

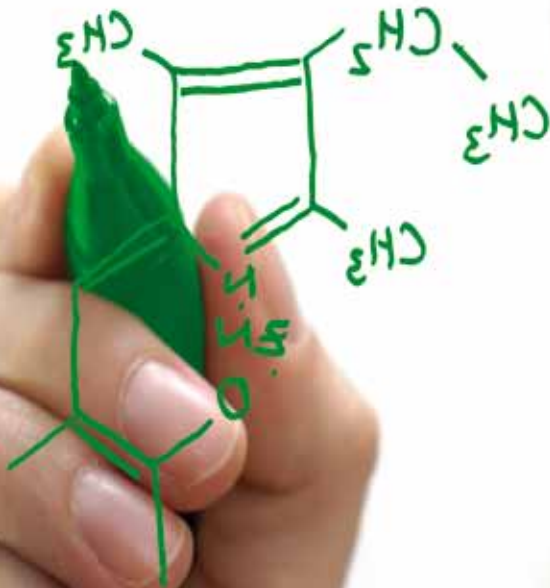
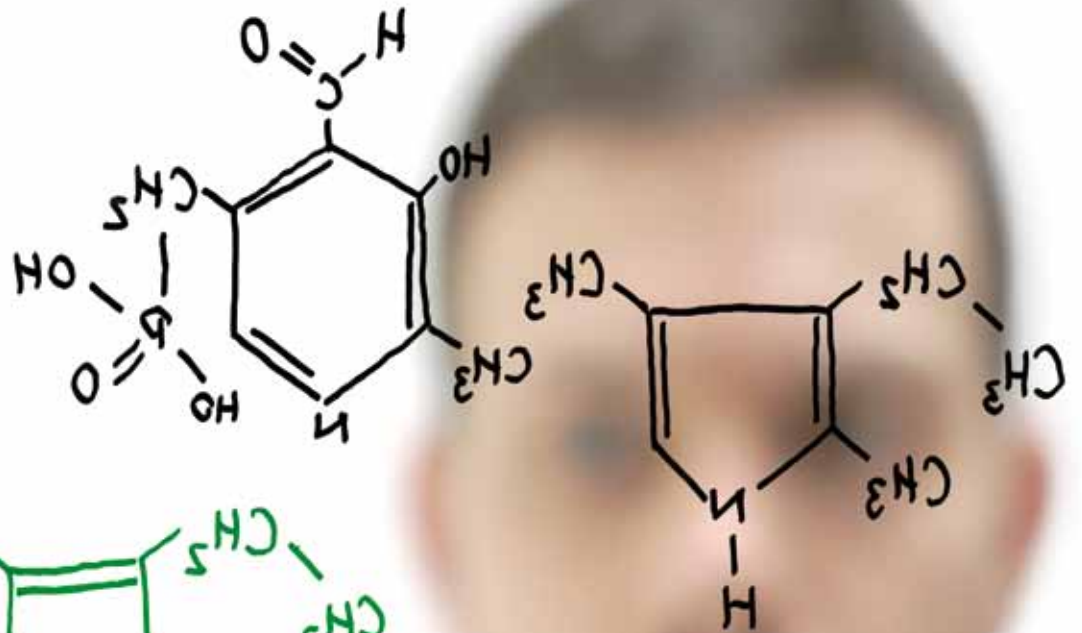


生物燃料和绿色化学

Bio-Fuels and Green Chemistry

康泰斯引领可持续发展

CHEMTEX PAVES THE WAY TO SUSTAINABILITY





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Mossi & Ghisolfi和康泰斯 从家族企业到跨国公司

Mossi & Ghisolfi and Chemtex

From a family-run business to a multinational company



M&G

M&G集团是由Vittorio Ghisolfi先生于1953年创立的家族性的跨国化学公司，总部在意大利，是全国第二大化学公司。集团拥有三大业务板块：聚酯类聚合物、醋酸纤维素和工程研发。在全球有20多个生产基地和工程研发机构，分别位于巴西、墨西哥、中国、印度、美国和意大利。M&G集团共有约2,300名员工，其中约100名员工在意大利Rivalta Scrivia和美国Sharon Center的康泰斯研发中心工作。在过去几年里，集团将其营业收入中的相当可观的资金投入到研发工作，在创新技术的开发上取得了重大的进展。

M&G is a multinational, family-run company established in 1953 by Vittorio Ghisolfi. It is headquartered in Italy and is the country's second largest chemical company. The Group is comprised of three business units: PET Polymers, Acetates and Engineering. It has more than 20 manufacturing and research locations in Brazil, Mexico, China, India, the USA and Italy.

M&G employs about 2,300 people with approximately 100 staff in Chemtex R&D Centers located in Rivalta Scrivia, Italy and Sharon Center (OH), USA. In the last few years, the Group has invested a considerable portion of its revenues in Research and Development and has achieved major goals in the development of innovative technologies.

