中国无锡尚德:
会呼吸的建筑

Suntech, Wuxi, China
A breathing building

文：攸琪柯
by: Yurchenko

太阳能光伏屋顶、长期的能源储蓄、气候性天花、低能耗的荧光灯光源和高科技的照明控制系统，尚德电力总部的每一个细部都在向世人展示着自己的专业优势：太阳能科技

Suntech newly designed headquarter achieve 70% energy saving by daylight use through transparent shell, a green facade with PV cells, using long term energy storage, climate ceilings, mass installation of fluorescent lighting source and application of light management system, represent itself a "showroom" for Suntech

The concept

Suntech is a worldwide leader in the design and manufacture of innovative solar energy solutions. The client aim for his China headquarter were to create a building complex forming an unique corporate identity with factors as structural flexibility, staff communications, design appearance as well as with the most important vision of the company: "Energizing a Green Global Future".

The complex consists of three buildings: production hall, office building and recreation building. The Austria based Architect Mario Buchegger, from mbdesign, has developed the client brief from the "body+head+skin = building" (diagram 1) concept: the hall of the production forms the main body of the building, while the office and the recreation center grow out of the main part like a head.

Body: the new production hall is attached to the existing one in the south of the building. With its four floors the new hall form a compact structure.
Head: The office building and the recreation centre are built out of single-storey organic stratums, which grow out of the new production hall in the south. "Due to different floor plans on each storey, a vibrant, dynamic arrangement, an organic landscape, with partly even floating rooms emerges by piling the stratums

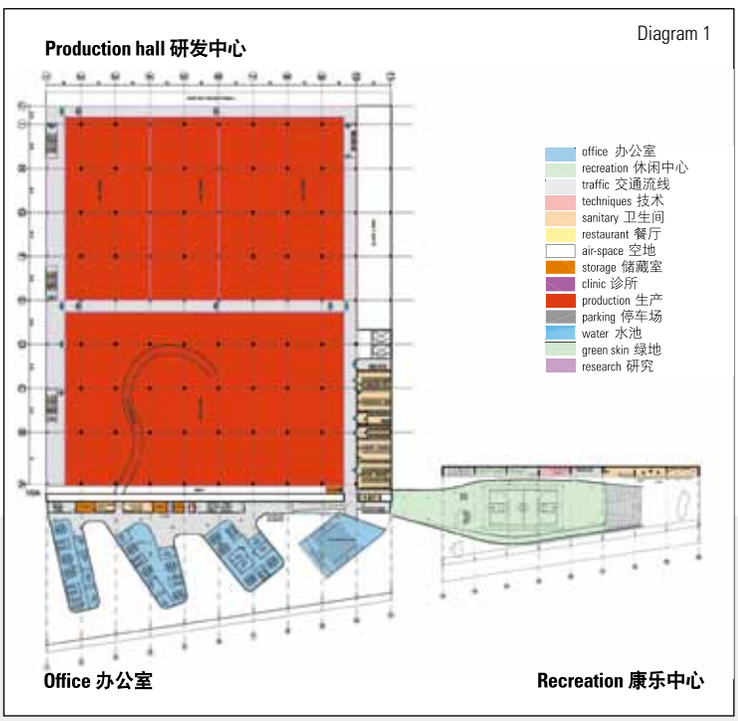
概念

无锡尚德电力是世界领先的创新太阳能方案设计单位和制造商。业主希望建筑结构能体现公司独特的业务性质，在设计上别出心裁，具有灵活的建筑结构，以方便员工交流。最重要的是体现公司的理念：“为绿色的世界未来提供能源”。

这个综合性的建筑共包括三栋大楼：研发中心、办公大楼和康乐中心。来自奥地利 mbdesign 的建筑师马利欧·布赫格尔（Mario Buchegger）为建筑提出了“身体+头部+皮肤=建筑”的概念（图表1）：研发中心构成整栋建筑的身体，而办公大楼和康乐中心就像从身体上长出来的头部。

图1：办公大楼（图片提供：尚德电力）

Picture 1: The office (picture courtesy: Suntech)



图表1：平面图：奥地利 mbdesign 的建筑师马利欧·布赫格尔（Mario Buchegger）为建筑提出了“身体+头部+皮肤=建筑”的概念 （图片提供：mbdesign）

Diagram 1: Plan view: the Austria based Architect Mario Buchegger, from mbdesign, has developed the client brief from the “body+head+skin = building” (picture courtesy: mbdesign)

one upon the other (diagram 2).” explains Mario Buccheger “Terraces which can be reached from the above storey complete this very special experience. The new building composes a landscape which shows not only its emotional but also its architectural uniqueness”.

