Actualizing Virtual Manufacturing by Using Virtual Prototype Instead of Physical Prototype

通过虚拟样机取代物理样机实现虚拟制造

—— An Interview with Mr. Xiaowu Zi, Vice General Manager of ESI Group (Beijing) Co., Ltd.

—— 访北京伊萨科技发展有限公司副总经理资小务先生

□本刊记者　陈海燕

ESI 集团作为世界领先的虚拟工程软件及服务供应商，在材料物理学领域具有深厚的技术积累，并研发出了一整套仿真解决方案帮助工业制造商通过虚拟样机取代物理样机，实现了虚拟性能、虚拟制造及测试和未来在研产品的预验证。ESI 产品涉及虚拟性能、虚拟制造、虚拟环境三个大类。通过与最新科技相结合，虚拟样机概念已经扩展到了产品性能生命周期管理，主要强调产品从开始使用到服役期结束整个生命周期中的运行性能。如今 ESI 集团的客户遍布各个行业，全球共有 1200 多位高水平的专家为 40 多个国家和地区的客户提供技术支持。

北京伊萨科技发展有限公司副总经理资小务先生
Mr. Xiaowu Zi, Vice General Manager of ESI Group (Beijing) Co., Ltd.

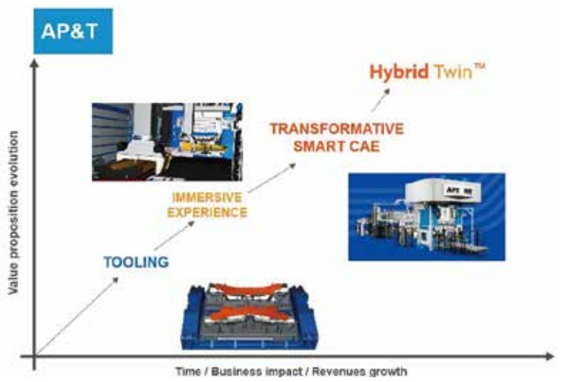
ESI 中国自 2006 年成立以来，充分发挥集团技术优势，整合全球先进工程经验，向中国用户提供成熟的虚拟仿真解决方案，帮助企业实现从研发、实验，到制造工艺，直至成功量产交付使用。通过对虚拟样机的不断优化，大大降低成本并缩短研发周期，极大提高产品的竞争优势，并逐步减少用户在产品研发过程中对物理样机的依赖。ESI 得到本土企业的认可与支持，实现在多个领域广泛应用。经过 14 年的努力，ESI 的产品性能生命周期管理（Product Performance Lifecycle Management）已经广泛应用于航空航天、汽车、船舶、机械、国防、机车、能源、冶金、电子及科研教育等行业。ESI 在北京、上海、成都共设有三家分支机构，全面开拓中国市场。

为进一步了解 ESI 中国的发展成就，记者专程采访了北京伊萨科技发展有限公司副总经理资小务先生。

资小务副总经理介绍说：“相比 5 年前采访，现在我们做的虚拟样机，面临更大的变革。首先是仿真方面，以前企业做产品时会采用很多物理样机，这些年我们用虚拟样机慢慢替代了物理样机，降低了成本，缩短了研发时间，模型也可再利用。但同时现在客户的需求和发展非常快，主要有两个大的趋势。一是，数字转型发展在欧美包括在中国都很快。数字转型不管是研发手段数字化，还是整个企业数字化，企业从经营管理甚至到内部的高层决策，都会基于数字化做决策。以前的信息化利用和管理在今天已经发生改变，今日的数字化，以 ESI 的角度来说，数字化仿真就是通过科学参数定义产品。虚拟样机就是这样的一项技术，比如汽车或飞机我们通过数字化手段来管理，包括它的控制系统、每个零部件、每一个性能，全部都可以通过数字化来定义，这是一个深刻的变化。二是，客户现在不太关心你用什么样的工具，而是要求你能够提供一个有效的解决方案。这是对我们很大的一个挑战。这就要求我们要有过硬的专业知识和丰富的工程经验，这也是一个很大的变化。ESI 具备两大优势，第一，有来自欧美的领先技术；第二，ESI 不是一个卖产品的公司，我们天天想的是创新，基因里就是一个技术型创新的公司，提供的都是非常专业的解决方案，解决某些特定的工程问题。比如，针对智能制造我们有很多解决方案，像铸造、焊接、钣金成型、3D 打印、机械加工等领域，我们都有很独到的专业的解决方案。并且基于技术团队非常丰富的工程经验，进行自主创新，帮助客户开发了 13 项自主、本地化自主知识产权，如钣金工艺参数数据管理、复合材料成型工艺知识管理、航空材料工装数据管理、制造工艺仿真系统等。”