Gruppo Mossi & Ghisolfi (“M&G” 集团), 是Ghisolfi 家族拥有的跨国化学公司，在1953年由Vittorio Ghisolfi先生创立，从事消费领域的塑料包装材料的生产。至今，M&G集团已经发展成为全球最大的PET聚酯生产商之一，集团的年营业额达到30亿美元。

Gruppo Mossi & Ghisolfi (“M&G”) is a multinational chemical company owned by the Ghisolfi family. Established in 1953 by Vittorio Ghisolfi as a manufacturer of plastic packaging for consumer applications, M&G has grown to become one of the world's largest producers of PET resin. Annual turnover of the Group is approximately USD 3 billion.

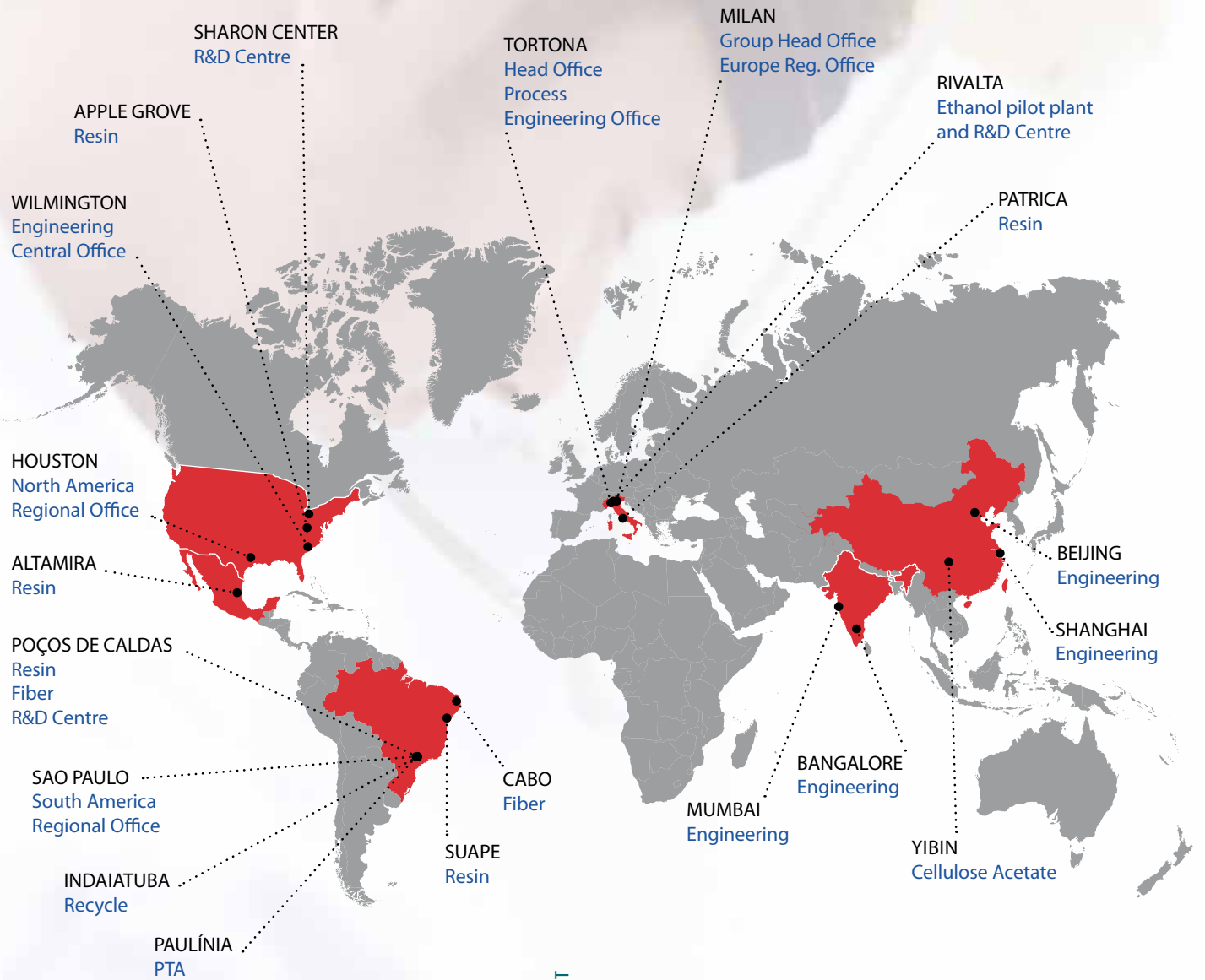
M&G在创新和新技术方面一直具有很强的前瞻性。贯穿集团的发展历史，M&G一直在为所从事的行业以及客户开发并提供行之有效的最佳解决方案。M&G集团在过去几年中对绿色化学和生物燃料的研发所进行的投入，再次证明了其对技术创新的专注与执着，业已取得的成果将为这些工业领域的真正革命铺平道路。

M&G has always been a forward-looking company with regards to innovation and new technologies. Throughout its history, M&G has developed best-in-class solutions that have proven beneficial to both its customers and the markets they serve. The Group's investment into green chemistry and bio-fuels research and development over the past years confirms its strong propensity for innovation and the resultant achievements will pave the way to a true revolution in these industrial sectors.

