333 BK**
- Blow molding grade, heat stabilized

吹塑级材料, 热稳定性



- Fuel Filters Media
Fuel resistance

燃油过滤器介

材料 **RADILON A 24E**

RADILON S 24E

燃油性能及低

- Filament
extrusion

grades 长丝挤出级

Under Bonnet – Fuel System

发动机罩内部件 – 燃油系统



- Fuel Vapour Corrugated Pipes

燃油蒸汽软管

- **RADILON D 40EP25ZW Blue**

RADILON D EP25ZW

- New renewably-sourced Radilon® D PA610 based grades

可再生Radilon® D

PA610基材料

- Barrier effect (permeability) 良好的

燃油阻隔性

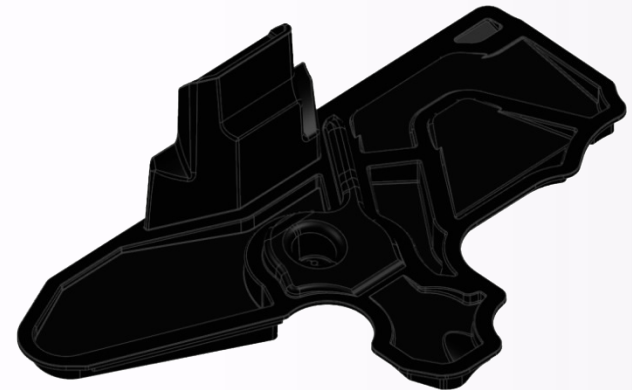
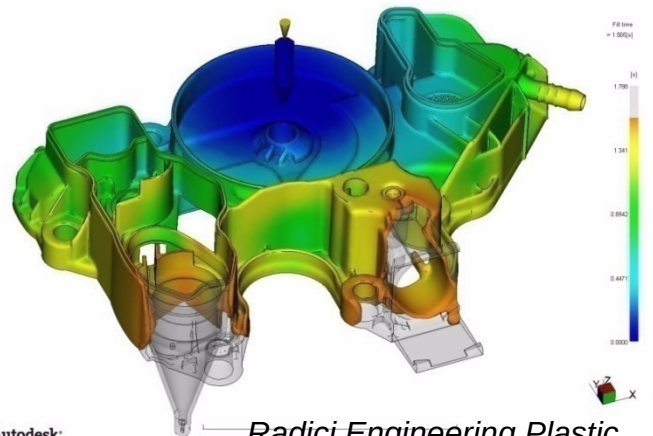
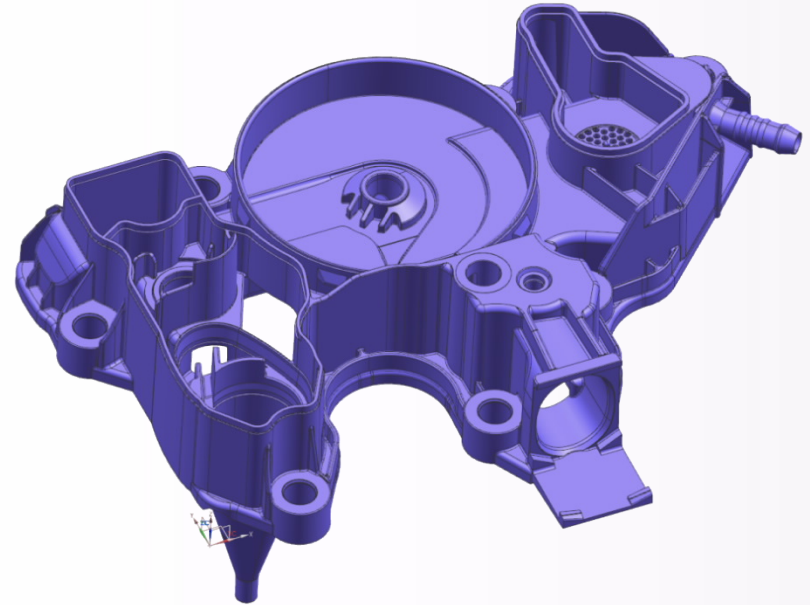
- Chemical resistance 耐化学腐



Under Bonnet – Oil Circuit

发动机罩内部件 – 润滑油路

- **Oil Filter Support Assembly**
机油滤清器总成
- **RADILON S RV300W Black**
- Process: Injection Molding 工艺: 注塑
- Heat stabilized 热稳定性
- CAE MoldFlow® support for optimizing mold due to complex shapes
应用Moldflow优化模具结构



