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Suppliers: First Line of Defense

Ralf Wirtz, the trade control manager of Oerlikon and its important vacuum subsidiary Leybold, in Cologne, Germany, often compares purchase enquiries sent to him from his company's salesmen. He's looking for hints that a potential buyer, perhaps in Malaysia, Singapore, the UAE, or even just down the street, is seeking to supply a secret nuclear weapons program in Pakistan, Iran, or North Korea. Experience dating back to the early 1980s has taught Wirtz that "turntable" operations, in which items are secretly diverted to a nuclear program in another country, are difficult to detect and stop.

Sitting in his office, he looks for suspicious communications, typically emails (but also faxes and third party contacts) from a potential customer asking about prices for Leybold vacuum products. Enquiries provide an important early indication of current and potential nuclear smuggling. A military nuclear program may need to procure thousands of individual items, but will likely use relatively few front companies to attain them, making the front companies' identification critical to efforts to prevent or slow down proliferation. While such enquiries contain names of individuals and trading companies, the type and amount of items

sought, they can also offer insight into the modus operandi of whichever nuclear program is placing the order.

Wirtz's team easily spotted October 2007 enquiries from a Pakistani trading company, which over a ten day period contacted two of Oerlikon Leybold's subsidiaries in Singapore and Ireland seeking vacuum pumps, Leybold's main product. The company claimed the pumps were needed for regenerating oil from industrial operations, a legitimate use of such equipment. After double checking with German authorities, Wirtz concluded this company was probably buying for Pakistan's nuclear weapons program. All such enquiries are maintained in his company's large database of trading companies and agents, which allows him to match similar enquiries from another trading company, perhaps with a less conspicuous address.

The global market in dual-use goods is enormous and the market in vacuum technology is an important subset of this international market. Almost all of this business in dual-use items is legitimate. Leybold estimates that procurement enquiries from smuggling networks make up less than a tenth of one percent of the total number of enquiries it receives. That small fraction makes detecting these enquiries challenging. To overcome this, Wirtz's export control office trains company personnel to spot suspicious procurement patterns and relays advice based on its analysis to its sales agents.

During the 1970s and 1980s, no supplier was more identified with the rise of the Khan network than Leybold-Heraeus, which included the Leybold division in Cologne and the division in Hanau, Germany. Leybold salesmen had greeted representatives of nuclear programs from Pakistan, South Africa, Iraq, Brazil, Libya, Taiwan, India, Iran, and North Korea. Leybold-Heraeus's

former employees and agents, including Gotthard Lerch, Gerhard Wisser, and Daniel Geiges, bolstered their careers helping Khan.

Yet no supplier has undergone such a dramatic turnaround. Leybold is now part of Oerlikon, a Swiss high-tech corporation with 170 subsidiaries in thirty-five countries that employs about 20,000 people. Oerlikon Leybold is both an industry leader and a model for all responsible suppliers of sensitive equipment, consistently placing nonproliferation over its commercial interests. By its own reckoning this policy has cost Leybold $50–60 million in lost orders. If one believes it is possible to stop nuclear smuggling, Leybold's story offers hope.

Leybold's path to exemplary global citizen has not been an easy one. Several years before Oerlikon purchased it, Leybold AG's owners decided it was time to reform. The daunting task fell to Horst Heidsieck, a forty-three-year-old executive who had originally studied physics at the University of Bonn. In 1990, he was a senior executive at the German Degussa chemical corporation, which at the time owned Leybold AG. Heidsieck hoped for a promotion within Degussa where he had spent much of his career. Instead, in October 1990, Degussa's leaders made him Leybold AG's chairman of the board and chief executive officer.

Heidsieck was reluctant to take the job. Leybold AG had been suffering heavy financial losses and was laying off workers. Further undercutting revenue, the company was subjected to enormous criticism in Germany and the United States over its past sales. Leybold's board of directors was dealing with the ramifications of the company's past sales on what seemed an almost daily basis.[1] The company would need massive restructuring if Heidsieck was to make it profitable again.

Soon after he took the job, Heidsieck had to confront damaging revelations about Leybold's past proliferation sales to Iraq's nuclear weapons program. After the 1991 Persian Gulf War, IAEA inspectors discovered Leybold AG equipment in secret Iraqi nuclear weapon sites, the inspectors' reports incontrovertible proof of Leybold's wrongdoing despite its frequent earlier denials. Even today, Wirtz reminds his employees, "We don't want our stuff dug up from the desert."