Skin: The head with its floating rooms can not “breathe without energy”. Therefore it is surrounded by an “oxygen mask”. This additional glass cover surrounds both the office building and the recreation centre and creates one unique building and maximizes the volume of the whole complex (picture 1).

图2：办公大楼和康乐中心外的玻璃外壳(图片提供：尚德电力)

Picture 2: The glass cover for the office and the recreational center (picture courtesy: Suntech)

身体：研发中心位于原有建筑的南面，四层楼组成了一个非常紧凑的结构。

头部：办公大楼和康乐中心是一个单层的有机体，位于研发中心的南面。“根据每个楼层的不同规划，我们设计出一个动感十足的有机体。房间给人一种漂浮的感觉，一层搭在另一层上（图表2）”，马利欧·布赫格尔表示道。“梯田式的阳台更是强调了这种感受。新建筑不仅表情丰富，还具有独特的建筑结构”。

皮肤：漂浮着的房间头部不能“离开能量而呼吸“。因此，需要给她戴上一个”氧气面罩”。在办公大楼和康乐中心的周围戴上一层玻璃面罩，将两栋建筑融为一体，并突出了建筑的体量（图1）。

“绿色”概念

“绿色”概念是通过太阳能和绿色植被实现的。在玻璃面罩的南面是一个太阳能发电站。该发电站除了发电以外，其巨大的光伏电池已成为整个公司的名片。在办公大楼/康乐中心以及玻璃面罩之间有一个类似于温室的区域。该区域用于休闲和娱乐，可以用来调节气候。

整个研发中心和玻璃面罩的其余部分被裹上了第二层“绿色皮肤”，各种钢筋、索套交织在一起，并种上了紫藤和野生的藤本植物（图表3）。

第二层绿色皮肤通常都会围绕整个建筑作为第二层外壳，而此处则环绕康乐中心，峰回路转径直来到垂直花园，作为一种特殊的元素。它就像康乐中心的脊背，拥有各式各样的花园供员工放松。垂直花园是由钢筋网格构成的。 但是由于预算的原因，垂直花园和绿色立面的设计最后没有付诸实践。

The “green” concept

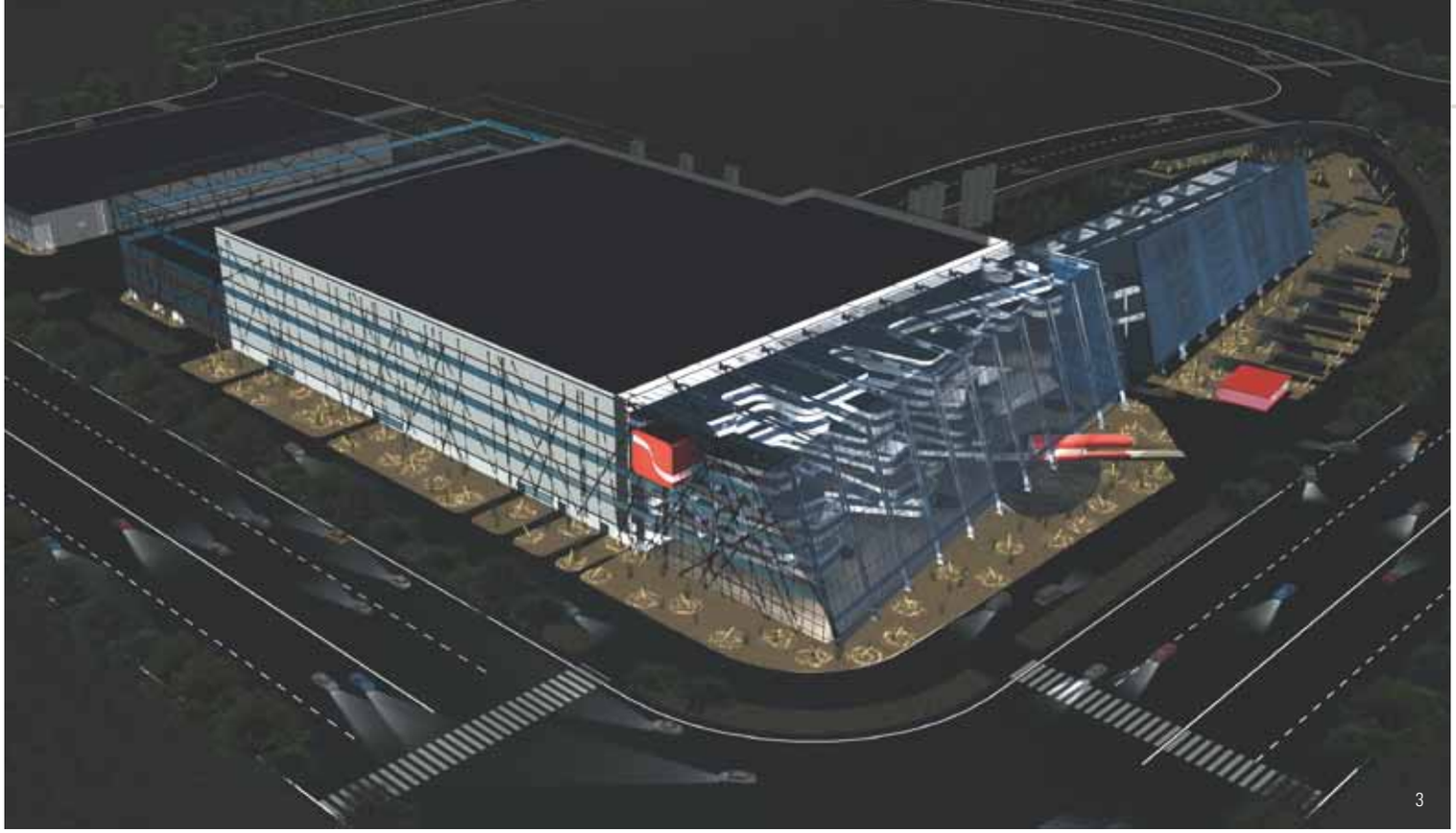
The “green” concept is applied through solar energy and visual green touches.

