

## (BN) China Corporate Espionage Boom Knocks Wind Out of U.S. Companies

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By Michael A. Riley and Ashlee Vance

March 16 (Bloomberg) -- Last June, three men squeezed inside a wind turbine in China's Gobi Desert. They were employees of American Superconductor Corp., a maker of computer systems that serve as the electronic brains of the device. From time to time, AMSC workers are required to head out to a wind farm in some desolate location -- that's where the wind usually is -- to check on the equipment, do maintenance, make repairs, and keep the customers happy.

On this occasion, the AMSC technicians were investigating a malfunction. They entered the cylindrical main shaft of the turbine, harnessed themselves to a ladder, and climbed 230 feet in darkness up to the nacelle, an overpacked compartment that holds the machinery used to convert the rotation of the blades into electricity. Devens, Massachusetts-based AMSC had been using the turbine, manufactured by the company's largest customer, China's Sinovel Wind Group Co., to test a new version of its control system software.

The software was designed to disable the turbine several weeks earlier, at the end of the testing period. But for some reason, this turbine ignored the system's shutdown command and the blades kept right on spinning. The AMSC technicians tapped into the turbine's computer to get to the bottom of the glitch.

The problem wasn't immediately clear, so the technicians made a copy of the control system's software and sent it to the company's research center in Klagenfurt, Austria, which produced some startling findings, Bloomberg Businessweek reports in its March 19 issue. The Sinovel turbine appeared to be running a stolen version of AMSC's software. Worse, the software revealed Beijing-based Sinovel had complete access to AMSC's proprietary source code. In short, Sinovel didn't really need AMSC anymore.

### Bad News

Three days after that expedition in the Gobi, Daniel McGahn, AMSC's chief executive officer, got the news on his mobile phone while he was traveling in Russia. Hired in 2006, McGahn helped revamp the then-floundering company by focusing it on two things: China and wind power. Those bets paid off for a while, as Sinovel bought more and more turbine controllers from AMSC. Then in March 2011, Sinovel abruptly and inexplicably began turning away AMSC's shipments at its enormous turbine assembly factory in Liaoning province.

On April 5, AMSC had no choice but to announce that Sinovel -- now its biggest customer, accounting for more than two-thirds of the company's \$315 million in revenue in 2010 -- had stopped making purchases. Investors fled, erasing 40 percent of AMSC's value in a single day and 84 percent of it by September. The company's stock chart looks like the electrocardiogram of a person rushing toward white light.

### Sinovel Relationship

On June 15, standing in a St. Petersburg office tower, McGahn listened to the report from the Austrian team for

30 minutes and felt the blood drain from his face. He had been trying for months to save the relationship with Sinovel and was making almost no progress. By the time he ended the call from his Austrian team, he knew why.

What McGahn says happened to AMSC may be incredibly brazen, but it's hardly exceptional. There have been a large number of corporate spying cases involving China recently, and they are coming to light as President Barack Obama and the U.S., along with Japan and the European Union, have filed a formal complaint to the World Trade Organization over China's unfair trading practices. The complaint includes the hoarding of rare earths, the metals required for the manufacture of other green energy technologies such as batteries for hybrid vehicles.

### Far-Reaching Campaign

In November, 14 U.S. intelligence agencies issued a report describing a far-reaching industrial espionage campaign by Chinese spy agencies. This campaign has been in the works for years and targets a swath of industries: biotechnology, telecommunications, and nanotechnology, as well as clean energy.

One U.S. metallurgical company lost technology to China's hackers that cost \$1 billion and 20 years to develop, U.S.

officials said last year. An Apple Inc. global supply manager pled guilty in 2011 to funneling designs and pricing information to China and other countries; a Ford Motor Co. engineer was sentenced to six years in prison in 2010 for trying to smuggle 4,000 documents, including design specs, to China. Earlier this month, the National Aeronautics and Space Administration told Congress that China-based hackers had gained access to sensitive files stored on computers at the Jet Propulsion Laboratory.

As the toll adds up, political leaders and intelligence officials in the U.S. and Europe are coming to a disturbing conclusion.