Under Bonnet – Oil Circuit

发动机罩内部件 – 润滑油路

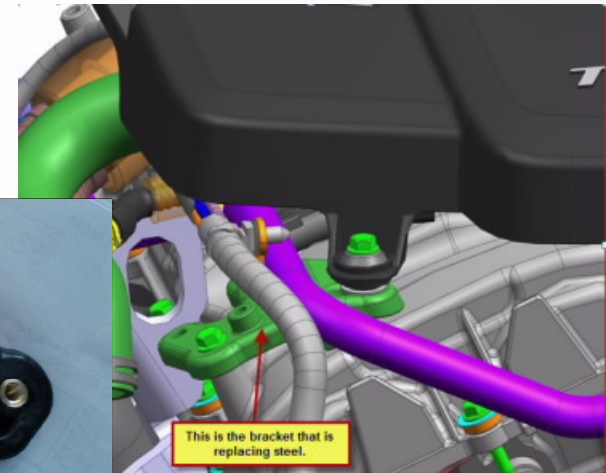


- **Oil Pipe Components** 油管零件
- **RADILON S RV350W Black**
- Process: Injection Molding of parts, assembly by Hot riveting and Vibration Welding
工艺: 注塑成型, 热铆及振动摩擦焊装配
- Pressurized oil at high temperature, Fatigue loads
高温油压等疲劳载荷
- CAE support for ensuring structural suitability for the application
CAE分析用于确保产品结构满足要求

Under Bonnet – Various

发动机罩内部件 – 发动机周边部件

- **Cam Covers** 气缸罩盖
- **RADILON A RV350W 333 BK**
- Resistance to motor oil 耐机油
- Good surface aspect 外观良好
- **Engine Support Bracket**
引擎支架
- **RADILON A RV500RW 339 Black**
- Metal Replacement grade 金属替代材料
- High mechanical resistance 良好的力学机械性能



Under Bonnet – Engine Beauty Covers

发动机罩内部件 – 引擎装饰盖



- Engine Cover 引擎装饰盖
- **RADILON S RCP3010LW**
Black
- Very good moldability and surface aspect 良好的加工性能及外观
- Good dimensional stability 良好的尺寸稳定性
- Paintability 良好的喷涂性能



Under Bonnet – Engine Beauty Covers

Flame Retardant 发动机罩内部件 – 阻燃级引擎装饰盖



- **Engine cover Flame Retardant (V-0)**

V0阻燃级引擎装饰盖

- **RADIFLAM A RV150 AF Black**

- For Turbo engines, the High Temp version:

RADIFLAM A RV150HHR AF Black

- Very good moldability and surface aspect - deep black



良好的加工性能及外观 -
深黑

- Good dimensional stability

良好的尺寸稳定性



March 28, 2014

• Flame retardant (V-0), does not propagate

fire

Radici Engineering Plastic

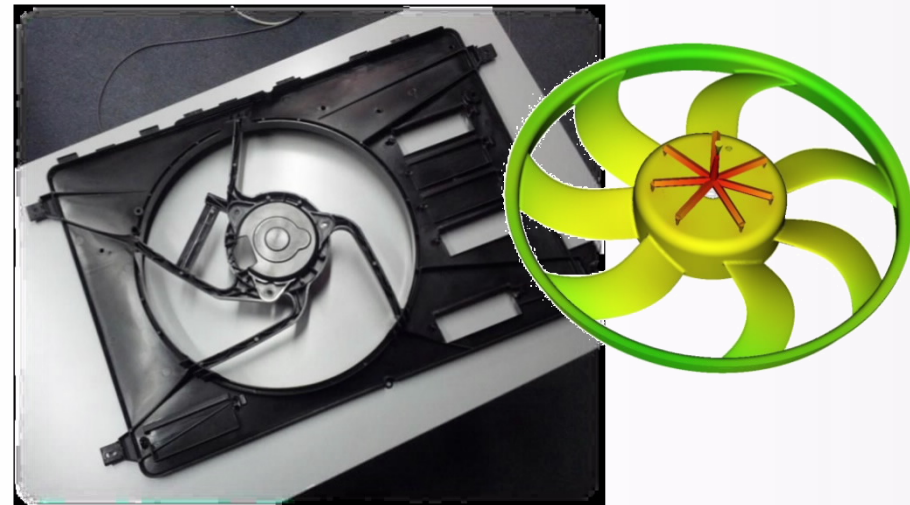
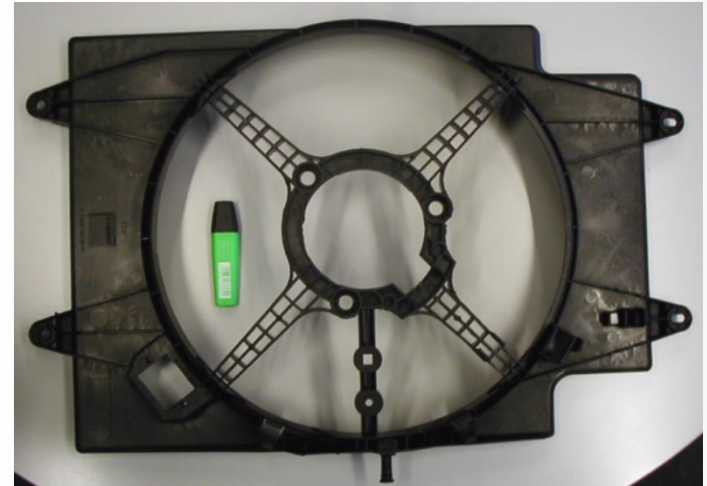
Under Bonnet – Fan/Shroud