Chemtex康泰斯是M&G旗下的全球性工程和技术公司，2004年加入M&G，通过在意大利、美国、印度和中国的分支机构，康泰斯在生物燃料、可再生化学品、能源、环保、石化、聚合物及纤维等行业，为客户提供专业的和增值的项目解决方案。凭借强大的技术研发和工艺设计能力，康泰斯在母公司的大力支持下，已经成功开发了一项突破性的技术——PRO.E.SA™工艺，利用纤维素生物质生产清洁的、可以被进一步转化为生物燃料或可再生化工品的可发酵性糖。通过这一突破性的技术平台，高效率、低成本生物炼制和可再生化学品的生产将成为现实。

Chemtex is the global engineering and technology division within M&G. Acquired in 2004, Chemtex today specializes in delivering value-added project solutions for its clients in the bio-fuels, renewable chemicals, energy, environmental, petrochemical, polymers and fibers industries through its operations in Italy, the United States, India and China. With its strong capabilities in process engineering and R&D, and with the strong support of its parent, Chemtex has developed break-through technology to produce clean fermentable sugars from cellulosic biomass that can be subsequently converted into bio-fuels or sustainable chemicals. The PRO.E.SA™ Process is the break-through technology platform that will make cost-effective bio-refineries and sustainable chemicals a reality.

M&G 的业务 M&G business

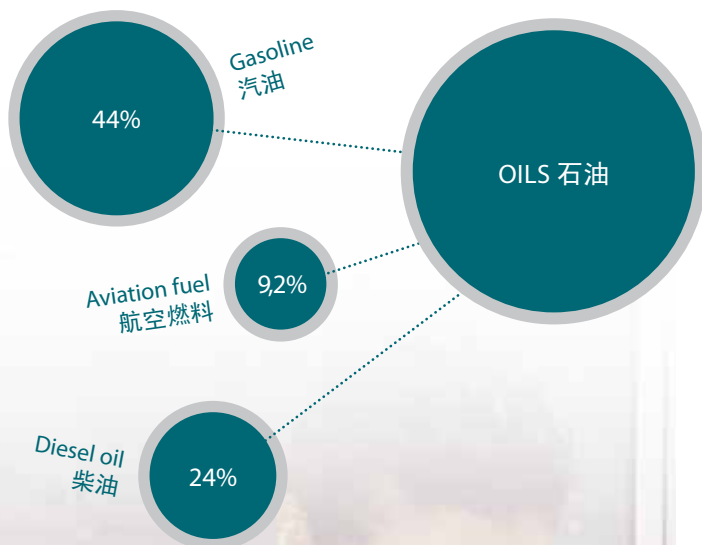


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气候、替代能源和可持续发展 绿色化学的解决方案

Climate, alternative energy and sustainable development.
Green chemistry solutions

石油在交通运输领域的用途 The use of oil in transports



新兴的清洁能源技术诸如风能和太阳能，在能源领域正得到发展，而在交通运输领域，源自石油的燃料仍占据着极其重要的地位。

New, clean technologies such as wind and solar are being developed in the energy field whereas in the transportation sector, fuels derived from oil remain vital.

石油的用途 Oil Use by Sector:

交通运输	Transportation	77%
其他	Other	19%
化学	Petrochemicals	4%

据国际能源署(IEA)预测，石油的消耗将持续增长，其中97%的增长与交通运输的需求有关。这将对环境造成直接的影响：25%温室气体的产生是由于交通运输领域的气体排放所造成的。

According to forecasts from the International Energy Agency (IEA), oil consumption is expected to keep growing and 97% of this increase will be associated with demand related to transportation. This will have a direct environmental impact: 25% of greenhouse gas production is attributed to emissions related to the transportation industry.

石油是石化行业的主要原料，石化产品在人们日常生活中的角色举足轻重。在极为广泛的日常用品中所能见到的绝大多数基础化学品，都是从石油衍生而来：目前约4%的石油生产用于生产石油衍生品，如烯烃和聚烯烃、溶剂、聚合物（聚酯、尼龙...）和涂料。

Oil is a major raw material for the petrochemical industry which produces products that play an important role in our daily lives. Most base chemicals, which can be found in a huge variety of daily use products, are derived from oil: about 4% of oil production is currently used to produce petroleum derivatives such as olefins and polyolefins, solvents, polymers (polyesters, nylon...) and paints.

为改善气候和环境，寻找石油基燃料和化学品的替代品就显得极其重要，实现生产周期的可持续发展尤为重要。生物燃料和生物化学是我们的未来，发展具有成本优势的石油替代品需要切实可行的解决方案，而这正是M&G和康泰斯所致力追求的目标。

It is of paramount importance to identify alternatives to oil-based fuels and chemicals for both the good of the climate and the environment. Sustainable development through the production life cycle is fundamental. Bio-fuels and biochemistry are our future. We need implementable and concrete solutions that are economically viable alternatives to oil and M&G and Chemtex are committed to finding them.



3 第二代生物燃料 走向全面的可持续性

Second-generation bio-fuels Towards total sustainability

生物燃料并不是一个新的概念。目前，全球的生物柴油和生物乙醇产量分别为200亿升和740亿升：相当于交通运输领域用量的1.5%。以废油、动植物脂肪为原料的生物柴油和以粮食和植物为原料的生物乙醇已经有多年的生产历史。

Bio-fuels are not a new concept. The current production of bio-diesel and bio-ethanol is about 20 billion liters and 74 billion liters respectively: accounting for 1.5% of consumption in the transport sector. Bio-diesel from waste oil, animal and vegetable fats and bio-ethanol from grains and vegetables have been produced for several years.