A solar power plant is installed at the south side of the glass cover. Apart from producing energy for the buildings, this huge panel composed of photo-voltaic cells acts as a business card for the company.

An interspaces like a greenhouse rises between the combined office / recreation centre and the cover made of glass. This area allows recreation and relaxation and can also be used for climatic balance.

The entire production hall as well as all the other parts of the vitreous cover are wrapped with a second “green skin” made of wire netting and ropes and have been planted with wisterias and wild vine (diagram 3).

The Second Green Skin, which normally goes around the building as a second cover, here merges with the recreation program from the Recreation Centre and mutates to the vertical garden as a special element it gives a green backbone to the recreation Centre with different kind of gardens to relax. The Vertical Garden is made out of concrete grid. Because of the expensive cost, however, the vertical garden and the green façade are not realized in the practice.



照明设计

利用太阳能，尚德办公大楼的能耗仅为普通办公大楼能耗的 30%。然而为整个项目提供技术概念、位于荷兰的设计单位 Deerns Consulting Engineers 在用词上却十分慎重。“到目前为止，还没有办法实现零能耗。我们认为用超低能耗建筑来形容这栋大楼比较适合”，照明设计师罗夫・凡・邓・伯格表示。锐高和奥德堡分别称为本次项目的灯控系统供应商和灯具供应商。为了实现低能耗的目的，照明设计师在细节上花了很多功夫。

“首先需要尽可能多地利用太阳光”，罗夫表示。“6000平方米的半透明太阳能电池板为中庭和办公室提供了充足的日光。”位于前台的楼层有很多可以搬动的会议室，这些会议室就像一个个独立的大盒子。从内部看，这个会议室与普通的会议室没有什么区别，但是整个盒子（会议室）可以放在前台楼层的任何地方以充分利用自然光。在每个可移动的会议室盒子一旁，安装有一个大型插座，以作为墙壁插座使用和照明用电、数据交流”。

“在光源的选择上，我们也下了很多功夫。整个项目中荧光灯用得比较多（TL和PL），因为这类光源的能耗较低。宽敞的中庭、攀岩墙和部分较高的天花使用了高压强放电灯（MHN和CDM-T），部分地方对照度的要求不是很高，我们采用了 LED 光源，”罗夫表示（表1）。