发动机罩内部件 – 风扇/护罩

- Fan / shroud 风扇/护罩
- **HERAMID A GF030/1K BK**
- Industrial recycled PA66 30% GF material, heat stabilized

工业级PA66 30%GF回料，热稳定性

- Or also:
RADILON A GF250W / GF300W
- PA66 25-30% GF, heat stabilized, automotive grade 车用热稳定性材料



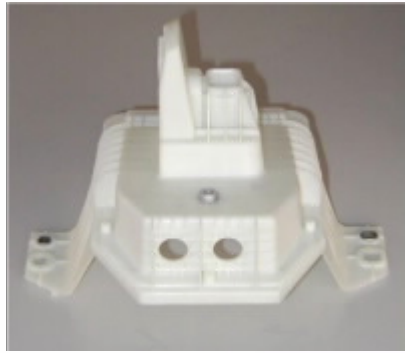
Transmission and Gearshift 传动和变速系统



- **Gear Shift Housing 换档器壳体**
- **RADILON A RV350W**

- High mechanical strength and wear and fatigue resistance

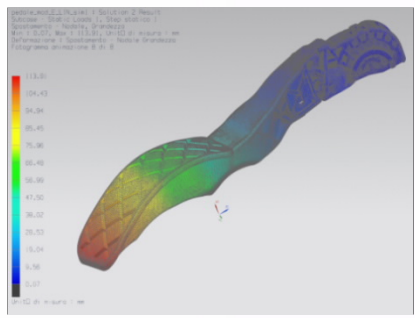
高机械强度及耐磨耐疲劳性能



- **Gas and Clutch Pedal 油门和离合器踏板**

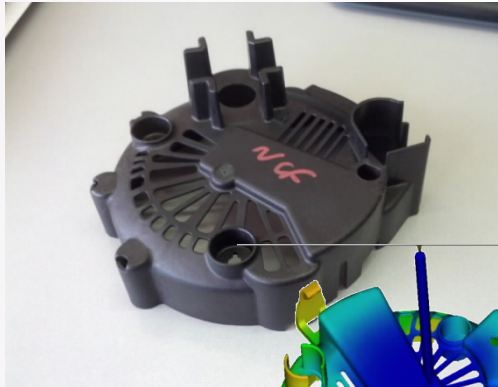
- **RADILON A RV400K**

- High mechanical strength and fatigue resistance



Electric / Electronic Parts

车用电子电器

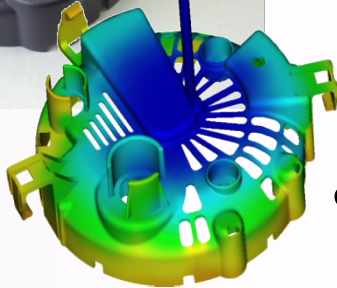


- Alternator Cover 发电机外壳

- **RADILON A FR 308 BK**

- V-0 flame retardancy V0

阻燃 Steering wheel encoder housing



- Halogen and phosphorus free 无卤无磷阻燃

HERAFORM AC90M/C10L BK TRW

- Head Lamp Bezels 前照灯装饰圈

- **RADILON A VHS 338 M BK**

- Unfilled PA66 for light frame, low fogging and suitable for metal coating 无填充尼龙用于车灯边框, 低雾, 适合金属电镀