着眼于未来生物乙醇的生产，原料的选择是一项关键因素。所谓的“第一代”乙醇主要是以玉米、小麦或甘蔗为原料。利用粮食作物生产生物燃料已经引起了道德和社会层面的广泛关注，尤其在粮食的供给要满足全球不断增加的人口的大背景之下。

As far as future bio-ethanol production is concerned, the choice of feedstock is a critical consideration. So called “first generation” bio-ethanol is produced mainly from corn, wheat or sugar cane. Ethical and social concerns have been raised about the exploitation of food crops for bio-fuel production especially considering the food needs for the world’s growing population.

人们已经对第一代乙醇生产技术能否保持环境的可持续性提出了质疑。很多人以为使用生物燃料就能达到二氧化碳的平衡，因为由内燃机燃烧产生的二氧化碳量相当于几个月前农作物在生长中所固存的二氧化碳量。然而，如果我们考虑包括生物质生产、收获和运输、作物灌溉和施肥、生物燃料的生产和运输等整个产品的生产周期，并假定在这些消耗能源的环节中使用化石能源，那么二氧化碳就可能达到负平衡。换句话说，几百万年前固存的二氧化碳已然被释放回环境中了。

Questions about the environmental sustainability of the first generation bio-ethanol production process have also been raised. Many assume that the CO₂ balance is neutral when bio-fuels are used because the carbon dioxide generated by an internal combustion engine is the same as that sequestered by crop fields a few months earlier. However, if we take into consideration the entire production life cycle that includes biomass production, harvesting and transport, crop irrigation and fertilization, bio-fuel production and transport and assume that fossil fuels are used for these energy-consuming activities, the CO₂ balance may therefore be negative. In other words, CO₂ sequestered millions of years ago is released back into the environment.

2014年起，二氧化碳固存能力
低于50%的燃料将不再被认
定为“生物燃料”。到2017
年，此百分比将提高至60%。

通过使用结构化的生命周期分析工具（LCA），欧盟已经测定了不同生物燃料的二氧化碳固存能力，并规定自2014年起，二氧化碳固存能力低于50%的燃料将不再被认定为“生物燃料”。到2017年，此百分比将提高至60%。源自纤维素、藻类、稻草和甘蔗的燃料高于这60%的标准，而用玉米、小麦、大豆和棕榈生产的燃料则达不到这一门槛。这些结果与美国测定的结果是一致的。

Using a structured Life Cycle Analysis (“LCA”) tool, the European Union has determined the CO₂ sequestration capacity of different types of bio-fuels and ruled that effective as of 2014, fuels having a sequestration capacity below 50% can no longer be considered “bio-fuels”. By 2017, this percentage will raise up to 60%. Cellulose, algae, straw and sugar cane are above this 60% threshold, while corn, wheat, soybean and palm are below it. These determinations are consistent with those in the USA.

生物燃料的二氧化碳固存能力 CO₂ sequestration capacity of bio-fuels (根据欧盟的计算 EU calculations)

生物乙醇 Bio-ethanol		生物柴油 Biodiesel		
玉米 Corn	31%	棕榈 Palm		18%
小麦 Wheat	34%	大豆 Soybean		31%
甘蔗 Sugar cane	71%	油菜 Rape		48%
纤维素 Cellulose	90%	费—托法合成纤维素		80%
秸秆 Straw	87%	藻类 Algae		90%



4

康泰斯的研发 PRO.E.SA™项目

Chemtex's Research and Development.
The PRO.E.SA™ Project

京都议定书为生物燃料的发展设定了战略目标。欧盟制定的目标要求，到2020年，生物燃料的消费比重需达到10%。因此仅意大利就至少需要150万吨的生物乙醇以用于添加到汽油之中。在美国，《能源自主与安全法案》(EISA)规定，到2022年，美国纤维素乙醇的年使用量须达到160亿加仑。

The development of the bio-fuels industry is a strategic objective set by the Kyoto Protocol. The target imposed by the European Union requires that 10% of bio-fuels be of biological origin by 2020. Therefore Italy will need at least 1.5 million tons of bio-ethanol, to be mixed with gasoline. In the USA, the Energy and Security Independence Act ("EISA") mandates that 16 billion usg of advanced biofuel in the form of cellulosic ethanol be used by 2022.

M&G认为，新一代的生物燃料必须满足以下基本要素，才具有生命力并可以被广泛接受：生产成本与汽油在原油价格为60-70美元/桶时的成本相比具有竞争力；在减少温室气体方面必须具有环境可持续性；原料作物在农业上要具有可持续性，不对粮食供应链造成负面影响，同时保证农户的收益。

M&G believes that new-generation bio-fuels must satisfy the following fundamental considerations if they are to be viable and broadly accepted: they must be produced at a price that is competitive to gasoline produced from oil at USD 60-70/bbl, they must be environmentally sustainable with respect of overall

Green House Gas sequestration, they must be agronomically sustainable in that the feedstock does not adversely impact the food chain while still being profitable for the farmer.