2016 年 ESI 集团与华为签署合作备忘录，致力于为全球以及中国客户提供创新的工业制造解决方案

数字化是智能化的基础。数字化双胞胎可以打通企业价值链端到端的经脉，在计算机软件和数据平台中对实际产品的设计、规划和生产过程进行数据镜像和仿真，以提高制造企业产品研发、制造的生产效率，从而支持企业进行涵盖其整个价值链的整合及数字化转型，为各个环节打造一致、无缝的数据平台，形成基于模型的虚拟企业和基于自动化技术的实现企业镜像。ESI 集团构建的混合孪生 Hybrid Twin 解决方案融合了仿真分析、材料物理特性以及大数据分析，能够帮助制造商实现产品的智能化和互联化，并且提供产品性能预测以及预判性维护的功能。



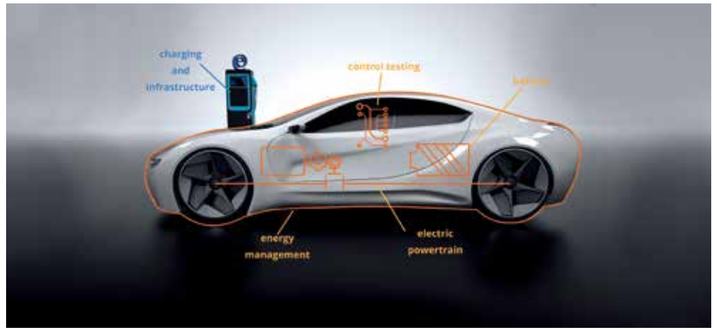
CAE 从设计工具出发，不断迭代，随工业一起转型、变革，如今已可以对服役产品进行全生命周期管理

资小务副总经理强调说：“这些年我们在面对问题的同时也在转型。我们将虚拟样机加上了创新的元素，比如混合孪生技术，客户的需求最早是从关心初始的产品设计性能，到现在发展到要求对整个产品全生命周期的性能进行有效的管理和预测，从而就产生了混合孪生解决方案。我们还给传统工业动力系统做了很多创新，提供创新的解决方案以帮助航发集团解决其面临的制造缺陷、制造的工艺优化、工艺的验证等问题。在汽车领域，我们服务的公司非常多，主要在汽车碰撞安全方面 ESI 有很强的解决方案，现在国内汽车厂商已基本不用做整车碰撞的物理试验了，它可以在虚拟样机环境下利用 ESI 的技术完成全部包括假人的伤害评估在内的虚拟碰撞实验，基本替代了整车物理碰撞。在汽车工业领域，ESI 同时也做了很多锂电池包的碰撞。电动车的发展中存在的一个很大问题是电池安全问题，碰撞之后能量集中，容易起火甚至爆炸和短路，这是很危险的。我们和清华大学合作，共同研究所有消费者都非常关心的电池安全问题，未来会开发数字化电池建模系统和碰撞安全的评估系统。我们和戴姆勒奔驰的供应商——中美合资公司 Farasis 合作，成为它的技术供应商。中车唐车也是我们的客户。”

2018 年 ESI 中国用户峰会

“除此之外，ESI 还与同济大学、北京交通大学、中科院力学所合作，并在 2016 与华为建立了战略合作伙伴关系，用有效的 CPU 资源能得到很高的一个计算效率，帮助客户节省成本。今年，我们与紫光云以及泰瑞数创建立战略合作，决定共同为三维实景中国提供具有物理属性的地理信息，助力中国地理信息产品的新发展。国土资源部及行业内数十家科研院校及同行见证了这一历史时刻，非常肯定仿真对数字（混合）孪生的地理信息产品产生的价值，期待这次战略合作引领地理信息的新发展。可以说，仿真技术就是数字孪生的价值基础。”