"It's the greatest transfer of wealth in history," General Keith Alexander, director of the National Security Agency, said at a security conference at New York's Fordham University in January.

### Covering Digital Tracks

In other espionage cases, such as those involving Google Inc., Lockheed Martin Corp. and DuPont Co., thieves did a far better job of covering their digital tracks. Sinovel, however, was caught red-handed. AMSC has presented to law enforcement officials in Austria and China computer logs and messages that show Sinovel courting one of the U.S. company's employees and paying him to aid in the code heist.

"It's a red-hot smoking gun example," said John Kerry, chairman of the Senate Foreign Relations Committee and the Democratic U.S. senator from AMSC's home state. "If this is the way the Chinese choose to do business, it's going to be very contentious and tough sledding ahead for this relationship."

### Intellectual Property Abuses

U.S. politicians and corporate executives have grouched about China's intellectual property abuses for years, to little effect. China often promises to take a harder stance against such thefts but rarely backs up the words with actions. For example, Chinese officials have promised to crack down on the theft of Microsoft Corp.'s Windows operating system; the company said it's still seeing mass downloads of its software that were never paid for. McGahn, though, has taken a highly unusual step.

He decided to fight back -- in China.

AMSC has filed four complaints against Sinovel in Chinese courts -- where Sinovel has a steep home-field advantage -- seeking \$1.2 billion in damages. Sinovel has filed its own countersuits claiming AMSC owes it \$207 million for problems including defective equipment. Sinovel declined to make its chairman available for an interview or to comment for this story. And because Chinese courts don't make legal documents available to the public, it wasn't possible to read Sinovel's counterclaims.

"How China responds to this is going to be central to how they respond to other issues of concern between us," Kerry said.

### Superconductive Material

AMSC was founded in 1987 by four professors at the Massachusetts Institute of Technology. The idea was to develop power transmission lines made from cooled superconductive material, which dramatically reduces energy loss. At the time, superconductivity looked like science's latest gift to big business. But the technology has never quite lived up to those early hopes, and AMSC's business wallowed in the red for decades.

In 2006 the company hired McGahn, a gregarious executive with a master's degree in marine engineering from MIT, as a vice president charged with exploring new businesses.

As McGahn surveyed AMSC's technology, he focused on the company's research into wind-turbine control systems. A modern 1.5-megawatt turbine is the equivalent of a 160-ton, high-performance pinwheel. Each gets stuffed with as much as \$200,000 worth of electronics, including a power converter and what's called a programmable logic controller, an industrial computer the size of a couple of cigarette cartons. These devices are used to do everything from filling up the bottles in a Budweiser brewery to controlling valves in oil pipelines. In the case of turbines, they can rapidly adjust the yaw and pitch of blades, among other functions. McGahn sensed an opportunity to take this technology and capitalize on China's efforts to harvest energy from the wind.

### Clean Energy Law

The same year AMSC hired McGahn, China passed a clean energy law calling for the creation of seven 10,000-megawatt wind farms in strategic zones throughout the country, including Gansu, Zhejiang, Inner Mongolia, and Jiangsu provinces. The law made China the hottest wind market in the world. In 2009, according to a U.S. wind industry report, a new turbine was going up in China every hour. By 2020 just one of those wind farms may produce as much power as 10 nuclear power reactors.

AMSC began packaging the electronic components and selling them to China's small but growing domestic manufacturers, which had plenty of capital and cheap labor to make the turbines' steel skeletons but lacked the sophisticated gadgetry to run them. The arrangement was working the way it was supposed to:

China would turn out the commodity hardware -- the turbines -- and a U.S. company would retain control of the high-margin intellectual capital-end of the business.

### 'Symbiotic Relationship'

"We always saw it as a symbiotic relationship of having China's low-manufacturing cost coupled with Western technology," McGahn said. "We would grow as they grew."

McGahn was well aware of the dangers of working with Chinese companies, which have become notorious for cutting out their partners after squeezing them for technology through transfer agreements and other means. Now 40, McGahn built a career out of taking technology startups and building them into revenue generators, often by finding customers among Asian manufacturers. He used this approach with nanotube plastics for auto parts at a Cambridge, Massachusetts-based

company called Hyperion Catalysis International and with photovoltaic film at Lowell-based Konarka Technologies.