Electric / Electronic Parts

车用电子电器

- **ABS / ESP Sensors Housing**

ABS/ESP传感器外壳

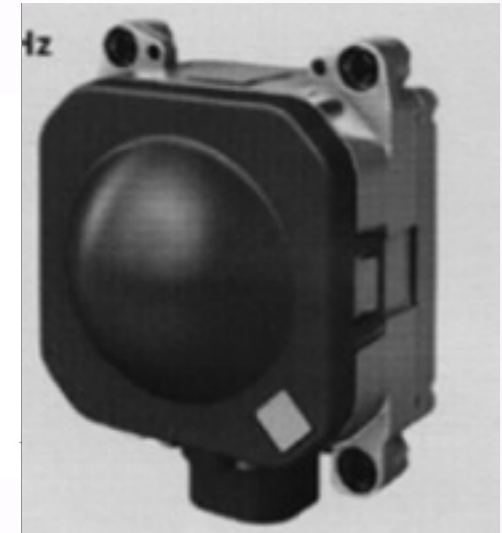
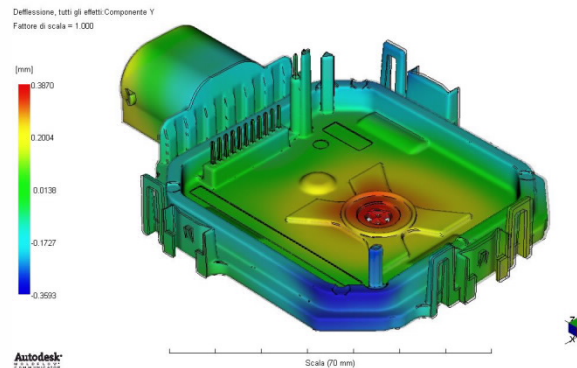
- **RADITER B**
ERV300TKB

- Toughened 增韧
- Good dimensional stability

良好的尺寸稳定性

- Hydrolysis resistant

耐水解性能



Interior 内饰

- **Seat Tilt Levers**

座椅倾斜手柄

- **RADILON A RV350LW
339 BK**



- **Excellent
aesthetics** 美观

- **Seat Back Component**

座椅靠背零件

- **Good
flowability** 良好的
流动性

- **Good aesthetics** 美观

- **High mechanical**

resistance 高机械性能



Interior 内饰

- **Central Fascia Cover**
中控面板
- **RADILON S LRV300LUK 9245 GY**
- **Excellent aesthetics**
美观
- **Good flowability** 良好的
流动性
- **Shift Lever** 变速操纵杆
- **RADILON S RCP4015K 333 BK**
- **UV - light**
- **Good aesthetics** 美
观
- **High dimensional**
stability and good



Exterior 外饰

- Fuel flap cover 加油口盖
- **RADILON S CP400 333 BK**
- Good aesthetics/paintability



- Wheel covers 车轮装饰盖
- **RADILON S ERCT2808UK 943 Grey**
- **HERAMID A ECP150TK 900 GY**
- Good aesthetics and dimensional stability

美观及尺寸稳定性好

- Paintability 可喷涂

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New Requirements and Materials Challenges

汽车行业新要求以及聚酰胺材料面临的挑战

Automotive Trends

汽车发展趋势

- Increased turbo- and super-charging
 - 增加了涡轮增压系统
- Lower limits on CO₂ emission /CAFÉ
 - 更少的CO₂排放, 符合CAFÉ规定
- Longer vehicles life time
 - 更长的车辆使用寿命
- Reduced under-the-hood space
 - 发动机仓内空间减小

