

An Underutilized Opportunity

R&D Cooperation In China

Working Together – Carrying out research and development (R&D) in China is now widely established among chemical multinational companies. Dr. Kai Pflug of Management Consulting – Chemicals and Dr. Bernhard Hartmann of A.T. Kearney China will highlight the preconditions for R&D cooperations between multinational companies (MNCs) and domestic chemical companies in China.



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In 2010 alone, more than 10 Western companies opened or extended their R&D capacity (tab. 1) in China. On the other hand, there is a strong interest of Chinese institutions and chemical producers in cooperating with Western companies, something that is frequently stated at chemical conferences. This means that some basic preconditions for R&D cooperation between MNCs and domestic chemical companies are met. However, what is the actual status of such cooperations, and how can they be classified?

Different Types of R&D Cooperation

There currently are three R&D cooperation types (fig. 1) dominating the chemical sector:

1. Cooperations between Western companies and Chinese universities
2. Cooperations between Western companies bringing in the technology and Chinese companies acting as the local provider of raw materials, production capacity or related assets
3. Cooperations between Western and Chinese companies, both of which provide core expertise in complementary areas.

Cooperations Between Western Companies and Chinese Universities

Of these three, the first type is the one most frequent. The MNC provides the materials and/or technology, while the domestic university provides the link to a customer industry and the research capacity to test the materials in this industry. For example:

- Evonik has a technological cooperation agreement with Luoyang Ship Material Research Institute.

In this cooperation, Evonik provides polyimide foam, which is tested and applied as insulation material for ship cabins.

- Linde works with Shanghai University to develop thin-film encapsulation material and packaging for electronic displays. The research is done at the university, with Linde providing funding for experimental materials and participation of Linde engineers.
- Bayer cooperates with Tongji University Automotive College, sharing expertise on new technologies and collaborating on interior and exterior car design.
- Rhodia works with East China Normal University to strengthen scientific collaboration in renewable materials and sustainable development.

This type of cooperation between MNC and Chinese universities is well-established and professionalized, with the university administration being involved in the contract management. It is relatively uncontroversial. For one thing, the investment tends to be relatively small (for example, 800,000 RMB in the Linde example). Secondly, the MNCs do work with non-commercial partners in these partnerships, thus limiting any potential damage via loss of intellectual property (though university professors in turn may work with domestic companies). Finally, even if these cooperations fail to yield any quantifiable research results, they still have promotional benefits, increasing the visibility of a MNC and helping the company to recruit promising young professionals.

Cooperations Between Western Companies (Technology) and Chinese (Raw Materials, etc.)

The second type of cooperation is between MNCs and Chinese companies in different production segments. The benefit from these cooperations comes from the MNC providing a technology or material, while the Chinese company offers a platform to test and use this material. For example:

- Novozymes works with the Chinese starch processing group Dacheng, providing enzymes and knowledge to convert biomass such as straw into sugar. Dacheng provides the raw materials, the facilities and the expertise to convert the sugar into glycols. Similarly, Novozymes cooperates with Sinopec and COFCO, a Chinese producer of processed agricultural products, in building a cellulosic ethanol plant.

Total and China Power Investments are cooperating to study a coal-to-olefins project in Inner Mongolia. Total contributes experience in processes such as methanol to olefins conversion and olefin cracking while China Power provides the coal.

- Suntech, another Chinese leading solar energy company, works with Silix Solar, an Australian solar company, to improve the power conversion efficiencies of crystalline silicon solar cells. This collaboration is particularly interesting as there is a clear overlap in the portfolio of both companies as both are deeply involved in the production of solar cells.

This type of cooperation is still acceptable to Western companies, as the contribution provided by the two partners can be clearly separated, which reduces the risk of knowledge loss. For example, Novozymes does not need to share its knowledge of how to produce enzymes with Dacheng or Sinopec.

Cooperations Between Western and Chinese Companies (Both Core Expertise)

Finally, there is R&D cooperation between chemical companies each having deep expertise in complementary technologies. This type is the most successful between different Western companies. However, the number of such cooperations between MNCs and Chinese companies so far is limited:

- Yingli Green Energy collaborates with Innovalight on research to raise the efficiency of multicrystalline solar cells produced by Yingli. Innovalight is the owner of nanotechnology-based technology to improve solar cell production while Yingli is a leading integrated photovoltaic manufacturer.

Why is the third type of collaboration so relatively rare, and how can this be changed to leverage the full potential of such collaborations?

The examples already give some clear indications about the requirements for successful cooperation between MNCs and domestic companies. Both Yingli Green and Suntech are listed in the U.S. and thus meet Western transparency standards. Both companies are strong in their markets and have substantial R&D programs. And both companies work in a segment in which China is strong.

Lessons To Be Learned

What are the lessons that can be drawn from this for MNCs wanting to collaborate with domestic chemical Chinese companies? R&D cooperation only works if it is a win-win situation. It is not realistic for a chemical company to give away research knowledge for free. As a consequence, to be an interesting partner for R&D cooperation, a company needs to have own strong areas, either in research or



with regard to other relevant aspects such as global market access.