Before arriving at AMSC, he had worked in Japan and South Korea and said he succeeded by carefully sizing up both partners and rivals. McGahn likes to tell people that almost all of history's wars started because political leaders misunderstood their adversaries.

"I spend an inordinate amount of time studying my counterparts," he said.

### Secure Barriers

If McGahn was going to bet AMSC's future on partnerships with Chinese companies, he wanted secure barriers around its intellectual property. He designed AMSC's China operations -- in fact, reorganized much of the company -- with that in mind. To hire AMSC's first 30 employees in China, McGahn interviewed 400 people, handpicking the ones he thought he could trust. When AMSC opened a factory in China's Jiangsu province to assemble power converters, McGahn made sure firmware and other technology-rich components were built in factories in the U.S. and then shipped to Asia.

Software was sequestered at the company's research facility in Austria, which has a booming clean energy sector much like Germany's. The source code to AMSC's control system software sits on a secure server in Klagenfurt. To protect the code from hackers, the server isn't accessible from the Internet.

### Strategy From Beginning

"The idea of dividing up the intellectual property part of the content and not having them in China was part of the strategy from the beginning," he said.

McGahn thought he'd planned for every contingency to keep AMSC safe. He also believed the company could find a way to have both partners benefit. He was wrong on both counts.

Chinese businesses have proven very good at copying Western goods and methods. This even appears to be true of espionage itself. China didn't invent intellectual property theft; it's just doing it on an unprecedented scale.

Willy Shih, a professor at Harvard Business School who has testified before Congress about business dealings between the U.S. and China, takes a historical view of intellectual property theft. In the 1870s, American textile companies would send employees to work in British factories. They would take notes on textile equipment and bring back the information. The Russians and East Germans stole U.S. computer and chip designs during the Cold War.

"And similar things have been true of Korean companies and Japanese companies," said Shih. "I would argue that it's a normal development pattern."

### Good Timing

China's been helped by good timing. It's emerging as a global economic power at a time when nearly every secret worth stealing sits on a computer server. U.S. intelligence agencies fear that Chinese spies have already siphoned terabytes of data from thousands of Western companies.

Stealing information, however, isn't the same as being able to use it. The Soviets ended up generations behind their U.S.

rivals in computing technology because they couldn't advance the cloned equipment fast enough. Shih said that for the Chinese to succeed at the current game, they will need to build a research and development culture that can supersede their skills at mimicry.

"Many countries go through an imitation phase, but the real challenge is moving to an innovation phase," he said.

## Found a Shortcut

Sinovel, arguably, found a shortcut to get there. Han Junliang, Sinovel's president, is 47 and wears thin-rimmed glasses below thick hair parted in the middle. His rather drab profile doesn't match his status as one of China's most famous entrepreneurs. He rose over 17 years through the ranks of a state-owned manufacturer, Dalian Heavy Industry Group Co., which builds steel-rolling equipment and other massive machinery. He eventually became chairman of an electrical equipment division. When Han left in 2006 to start Sinovel, Dalian Heavy was among the company's major shareholders and its biggest benefactor. Han himself has a 13.3 percent stake in Sinovel through an investment that included personal loans and other means, according to company documents and wind energy experts.

Unlike some of its Chinese rivals, there are no tennis courts or Ping-Pong tables at Sinovel. The company isn't focused on amenities, just rapid and relentless growth. Workers assembling the massive turbine bodies in the hangar-size factory in the northern province of Liaoning wear coats and hats on the plant floor because the facility isn't heated. In less than four years, Han has made the company into the second-largest turbine maker in the world, after the Danish manufacturer Vestas Wind Systems A/S.

## Not Alone

He didn't do it alone. Sinovel is one of the best-connected clean energy companies in China. Among its major investors is the private equity group New Horizon Capital, co-founded by Wen Yunsong, also known as Winston Wen, son of China's premier, Wen Jiabao. Han was also close to Zhang Guobao, until recently head of China's powerful National Energy Administration. According to a former U.S. diplomat, who didn't want to be named because he still works in China, Han's relation to Zhang may have given him an early look at yet-to-be-published government regulations and provided Sinovel preference in the kinds of turbines chosen to power the state-planned wind farms.