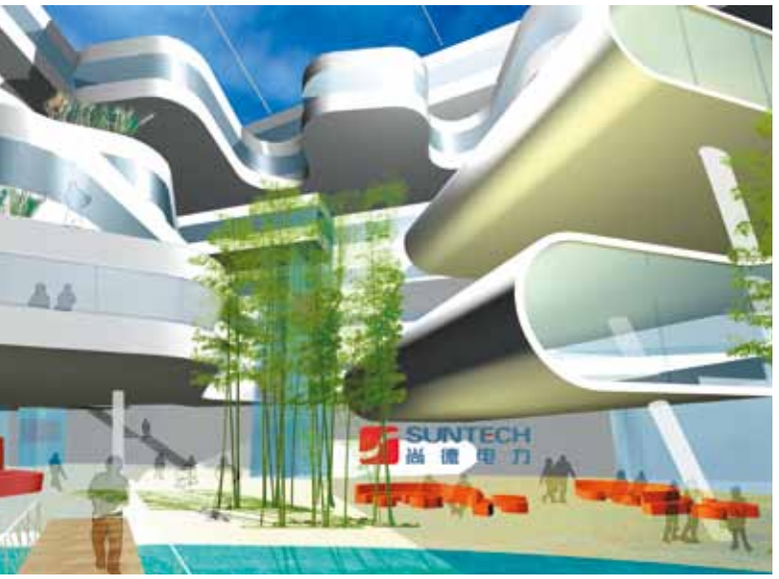
图3：夜景效果图 （图片提供：mbdesign）

Picture 3: Aerial view by night, rendering (picture courtesy: mbdesign)

Lighting Design

Thanks to the solar energy, the office is now consuming only 30% of the energy of a regular office. Deerns Consulting Engineers, the Netherland based company that designed the whole technical concept has contributed a lot to energy saving projects, yet they are very cautious when selecting the word: “the use of zero energy could not be reached, therefore we changed the name to ultra low energy building”, says Ralph van den Berg MSc, the lighting designer.

Tridonic Atco and Zumtobel have finally being selected as the lighting control system supplier and the luminaries supplier respectively. The lighting designer has put lots of effort in details to realize low energy consumption goals. “First of all we had to use as much daylight as possible”, says Ralph van den Berg MSc. “The large façade of 6000 m^2 of translucent solar panels gave us a lot of daylight in the atrium and offices.” In the reception floor there are moveable meeting rooms, they are like independent boxes. From the inside it looks like a normal meeting room, but the wole “box” (the meeting room) can be completely moved to different location inside the reception



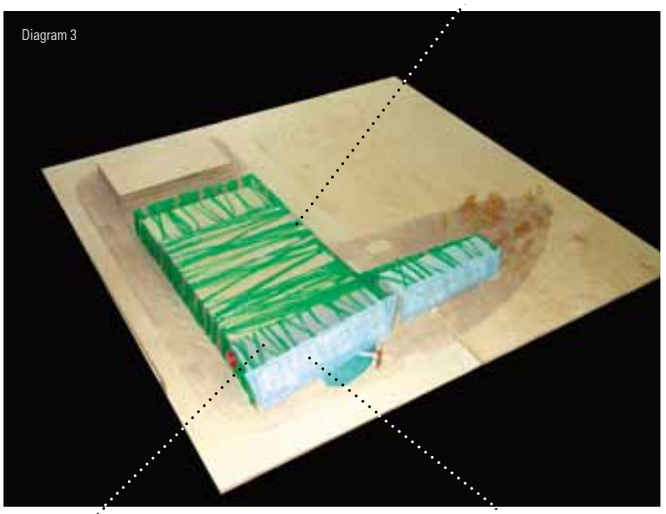
图表2：概念模型：多层办公大楼（图片提供：mbdesign）

Diagram 2: Conceptual model: office building with stratums
(picture courtesy: mbdesign)

“此外，我们还需要一个灯控系统。灯控系统的使用可以使灯光的变换更为灵活。如果办公室有所变化，系统可以重新编程。同时系统还可以感应到各种运动、按照日光的变化规律加以调光、并根据每天的不同时间决定灯具的开和关。部分会议室配备了控制面板，可以调成不同的照明场景。不过对中国的公司来说，照明控制系统依然是一个新的东西。在安装系统的时候，他们需要很多帮助，”罗夫表示。

“太阳能和宽敞的窗户会给办公室的员工造成眩光。所以建筑师把办公室安排到宽敞的中庭，这样眩光就会很少。当阳光太强时，可以利用室内的半透明遮光帘，”罗夫说道。

第二层绿色皮肤 Second Green Skin



图表3：第二层“绿色皮肤”图示：整个研发中心和玻璃面罩的其余部分被裹上了第二层“绿色皮肤”，各种钢筋、索套交织在一起，并种上了紫藤和野生的藤本植物 （图片提供：mbdesign）

Diagram 3: Second “green” skin’s drawing: The entire production hall as well as all the other parts of the vitreous cover are wrapped with a second “green skin” made of wire netting and ropes and have been planted with wisterias and wild vine (picture courtesy: mbdesign)