谈到未来的发展规划，资小务副总经理充满信心，他表示：“现在中国的经济发展和技术创新能力都非常活跃。ESI 集团很关注并看好中国市场，很多领域都非常领先，且具备完善的人才储备。现在我们提出的需求总部会很认真地听取和对待。我们也在转型期，思考怎样跟中国的自主研发、自主知识产权结合，怎样通过一些新的技术和中国企业的技术相融合，这是我们在考虑的一个可持续发展方向。在人工智能方面，会和华为、浪潮继续加强探讨与合作。今后还会继续加大对中国高校和顶尖研究机构的投资。”

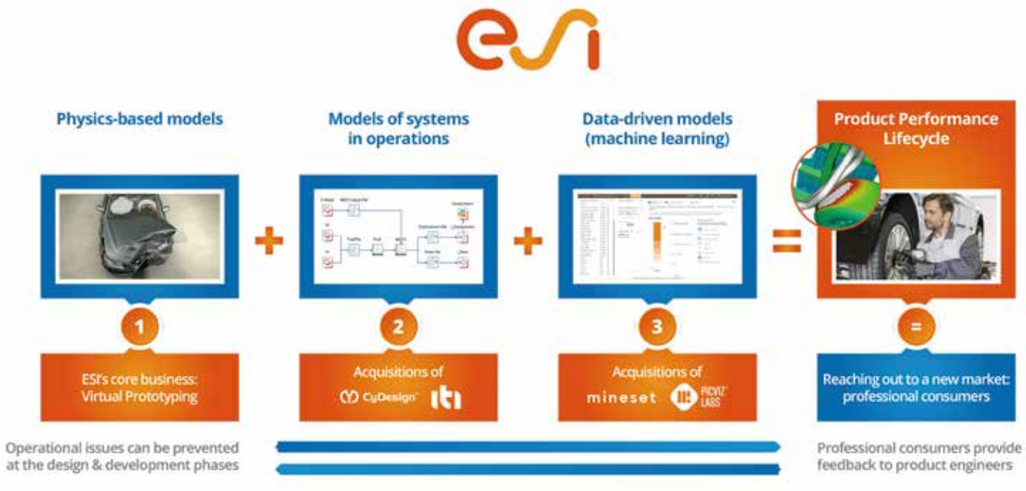


As a world-leading virtual engineering software and service provider, ESI Group has accumulated profound technology in the materials physics field. It has developed a full set of simulation solutions to help manufacturers practice virtual performance management, virtual manufacturing, virtual testing and even pre-validation on products in research. In these solutions, virtual prototypes are applied instead of physical prototypes. ESI's products are designed in the three major categories, i.e. virtual performance management (VP), virtual manufacturing (VM) and virtual environment (VE). Interfused with state-of-the-art technology, the application scope of virtual prototype has been extended into product performance management in a full cycle from commissioning to dismission. With over 1200 top experts worldwide, ESI Group is providing the technical supports to its customers in various industries in more than 40 countries and regions.

In 2006, ESI established the company in China. Since that, ESI China has been delivering well-rounded virtual simulation solutions to Chinese customers. These solutions are all the essence extracted from the group's technical advantages and engineering experience. They function from the pre-validation in the research and development, to the estimation on the effect of manufacturing technique, and to the production delivery. Ideal virtual prototypes that are applied gradually can cut the coat and the R&D cycle considerably. As a result, the users gain more competitive advantages and have less dependence on physical prototypes in the R&D process. The products released by ESI China have been recognized by domestic companies and widely used in multiple fields. In the past 14 years of development and promotion, ESI Product Performance Lifecycle Management has been widely applied in various industries like aerospace, automobile, ship craft, machinery, national defense, locomotive, energy, metallurgy, electronic, scientific research and education. ESI China deploys the three branches in Beijing, Shanghai and Chengdu to fully develop the China market.

To get more information about the development and achievement of ESI China, the journalist interviewed Mr. Xiaowu Zi, Vice General Manager of ESI Group (Beijing) Co., Ltd.