When China finalized bids for a mega-wind project in 2008, Sinovel won 47 percent of the deal, by far the biggest share of any manufacturer.

"Han seems to have ridden the wave just perfectly," said Louis Schwartz, president of China Strategies, a firm that advises Western companies on China's wind sector.

## Visible Flaws

By late 2010 there were visible flaws in China's wind power industry. The first was the production quality of the turbines.

Since the government planners demanded quantity, and not performance, wind farm developers tended to cut corners.

Thousands of China's turbines lack the more expensive technology that keeps them operating when there is a disturbance on the power grid. In April 2011, wind farms totaling 1,346 turbines shut down suddenly, a major technical failure that caused disruptions on the electricity grid of two provinces.

The second problem was oversupply, which persists to this day. China has ended up with more than 80 wind turbine manufacturers in a market that analysts believe can support about 10. The price of a 1.5-megawatt turbine in the country has dropped about 40 percent and continues to fall, placing enormous pressure on Han and his company. Sinovel had signed multiyear contracts with AMSC, keeping what his company paid for a turbine's electronics suite steady even as Sinovel's prices plummeted. AMSC's products accounted for about 12 percent of a Sinovel turbine's cost in 2008, according to public filings. By 2011 they made up 18 percent, said Schwartz, the U.S. consultant.

'See The Motivation'

“You can see the motivation to acquire that technology,” he said. “Everybody was getting squeezed except AMSC.”

The semi-trailer load of ASMC electronic components that Sinovel turned away March 31 was worth \$70 million, and the U.S. company claims it's owed another \$70 million for components already shipped. Sinovel and AMSC had several supply contracts extending to 2013 that together were worth more than \$700 million. That all adds up to a very large chunk of AMSC's current and future revenue stream.

The one piece of leverage that AMSC thought it had until last June was proposed regulations in China that will require existing wind turbines to be retrofitted with an updated technology called “low voltage ride through,” or LVRT.

LVRT capability keeps turbines from shutting down when there is a large voltage dip on the grid, which can occur from little more than a tree falling on a transmission line. The technology would have prevented the April wind farm shutdowns.

Even if Sinovel wanted to renege on its contracts, all its existing 1.5-megawatt turbines were powered by AMSC electronics.

If the company wanted the upgraded LVRT software, Sinovel would have to come to the table.

#### Different Plan

Han apparently had a different plan in mind. According to court documents, in 2010, Sinovel began recruiting Dejan Karabasevic, a Serbian software engineer who worked at AMSC's research facility in Klagenfurt. In December, Karabasevic sent his existing contract with AMSC to Sinovel employees for review; by January 2011, Sinovel was hunting for an apartment for him in Beijing.

Once in China, the engineer was pressed to create software that could go on existing turbines as quickly as possible, using source code taken from AMSC's server in Austria. For five days beginning May 10, Karabasevic said in a confession to Austrian police, he worked steadily in his Beijing apartment and then traveled to a wind farm with three Sinovel employees to test the code in working turbines. By June it was done.

#### Pleaded Guilty

Karabasevic, who pleaded guilty, was sentenced in September to 1 year in jail and two years probation for distribution of trade secrets. His attorney, Gunter Huainigg, declined further comment.

In court filings in a Beijing copyright infringement case, one of the four theft-related cases filed by AMSC in China, the company said it has evidence that the stolen code was already in more than 1,000 Sinovel turbines by July. McGahn said he assumes it's been installed in many more since. Beginning in October, Sinovel filed two countersuits totaling \$207 million, claiming it stopped accepting the company's electronics because of quality problems.

In hindsight, it now appears that Han never planned to fulfill the kind of long-term partnership McGahn had envisioned.

In 2010, Han helped create a company called Dalian Guotong Electric, making himself chairman and giving Sinovel a 20 percent stake.

#### Swapped Out

When AMSC investigators opened up a Sinovel turbine in a second location in July, they found that an AMSC power converter had been swapped out and replaced with a nearly identical one made by Guotong. It was running on a version of AMSC's control system software obtained the year

before by Sinovel and decrypted by its engineers. It looks like Han wanted to make Guotong Electric the Chinese version of AMSC.