玻璃作为建筑头部的“氧气面罩”
Glass-envelope as “oxygen mask” for the head of the building

太阳能发电站
Solar Power Station

“Furthermore we needed a light management system for lighting control. The use of this system made it possible to be flexible with lighting. When an office is changed we can easily reprogram the system. It’s also possible to use movement detection, daylight depending dimming and time-based switching. Some meeting rooms have control panels where people can switch to different light scenes. The use of a lighting management system, however, was still new for the Chinese companies, and they needed more assistance than expected to engineer this system”, comments Ralph.

area in order to get more sunshine. The electricity for luminaires, data-communication and wall sockets is designed with a large socket at the side of each movable meeting box.
“We also selected the main lighting sources. We have used as much as possible fluorescent lighting (TL and PL), because they have a very low energy consumption. The large atrium, the climbing wall and some high ceilings are provided with high pressure gas discharge lamps (MHN and CDM-T). Some places which needed low lighting levels are provided with LED’s”, continues Ralph (table 1).

“Solar lighting and large windows can cause glare by the people who work in the office. So the architect located the office back in the large atrium, so the glare is quite low. When the flare is too high they can use the indoor translucent sunscreens.” adds Ralph.

国际团队和工作流程

建筑师、照明设计师和室内设计师的交流主要是通过电子邮件来完成的。为了方便彼此的交流，设计师主要使用了 Design Review 这个软件，以方便其他的设计师直接在上面做批注。据罗夫介绍，“照明的仿真系统是通过 Dialux 来实现的（图4）。通过这种方式，工程师和设计师门可以看到照明的效果。”

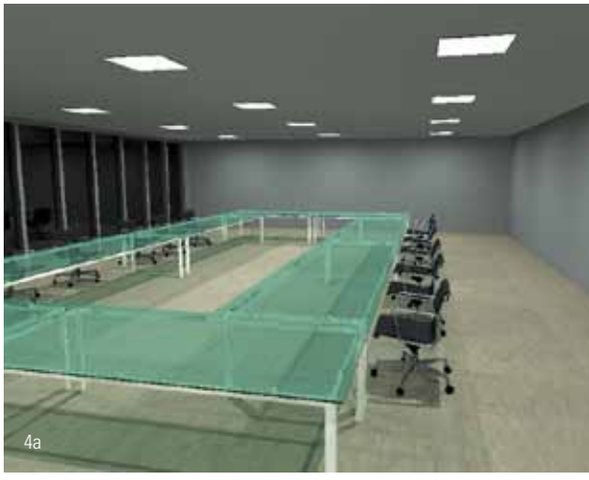
新技术

这个名副其实的“绿色”建筑还使用到了各种新的技术，譬如将能源长期储存在地下蓄水池中，以及气候天花等。■

图4：用 Dialux 为会议室做的照明仿真图，共有三种方案：a）3000K色温；b）4000K色温；c)日光；本次项目最后采用了 a 方案 （图片提供：Deerns Consulting Engineers）

Picture 4: A Dialux generated lighting simulation for the meeting room In three different lighting situations: a) with 3000K color temperature b) 4000 color temperature c) with daylight. The option “a” has been chosen for the project (picture courtesy: Deerns Consulting Engineers)


4c


4a


4b

项目信息 Project information

业主 Owner:	尚德电力，中国无锡 Suntech, Wuxi, China
建筑师/室内设计师 Architect/Interior designer:	沃尔特・克莱驰 Walter Kletzi, 马利欧・布赫格尔 Mario Buchegger, 沃夫纲・威斯尔 Wolfgang Wieser , 马格瑞特・穆勒 Margarethe Mueller, mbdesign
项目经理 Project management: mbdesign	DI. 达格柏特・格尔 DI.Dagobert Gauer,
照明设计师 Lighting designer:	罗夫・凡・邓・伯格 Ralph van den Berg MSc, Deerns Consulting Engineers
灯具供应商 Luminaries supplier:	奥德堡 Zumtobel
照明控制系统供应商 Lighting management system supplier:	锐高Tridonic.Atco

Global team and workflow

In order to have a smooth workflow architects, lighting designers and interior designers mainly communicated by e-mail and with the program Design Review which made possible to send drawings on which every designer could give their comments on it.
“The lighting simulations where made by Dialux (picture 4). In this way the engineers and designers could see the lighting effects which had to be created.” explains Ralph.

New technologies

New technologies such as long term energy storage in aquifers under the ground and climate ceilings are also used in this project to make it a qualified building for “green concept”. ■