On a practical level, the following issues need to be observed:

- Put together a strong rationale for your value as an R&D partner. This selling point should focus on the benefit of such cooperation for your partner, not on your own needs.
- Focus on benefits specific to your partner. While Chinese companies are interested in a clean environment, they will not put substantial effort into cooperation if it only improves the Chinese environment and not their overall market position.
- Be realistic about which companies will be interested to collaborate with you. If your own company is mid-size, searching for a mid-size Chinese partner is more promising than for a state-owned chemical giant.
- Be realistic about the contributions of the Chinese partner. They are more likely to be in application and development than in basic research, in line with as the focus of R&D work in Chinese companies (see tab. 2)

- If you cannot find a good reason for a Chinese company to collaborate with you, stop your search for a partner as it is unlikely to be successful.
- Internally, clarify and summarize your own goals of R&D cooperation. This will allow you to prioritize any potential opportunities.
- Create clear responsibilities for cooperation within your company. Who drives the partner search – is it the head of R&D, the company chairman, or somebody else?
- Continue to have clear responsibilities once the cooperation has started. Consider creating a liaison officer inside your company, and urge your partner to create an inter-company R&D team.
- Be visible to potential Chinese partners, e.g., via participation in conferences, publishing of articles, etc.
- During the partner search, do not limit yourself too early.
- Identify small areas of cooperation that can be used for trust-building. Be prepared to share some of your knowledge in these initial cooperations.
- Be upfront about potential issues regarding intellectual property, and prepare possible solutions for these issues in advance.

In summary, R&D cooperation is very similar to a business transaction – it is an exchange from which each partner needs to benefit. As a consequence, research cooperation cannot substitute own research, but it can strengthen it.

| Company | Chemical Area | Research Center Activity |
|--------------|--------------------------|--|
| Air Products | Performance materials | Extension of Asia Technology center in Shanghai |
| BASF | Epoxy resins | Expansion of technical center in Shanghai |
| Bayer | Plastics for automotive | Opening of AutoCreative center in Shanghai |
| Borouge | Plastics | Opening of plastics application Centre in Shanghai |
| Chemtura | Specialty chemicals | Opening of application development center in Nanjing |
| Dow Corning | Silicon materials | Launch of development center in Shanghai |
| DSM | Composites | Opening of research center in Shanghai |
| Dupont | Circuit & packaging mat. | Opening of new laboratory in Shanghai |
| Dupont | PV, auto, biomaterials | Doubling of R&D staff in Shanghai until 2012 |
| Evonik | Silicons | Opening of R&D center for radiation-curing silicons |
| PPG | Aerospace coatings | Opening of aerospace application center in Tianjin |
| Solutia | Automotive film | Opening of service center in Suzhou |

Tab. 1: 2010 R&D center openings/extensions of chemical MNCs in China

| Company/University | Chemical Area | Research Activity |
|-----------------------|------------------|---|
| East China University | 2,3-Butanediol | Progress in biological production |
| Hebi Baoma | DME | Pilot plant for DME from coal-based syngas |
| PetroChina | Polyesters | Development of environmentally friendly new types |
| Shanghai Chlor-Alkali | Epichlorohydrin | Pilot plant for preparation from glycerin |
| Sinopec | Polyester | Development of novel Titanium catalyst |
| Sinopec | Oil processing | Processing of highly acidic oil |
| Sinopec YCF | p-Aramid | Start of pilot production plant |
| Sinorgchem | Rubber Chemicals | Establishment of R&D center in Shanghai |
| Suntec | Photovoltaic | Cooperation with other firms to improve solar cells |
| Weifang Jinsida | Dye production | Zero emission waste water treatment |
| Xiamen Finehope | Fiberglass | Development of PU fiberglass |
| Yingli Green | Photovoltaic | Cooperation with other firms to improve solar cells |
| Yip | Acetate Solvents | Establishment of R&D center in Shanghai |

Tab. 2: Examples of recent R&D work in Chinese chemical companies

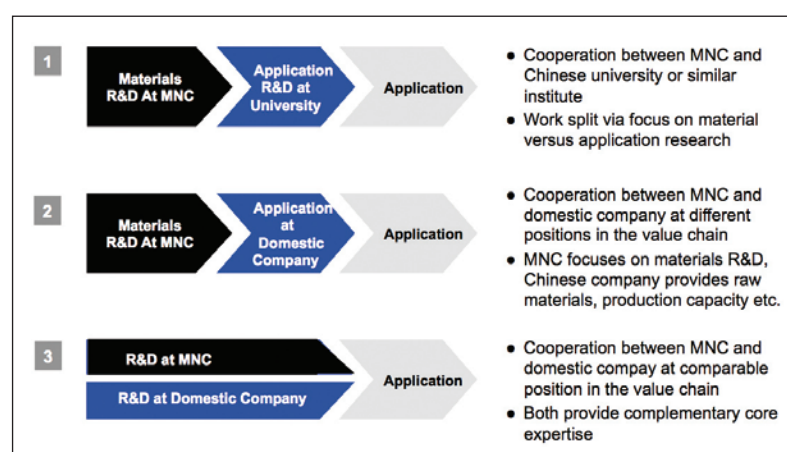


Fig. 1: Current types of chemical R&D cooperation between Chinese organizations and multinational companies

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