Last June, after AMSC promoted McGahn from vice president to CEO, the executive began to learn the full extent of how wrong he was about Sinovel. As investigators scrambled to determine who had stolen the control system source code, they narrowed the possibilities down to three people, all of whom worked at the Klagenfurt research facility. According to interviews with people involved in the investigation and a review of court documents, log files showed that the altered code had been uploaded onto the Sinovel turbine on two different days, June 2 and June 10. Two of the employees weren't in China at that time.

#### Vacation Days

The third, Karabasevic, had given notice at the end of March and started using vacation days the company still owed him.

One of AMSC's most valuable software engineers, Karabasevic and his bosses had agreed he would stay in touch as they looked for a replacement, so he retained a company e-mail account. The investigators discovered he was accessing the e-mail from computers in China. Next, they overlaid the computer addresses with offices, production facilities, and wind sites linked to Sinovel. The data sets matched.

In addition to its internal checks, AMSC brought in a consulting firm that specializes in white-collar crime. The company hired a private investigator to tail Karabasevic in Beijing. Forensics experts examined his company laptop and recovered data he had attempted to wipe from the machine. This led to the discovery of hundreds of messages about the code exchanged between Karabasevic and three Sinovel employees, including one e-mail in which the engineer sent AMSC's source code to his Sinovel counterpart.

#### Austrian Authorities

AMSC eventually turned this evidence over to Austrian authorities who took Karabasevic into custody. He admitted to being courted over several months by Sinovel, and to reprogramming the turbine-control system code from a Beijing apartment Sinovel provided him. In a locked closet inside the apartment, investigators found a six-year, \$1.7 million consulting contract with Sinovel and a related company. The signature on the contract belonged to Han Junliang.

In terms of outright theft of intellectual property, there is growing evidence that China's intelligence agencies are involved, as attacks spread from hits on large technology companies to the hacking of startups and even law firms.

"The government can basically put their hands in and take whatever they want," said Michael Wessel, who sits on the U.S.- China Economic and Security Review Commission that reports to Congress. "We need to take more actions and protect our intellectual property."

#### Deflated Bubble

Those actions may create unexpected difficulties for Sinovel in using AMSC's stolen code. At the end of 2010, as China's wind-power bubble deflated, Sinovel had \$1.7 billion in unsold inventory and was owed \$2 billion by its customers. The obvious solution is to increase sales by looking overseas, part of Sinovel's long-term strategy in any case. The Chinese company's first major international deal, a contract in Ireland with Dublin-based Mainstream Renewable Power Ltd., was shelved last year after AMSC made its software theft public. If Sinovel does export turbines with the stolen code, AMSC said it can file lawsuits in those markets as well.

So far neither Sinovel nor China's government is giving any ground. Police in Beijing, after reviewing a case file provided by AMSC, declined to open a criminal investigation against three

Sinovel employees named by Karabasevic. In the weeks leading up to the Feb. 24 arbitration hearing in Beijing, the pressure on McGahn and his company has grown. A fire in a turbine belonging to another AMSC customer in China killed two people, and a Chinese media report, citing an anonymous source, blamed AMSC's components. Jason Fredette, an AMSC spokesman, said that based on information the company has obtained, its electronics weren't at fault.

### Cyberattack

The day after the press report, AMSC computer networks in Devens were hit by a cyberattack. Forged e-mails were sent to a handful of company executives; they contained spyware designed to copy confidential data, including documents and internal communications. Fredette said e-mails were expertly crafted and had a fake link to a story about Sinovel's troubles, a bit of irony inserted by the attackers. The U.S. Federal Bureau of Investigation is investigating the incident.

McGahn said he still wants to do business in China. But even if the company never sells another component there, he contends AMSC will survive. He has since moved to secure deals in Russia and is eyeing India as the next big wind market. In the meantime, McGahn has been schooled about doing business in China in a way he never imagined.

"I used to be a Sinophile," McGahn said, then pauses for a long exhale. "I don't know what I am now."

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