基于这些理念，M&G在2007年初通过康泰斯对这一领域开展了调研。在迅速得出上述基本条件可以实现的结论后，开始启动耗资1.2亿欧元的以木质纤维素为原料生产生物乙醇（即第二代生物乙醇）的研发计划PRO.E.SA™。来自政府机构，如意大利国家新技术、能源和环境局ENEA，都灵理工大学等在研发方面的支持，以及欧盟Biolyfe计划和意大利皮埃蒙特区所提供的部分经济资助，彰显了此研发工作对于整个区域而言的重要战略意义。

With this in mind, M&G, through Chemtex, started its investigation into this sector at the beginning of 2007. Having quickly determined that the aforementioned fundamentals were achievable, the PRO.E.SA™ Project a 120 million euro research and development project to produce bio-ethanol from ligno-cellulosic material (i.e. "second generation" bio-ethanol)- was started in earnest. Government agencies such as ENEA, the Italian National Agency for New Technologies, Energy and Environment and Turin's Politecnico provided research support and the European Union's Biolyfe Program and Italy's Piedmont Region assisted with economic support, highlighting the strategic importance of research for the regional territory.



来自于大自然的清洁能源 Clean Fuel from Nature

芦竹是一种自然生长的禾本科植物，广泛生长于地中海流域、中东和印度等地。在意大利，芦竹常见于丘陵和沿海地区，是欧洲最高的茎秆类植物。它通常能长到6米高，在理想条件下一年后的最高能超过10米。每年9至10月开花，披针形叶，秆直立，羽状部呈羽毛状。芦竹系无性繁殖，采用地下茎进行种植。

Giant Reed (*Arundo donax* L.) is a grass which grows spontaneously throughout the Mediterranean Basin as well as in the Middle East and India. In Italy, it can be found both in hilly and coastal areas. It is the tallest cane in Europe: it generally grows to 6 meters and in ideal conditions it can exceed 10 meters over one year. Its leaves are lance-like; it flowers in September/October, bearing upright, feathery plumes. Its seeds are sterile. Its vegetative propagation takes place through underground rhizomes.



PRO.E.SA™提供了一个开始于田间、结束于生物产品的整体解决方案。作为一个综合性的项目，PRO.E.SA™需要多个不同学科的整合，从生物化学和生物技术到农学和植物学；从工程设计到化学；从技术研发到工艺建模；从生物质原料供应链到产品销售。因此，此项目是在与意大利主要的科研机构在共同合作下开发完成的，包括都灵理工学院、热那亚大学、国家新技术、能源和环境局（ENEA）、国家农业研究理事会（C.R.A.）、国家非常规可再生能源研究中心（C.R.E.A.R.）等，有近100位意大利研究学者参与其中。

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**雄心勃勃的目标：
用木质纤维素生物质（LCB）
为原料经发酵和精馏后得到的
生物乙醇不会影响
粮食和饲料的生产**”

PRO.E.SA™ is a holistic solution that starts in the field and ends with bio-product. PRO.E.SA™ is a complex undertaking requiring integration of different sciences ranging from biochemistry and biotechnology to agronomy and botany, from engineering to chemistry, from technology development to process modeling and from biomass supply chain logistics to product off-take. This is the reason why the project was developed in cooperation with major scientific institutions in Italy – Turin's Politecnico and University, Genoa University, ENEA (The Italian National Agency for New Technologies, Energy and Environment), C.R.A. (Agricultural Research



Council), C.R.E.A.R. (Research Centre for Non-Conventional Renewable Energy) – and about one hundred Italian researchers have been working on it on a regular basis.

从农学的角度而言，能源作物作为原料是有优势的。其中，芦竹是一种首选的能源作物。多年来，康泰斯与Alasia Franco Vivai合作，对来自南欧、北非和中国南部的多达89种不同的芦竹品种进行了评定，并根据不同的地域、气候和土壤条件相应确定了最佳的品种，干生物质产量可达每公顷50吨，对于农户而言，这可谓是激动人心的创收良机。

On the agronomic side, energy crops are a favored feedstock. Amongst those preferred is Giant Reed (Arundo Donax L.). Over a period of several years, Chemtex, in cooperation with Alasia Franco Vivai, has assessed 89 different phenotypes of Giant Reed (Arundo donax L.), coming from Southern Europe, North Africa, Southern China and identified optimum varieties for specific geographies, climates and soil types. With biomass yields of up to 50 tons per hectare (dry matter basis), this represents an exciting



5 技术的挑战

The Technology Challenge

康泰斯已经成功地开发出突破性的技术，将木质纤维素生物质转化为第二代生物乙醇。整个工艺过程由四个主要部分组成：预处理、酶解、发酵和精馏。

Chemtex has developed break-through technology to transform ligno-cellulosic biomass into second-generation ethanol. The process is based on 4 main steps: pre-treatment, hydrolysis, fermentation and

1 预处理 Pre-treatment

木质纤维素生物质（LCB）基本上由三种多糖物质组成：纤维素、半纤维素和木质素。利用木质纤维素生物质生产生物燃料的主要难点是如何接及多糖。纤维素和半纤维素必须要从木质素中分离出来，以便能水解成简单糖，并进一步发酵成乙醇。

Ligno-cellulosic biomass (LCB) is basically composed of polysaccharides: cellulose, hemi-cellulose and lignin. Access to polysaccharides is the main obstacle to the use of LCB for bio-fuel production. Cellulose and hemi-cellulose must be freed from the lignin so that they can be hydrolyzed to the simple sugars which are subsequently fermented to produce ethanol.