"Now, we are facing a greater revolution than 5 years ago when we made the last interview. Manufactures used to develop products with a number of physical prototypes, but now more virtual prototypes are designed to replace physical prototypes because they not only can reduce cost and R&D cycle greatly, but also are recyclable. In the respect of customer demands and development, the market has the two mainstream trends: The first is fast digital transformation in both the West and China. In such a digital transformation process, digitalization works across the entire enterprise from R&D means to routine operation and to high-level decision making. Traditional informationalized use and management are out of date. Now, digital simulation, from ESI's perspective, defines a product with scientific parameters. Virtual prototype is a typical one. For instance, an automobile or aircraft can be managed by digital means. Each control system, spare part or performance of them can be defined in a digital manner. It is a deep-going revolution. The second is the customers' focus that is centered on an efficient solution,



not on the tools to apply. For us, it is a great challenge. We need rich professional knowledge and abundant engineering experience to cope with it. For this, ESI boasts the two major advantages: The first is the sophisticated technology introduced from the West. The second is innovation. We are a technology-based featuring in innovation. Not only a product seller, we are also a professional provider of tailor-made solutions to solve specific engineering problems. For example, we provide a line of unique solutions for the smart manufacturing practiced in such fields as casting, welding, plate forming, 3D printing and machining. Our technical team has rich engineering experience and high independent innovation enthusiasm. With their help, the customers have developed 13 intellectual properties, such as plate process technological parameter data management, composite material modeling knowledge management, aerial material tooling data management and manufacturing simulation system," said Mr. Zi.

Digitalization is fundamental to intelligentization. Digital Twin can get through the value chains of an enterprise by realizing data imaging and simulation across the design, planning and manufacturing process of the products in the computer software and data platform to improve its manufacturing efficiency. Digital Twin gives enterprises the supports for the integration of the whole value chain and the digital transformation, provides them with a unified and seamless data platform covering all chains, on which a virtual enterprise is molded or an enterprise image is made based on automatization technology. ESI Group delivers Hybrid Twin solution which integrates a set of powerful functions such as simulation analysis, materials physical property and Big Data analysis. Such solution helps the manufacturers to realize the intelligentization and interconnection of their products and enables the predication on product performance and the predictable maintenance.

"In these years, the problems we face have been changing. We add innovative elements into virtual prototypes. For example, the customers' demand focus has been transferred from product design performance early to efficient management and predication on the product performance in a full life cycle. This expedites our Hybrid Twin solution. By innovating traditional dynamic systems, we help AERO Engine Corporation settle down a series of problems in the aspects of manufacturing defect, technique optimization and process verification. We have served multiple automobile makers with powerful solutions in crash safety. Now domestic automobile makers need not do all crash tests on finished automobiles. In a virtual prototype environment, ESI virtual testing technology can replace physical crash tests including assessment on dummy injury. Additionally, our solutions also cover lithium battery package collision. Battery safety is a crucial for electric vehicle. Any crash may result in concentrated energy, making battery prone to firing or short circuit, even explosion. We cooperate with Tsinghua University to jointly take out the researches on the battery safety the public concern much. We are working to develop a digital battery modeling system and a collision safety assessment system. We as a technology supplier develop cooperation with joint venture Farasis, a supplier of Daimler-Benz AG. Tangshan Railway Vehicle Co. Ltd. is one of our customers," said Mr. Zi.

"ESI has also cooperated with Tongji University, Beijing Jiaotong University and the Institute of Mechanics of Chinese

IC.IDO 工程虚拟样机仿真分析决策平台

Academy of Sciences. It established a strategic partnership with Huawei in 2016. With effective CPU resources, ESI can help customers save costs with high computing efficiency realized by CPU resources. This year, we have built strategic cooperation with Unicloud and Terra-IT to jointly provide geographic information (containing physical properties) for 3D real China map, to help the new development of China's geographic information products. The Ministry of Land and Resources, scientific research institutions, schools and peers witnessed such historic moment. The values of the simulation on Digital Twin (Hybrid Twin) and geographic information product have been affirmed highly. Such strategic cooperation will accelerate more development of the geographic information field. Simulation is the value basis for Digital Twin."

"The economic development and technology innovation are much dynamic in China. ESI Group highly values China market. We are confident for some leading fields and rich talent reserve. The headquarters will listen to and take the demands we put forward. In this transformation period, we are thinking about how to integrate with Chinese self-developed technologies and IPs and how to promote the interfusion of our technologies with the Chinese enterprises'. This is our direction of sustainable development. In terms of AI, we will continue to strengthen discussion and cooperation with Huawei and Inspur. And we will strengthen the investment cooperation with Chinese schools and top research organizations," said Mr. Zi talking about further development.