Polyamide Requirements

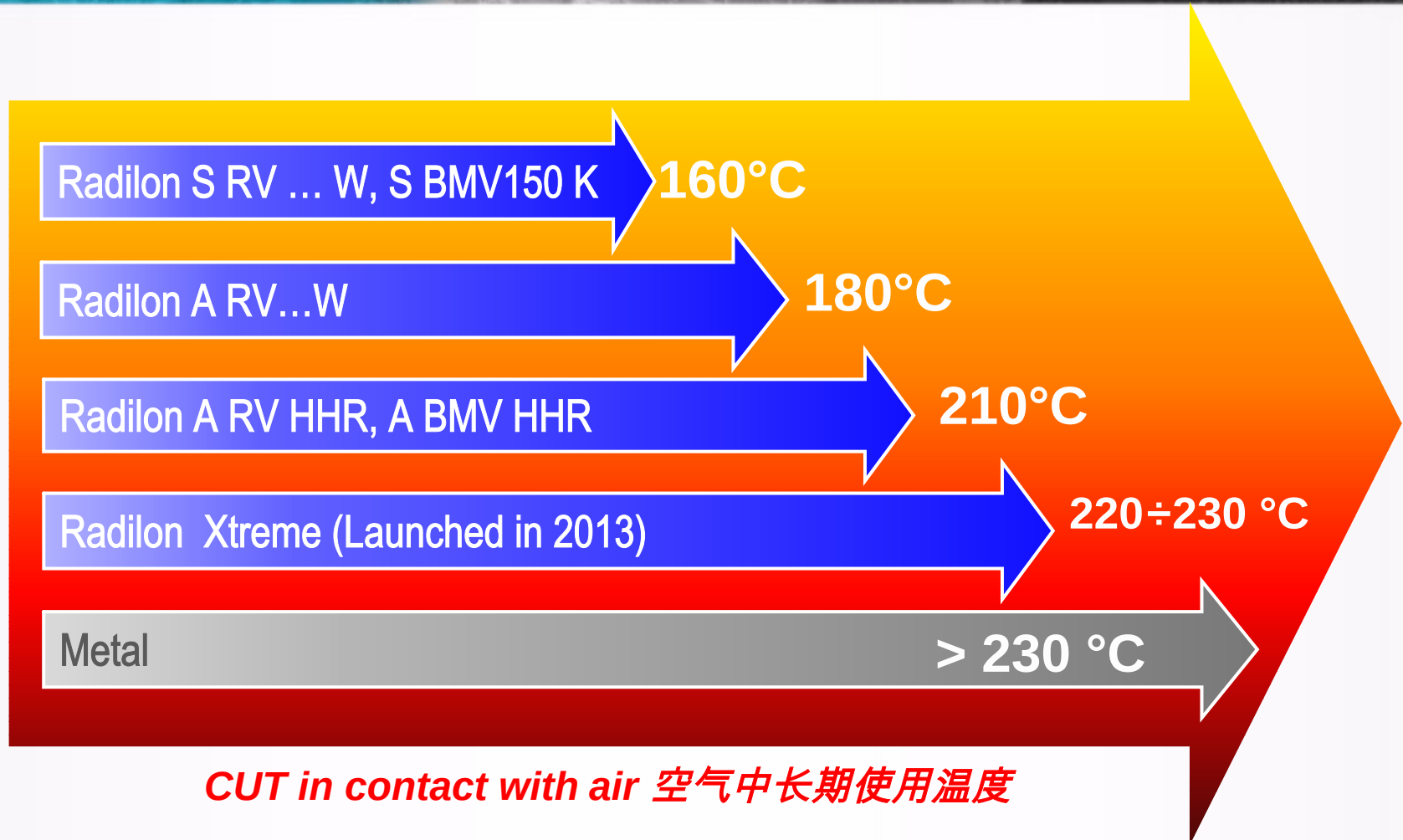
聚酰胺性能要求

- Higher properties retention after ageing
 - 更高的老化后性能保持率
- Resistance to ZnCl₂, Fuels and Hydrolysis
 - 耐ZnCl₂, 耐燃油, 耐水解
- Longer life time
 - 更长的使用寿命



Radilon® Heat Resistant Materials Offer

Radilon® 耐热级尼龙材料



Radilon® A RV350 HHR

❑ In hot air at 210°C this brand new material:

该新材料在210 °C热空气中:

- o Retains properties better than various High Temperature Nylons

性能保持率好于其他高温尼龙

- o Can often replace special polymers such as PPA, PPS, PA4,6.

能够替代特种聚合物如PPA PPS PA46

❑ Typical applications 典型应用:

- o Charge air cooler 中冷器

- o Resonators 进气谐振腔

- o Turbo air ducts 涡轮增压管



Turbo duct resonator



Air resonator box

Radilon® XTreme-HHR



Radilon® XTreme key features (pure polymer) 关键性能(纯聚合物):

- Melt temperature (matrix) 熔点: 280 °C (+ 20 °C versus PA66)
- Glass Transition Temperature 玻璃化转变温度: 90 °C (+ 20 °C versus PA66)
- Moisture Absorption at Saturation 饱和吸水率: 7 % (-25% versus PA66)
- Range of viscosity available 粘度范围: from injection molding to blow molding
- Recommended mold temperature {

Radilon® XTreme:

Typical target application in the



FEA Support: Moldflow

有限元分析支持: 模流分析



- **Cooling analysis** 冷却分析
 - **Cooling time** 冷却时间
 - **Distortions** and effects of uneven cooling 冷却不均导致产品变形
 - **Coolant liquid temperature loss** 冷却液温度降
- **Shrinkage and warpage** foresight, considering (all together or one at a time) effect of: 预测收缩与翘曲, 同时考虑多种影响:
 - **Differential shrinkage** 收缩不均
 - **Differential cooling** 冷却不均
 - **Fiber and material orientation** 玻纤及分子取向
- **Clamping force** estimation 预估锁模力
- **Simulation of special processes:** 特殊成型工艺仿真:
 - **Gas assisted injection moulding (GAIM)** 气辅成型
 - **Co-injection molding** 共注成型
 - **Injection-compression** 注压成型

Autodesk
Moldflow

FEA Support: Structural

有限元分析支持: 结构分析



- **Static linear** analysis, at different temperatures
在不同温度下的线性静力学分析
 - Stress distribution and max stress location 应力分布及最大应力区域
 - Part deformation under load 受载荷下零件变形
- Analysis of **resonance frequencies** 共振频率计算
 - Modal shapes 模态振型
 - Harmonic response 谐响应分析
- **Non-linear analysis** are available for: 非线性分析可用于
 - Contacting parts 零件接触
 - Material nonlinearities 材料非线性
 - Large displacements and/or deformations 大位移 和/或 变形
- **Dynamic response** 动态响应
- **Thermal** analysis and thermal effects on mechanical behaviour
热分析, 以及热对机械性能的影响

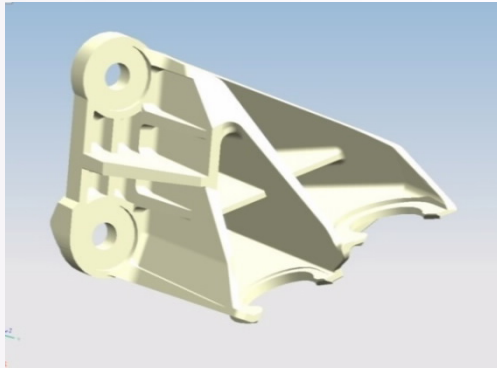


CAD Support for Metal Replacement

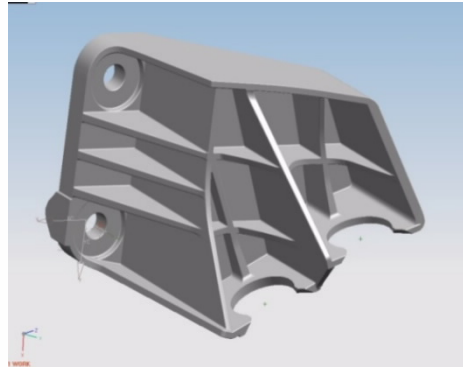
塑料替代金属CAD支持



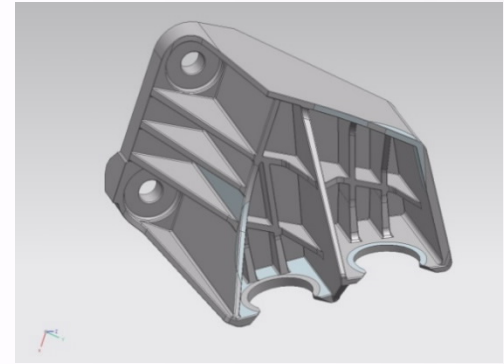
Radilon A RV500RW 339 BLK



Step 1



Step 2



Step 3

Step 1: The aluminum 3D model used without modification for the first calculation. 未经修改铝件3D数模用于第一轮分析.

Step 2: Redesign from metal to plastics. Thick parts modified and additional ribs in critical areas. 从金属件到塑料件, 结构需重新设计. 修改了厚壁区域, 并在关键部位增加了加强筋.

Step 3: Redesign from metal to plastics to reduce the Von Mises stress concentration. 从金属件到塑料件, 结构需重新设计, 以减小应力集中.

Parts Testing 部件测试

- Leakage 泄漏测试
- Burst pressure 爆破压力测试
- Back fire 回火测试
- Pressure pulsation 脉冲压力测试
- Heat ageing, 热老化测试,
Temperature shock 温度冲击测试
- Ball-drop-tests 落球撞击测试
- Insert pull-out / torque 嵌件拔出力/扭
矩测试
- Shaker tests 振动测试
- Acoustic measurement 噪声测试
- Customer specific tests 客户指定测试



THANK YOU FOR YOUR ATTENTION

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