康泰斯技术的优势

1. 高度灵活：工艺参数可根据各种不同的木质纤维素生物质进行优化调整，包括能源作物、农业废弃物、木质生物质和甘蔗渣等，以保证接及多糖的最佳条件。
2. 容易放大：康泰斯的技术能很容易进行放大，以适应大规模生产。
3. 不添加化学品：将多糖从生物质中分离的过程只使用水蒸汽，不需酸或其它化学品，对设备材料无特殊要求，工艺过程对环境的影响降到最低。
4. 高性价比：PRO.E.SA™技术集简便、灵活和可操作性于一体，提供了突破性的从田间到产品的整体解决方案，减少了建设投资，降低了操作成本。

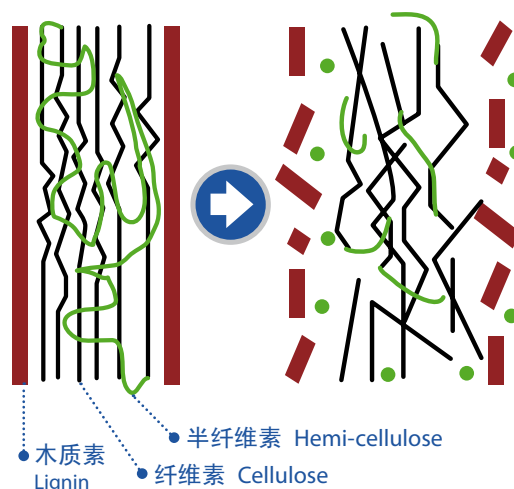
Benefits of Chemtex's Technology

1. High flexibility: process parameters can be adapted to many types of LCB including energy crops, agricultural wastes, selected woody biomass and sugar cane bagasse, ensuring excellent access to polysaccharides.
2. Easy to scale up: Chemtex's technology can be easily adapted to large scale production.
3. No chemicals: only water vapor is used to free polysaccharides from LCB. No acids or chemicals are used. No special materials of construction are required and the environmental impact of the process is minimized.
4. Cost effective: By taking a holistic approach from field to product, the PRO.E.SA™ Process combines simplicity, flexibility and operability to achieve a break-through with regards to lowering capital expenditure and operating costs.

预处理的目的是把木质纤维素的结构打散成三种主要的聚合物，从而使它们在下一步骤中可以被酶所接及。康泰斯开发了一种独特的低能耗的预处理工艺，能够在不使用化学品（如酸）的条件下，用饱和水蒸汽迅速将多糖分离出来，纤维素和半纤维素的回收率高，且不产生糠醛和羟甲基糠醛等抑制物。

The objective of pre-treatment is to break the ligno-cellulosic matrix into its main polymeric components to make them accessible to enzymes in the subsequent step. Chemtex has developed a novel, low energy consumption pre-treatment process using saturated water vapor to release polysaccharides rapidly and without chemicals (e.g. acids) that results in a high recovery yield of cellulose and hemi-cellulose without production of furfural and HMF contaminants.

预处理 Pre-treatment



2 酶解 Enzymatic hydrolysis

水解是将预处理过程中释放的多糖转化为简单糖的过程。PRO.E.SA™技术的酶解工艺使用了由领先的生物技术合作伙伴所开发的复合纤维素酶，将纤维素转化为六碳糖（含六个碳原子），如葡萄糖；将半纤维素转化为五碳糖（含五个碳原子），如木糖和阿拉伯糖。

Hydrolysis is used to obtain simple sugars from polysaccharides freed by the pre-treatment step. PRO.E.SA™ Technology utilizes enzymatic hydrolysis using a mix of cellulose enzymes developed by best-in-class biotech partners which make it possible to obtain hexoses (with 6 carbon atoms), such as glucose, from the cellulose fraction and pentoses, mainly xylose and arabinose, from the hemi-cellulose fraction.





什么是水解 What is hydrolysis?

水解，源自于希腊语，*ydor* (水)、*lyo* (溶解)。它是通过添加一个水分子将物质分子分解为两个或以上部分的化学过程，有时也可理解为凝结的相反过程。水解反应形式多样，其中有些是自发的，其它则需用催化剂，常采用酸或碱。在生物体中，水解通常由一些类属于水解酶的特定酶促发。

Hydrolysis comes from the Greek *ydor* (water) and *lyo* (to dissolve). It is a chemical process in which a certain molecule is split into two or more parts by the addition of a molecule of water and it may sometimes be considered as the opposite of condensation. There are various types of hydrolysis reactions; some of them are spontaneous. In other cases a catalyst is required, often an acid or base. In living organisms, hydrolysis is often catalyzed by specific enzymes that belong to the hydrolase family.

3 发酵 Sugar fermentation to ethanol

从PRO.E.SA™预处理和酶解过程中得到的清洁的简单糖类，在发酵过程中用改性酵母（酿酒酵母）转化为乙醇。为了提高收率，在康泰斯开发的发酵工艺中采用的微生物可以转化所有的游离糖、戊糖和己糖。发酵过程产生的发酵液中乙醇浓度高，从而有效减小了发酵罐的体积，并降低了下一步精馏过程的能耗。

Fermentation converts the clean sugars produced from the PRO.E.SA™ Pre-Treatment and Hydrolysis Steps to ethanol using a modified brewer's yeast (*Saccharomyces cerevisiae*). In order to increase yields, the microorganism used in the process developed by Chemtex makes it possible to convert all freed sugars, pentoses and hexoses. The fermentation step produces beer with a high ethanol concentration which reduces fermentor sizing and the energy requirement in the subsequent distillation step.

4 精馏 Distillation

这最后一步工序将发酵过程中产生的发酵液在精馏塔中进行分离，把乙醇从发酵残液（主要含木质素）中分离出来。乙醇从塔顶流出，而固体物质（主要是木质素和其它残渣）则在塔底进行回收。由于木质素具有很高的热值，可用于热电联产机组产生蒸汽和电力，这样就确保工厂能量的自给自足。分离出的乙醇经过脱水后得到99.0%的纯净产品。

In the last step of the process, beer resulting from fermentation is treated in a separate column to separate ethanol from fermentation residues (mainly lignin). Ethanol exits from the top end of the distillation column, while the solid fraction, comprising lignin and other residues, is recovered at the bottom of the column. Since lignin has a high heating value, it can be fed to a cogeneration unit to produce steam and electrical power, thus ensuring self-sufficiency from an energy perspective. The ethanol stream undergoes a dehydration step to obtain a 99.0% pure product.



什么是发酵 What is fermentation?

发酵，源自于拉丁语 *fervere*，原意为“翻腾”。发酵代表了任何被微生物催化的过程。乙醇发酵是某些酵母在厌氧条件下产生能量新陈代谢的一种形式。在日常生活中常见的几种发酵过程，如面包发酵或酿酒。发酵过程是通过一种被称作酵母的微生物来完成的，其中最常用的是酿酒酵母，通常存在于葡萄皮或酵母菌中。发酵过程分两步进行，第一步，由酵母通过转化酶，将复糖（二糖，比如蔗糖）分解；然后将单糖（比如果糖）转化为乙醇。

Fermentation comes from the Latin *fervere*, which means "to re-boil". Fermentation indicates any process catalyzed by a microorganism. Ethanol fermentation is a form of energy metabolism that takes place in some yeasts in the absence of oxygen. It is responsible for several processes that occur on a daily basis, such as bread leavening or winemaking. Fermentation is performed by a class of microorganisms called *Saccharomyces*; the most common of them is *S. Cerevisiae*, which can be found in grape skin as well as in brewer's yeast. Fermentation occurs in two phases: in the first one, the yeast breaks down complex sugars (disaccharides, such as sucrose) by means of the invertase enzyme; ethanol is produced in the second phase from simple sugars (e.g. fructose).

从中试到工业化生产 Crescentino工厂

From Pilot to industrial production
The Crescentino Plant



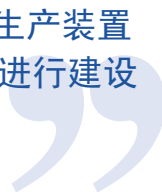
采用康泰斯突破性技术PRO.E.SA™的全球首座第二代生物乙醇工业化生产装置目前正在意大利Crescentino(Vercelli)进行建设。通过“意大利生物制品公司 (IBP)”这一项目，M&G的宏伟计划——采用绿色化学方案进行燃料和化学品领域的革命，将实现第一座里程碑。

The first second-generation bio-ethanol industrial production plant in the world employing Chemtex's break-through PRO.E.SA™ Technology is under construction at Crescentino (Vercelli). With the Italian Bio Products ("IBP") Project M&G will achieve a first milestone in its ambition to revolutionize the fuel and chemical sectors with green chemistry solutions.



全球首座

第二代生物乙醇工业化生产装置
正在意大利Crescentino进行建设



位于Crescentino的IBP工厂将于2012年投产。装置的“保证”产能为年产4万吨乙醇，实际按照年产6万吨乙醇进行设计。装置将采用当地生长和供应的原料，主要是在边际土地上种植的能源作物（芦竹），这样就实现了不与粮争地；同时，装置也能采用农业废弃物（如稻草、麦草等）作为原料。装置的生产将形成一个良性的产业循环，并为农业和工业的紧密合作奠定坚实的基础。此装置建在一片曾经废弃并将重新打造的工业区内。

The IBP plant at Crescentino will be operational in 2012. While the "guaranteed" production is 40,000 tons per year, the Plant has been designed to produce 60,000 tons per year of ethanol. It will

operate within a local production and supply chain using mainly dedicated energy crops (arundo donax, or giant reed) grown on marginal land so that there is no competition with food: the plant can also utilize agricultural wastes such as rice and wheat straw as feedstock. A virtuous production cycle will be created and the IBP plant will be the cornerstone of cooperation between agriculture and industry. The plant will be located in an abandoned industrial area which will be "renewed."

Crescentino工厂生产的生物乙醇将满足“生命周期评价”的标准；根据ENEA专家按照欧盟有关二氧化碳和其它温室气体固存能力的最新标准所进行的评价，Crescentino工厂生产的产品的二氧化碳固存能力将超过70%。

Bio-ethanol produced at the Crescentino plant will meet Life Cycle Assessment standards; based on assessments performed by ENEA experts in accordance with recent EU directives on CO2 and other greenhouse gases sequestration capacity, product from the IBP Plant will exceed 70% sequestration capacity.

最后，值得一提的是，在乙醇生产过程中从生物质分离出的木质素将用于热电联产机组中，产生15MW的绿色电力并上网供电。

Finally, it is worth pointing out that lignin extracted from biomass during the ethanol production process will be used in an integrated cogeneration plant that will produce 15MW of green power that will be sold to the grid.

项目还通过与所在地政府和居民进行互动对话和互联网宣传等方式，对整个项目的建设进行了广泛深入的民意调查。

A broad local consensus on the entire project has been built by implementing a careful and accurate communication plan based on a proactive dialogue with Authorities, fair discussions with residents, education projects at schools and a specific web site (www.biocrescentino.it).

7 | 前景

The Future

我们的研发并未就此止步，新的征程已经开始。我们正在评估开发更方便的柴油和航空燃料替代品的可能性，而采用生化路线替代石化路线生产合成橡胶和其它化学中间体的诸多技术已在研发之中。

Research is not stopping. Projects have been started to assess the possibility of producing “drop-in” substitutes for diesel and jet fuel. The production of synthetic rubber and other chemical intermediates normally produced via a petrochemical route are under development involving a biotech solution.



M&G和康泰斯
很自豪地担负起了
“绿色革命”带头人的重任

M&G和康泰斯很自豪地担负起了“绿色革命”带头人的重任。我们仅仅成功地迈出了第一步。通过创新的化学和生化技术，我们能够极大地减少对石油的依赖并显著地降低二氧化碳的排放。而且，我们现在就可以实现。

The “Green Revolution” is upon us. M&G and Chemtex are proud to be driving this change. We have only taken the first steps. With innovative chemistry and bio-technology, we can radically reduce our dependency on oil and drastically reduce CO2 emissions. And we can do it now.

从第一代到第二代生物乙醇

From first to second bio-ethanol generation

生物乙醇的生产可采用不同的原料，基本上可分为三大类
Different raw materials can be used in the bio-ethanol production process. They can be divided into the following 3 large groups:

1. 糖 Sugars
2. 淀粉 Starch
3. 木质纤维素材料 Ligno-cellulosic material

糖和淀粉被用来生产第一代生物乙醇

木质纤维素原料被用来生产第二代生物乙醇

第一步，即产生含糖溶液，两种工艺过程相同，但含糖溶液以后的步骤则明显不同。

Sugars and starch are used to produce first-generation bio-ethanol. Ligno-cellulosic feedstock is used in second-generation production processes.

The first steps, in which a sugar-rich solution is produced, are common to both processes, whereas subsequent phases, starting from such solution, are clearly different.

第一代乙醇工艺包括下列步骤：

- 液化：用酶制剂打断淀粉聚合物链
- 糖化：用酶制剂打断低聚物链并形成简单的可发酵性糖
- 发酵；
- 精馏

The first-generation process includes the following steps:

- liquefaction. Starch polymer chains are broken by enzymes;
- saccharification. Oligomer chains are broken into simple, fermentable sugars by enzymes;
- fermentation;
- distillation.

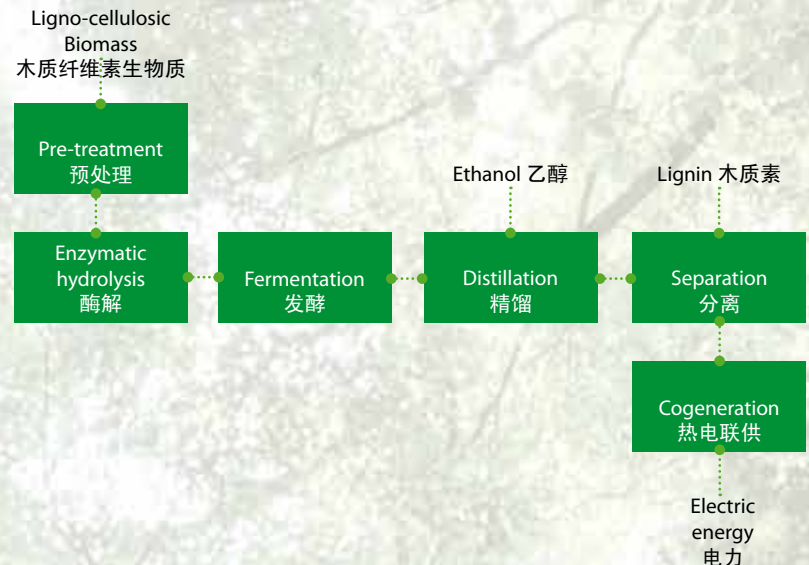


第二代生物乙醇

以木质纤维素生物质为原料，采用预处理工艺打开连接纤维素、半纤维素和木质素之间的键，使原料能更适宜酶解。

Second-generation bio-ethanol

The process starts from ligno-cellulosic biomass. A pre-treatment phase is required to break the bonds between cellulose, hemicellulose and lignin, thus making the raw material more suitable for enzymatic hydrolysis.







更多资讯请访问
<http://www.chemtex.com>



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