In 1991, Leybold AG's reputation was in shambles. It faced further sales losses in Japan and the United States, two of its key markets, and was close to being put on a blacklist of organizations American companies were forbidden to do business with. For a company in which exports represented two thirds of its sales, disaster was looming.

Many of Leybold's questionable exports were known to German authorities, and in fact the government export regulators had either approved them or took no action to stop them. In the early 1990s, an embarrassed German government passed far stricter laws and regulations. In 1992, the government essentially blacklisted Iran, which had been an important recipient of German dual-use exports. Also it created special nuclear investigation teams, or "special nuclear commandos," that on several occasions raided Leybold, carrying away incriminating documents. Leybold officials were not prosecuted, because its sales in general did not violate the weak German export control laws, but the company was subject to large fines, not to mention further damage to its reputation.

Heidsieck decided that instead of simply complying with the new, tougher export laws, Leybold must become a leader in stopping the proliferation of equipment essential to building weapons

of mass destruction. Industry and government "must cooperate in preventing the further proliferation of weapons of all types," he said. A corporation has the duty, he emphasized, to "check, on its own initiative, whether exports to certain countries can be responsibly justified or not."[2]

With a goal to thwart purchases from what had once been welcomed customers, Heidsieck's reforms were unpopular in many parts of the company. Several salesmen found the sales to sensitive countries lucrative and considered them legitimate. One Leybold official involved in many of the sales said they were like a "license to print money."[3] Customers from these countries would not just knock on your door, he added, but "pound" on it.

New German laws in 1991 required Leybold to establish an internal Corporate Export Controls Office (CECO) to ensure that the company was abiding by the new laws. Under revised German law, each company had to nominate a senior "export-responsible executive," who is held personally accountable for any illegal actions by the firm. Heidsieck made himself Leybold's responsible official. The stakes were high. If his mid-level managers violated the laws, he could face jail time.

In March 1992, Heidsieck instituted the Leybold Charter, a set of principles controlling the export of its products and services. These principles underscored Leybold's commitment to the non-proliferation of nuclear weapons and nuclear-capable delivery systems. The charter institutionalized the policy that the goal of nonproliferation of nuclear weapons is more important than commercial interests. Even if a particular export is legal, Leybold is committed to not selling the item if the company knows or has reason to believe the item will be used for the development or production of nuclear weapons in sensitive countries. Some

of these countries, like India, Pakistan, and Israel, may not have signed the Nuclear Non-Proliferation Treaty. Other countries, such as Syria, Iran, Libya, and North Korea, are viewed as sensitive even if they have signed the treaty. Leybold's voluntary self-restraint was a marked difference from its previous policy of keeping one's head in the sand about the end user. It was also far beyond what most suppliers were doing at that time.

Many outside the company reacted skeptically to the charter, cynically interpreting it as part of a campaign to keep Leybold from being blacklisted by the United States. Heidsieck did in fact hire a well-known U.S. public relations firm, Burson-Marsteller, to work on improving Leybold's standing. He also did not hesitate to visit Washington, charter in hand, pleading for understanding. To back up his commitment, any shipments to a collection of sensitive countries, including Pakistan, North Korea, Iran, India, and Israel, were to be authorized by Heidsieck himself. He instructed his export manager, Bernhard Herkert, based in Hanau with Heidsieck, and Wirtz, then Herkert's assistant in Cologne, to send all enquiries from any of these countries to the German customs authorities. If they raised any suspicions about the end use of the item, Heidsieck would not permit the sale.

Herkert said in an interview in 1993 that in the past sensitive export matters rarely reached top management but that had "drastically changed."[4] By 1993, his office had dealt with about 3,500 export cases, and had turned down many orders that could not meet Leybold's strict policies. Company officials were required to know government export regulations and laws, and had to submit sensitive orders through a detailed company approval process that checked for possible misuse. His office required company personnel to obtain detailed information about the cus-

tomer and final purpose of the equipment. If they did not follow these procedures, they risked being fired. In one case, Heidsieck fired a salesman who sold spare parts to an Iranian steel factory against company policy.[5]

Preventing future sales to sensitive countries was only part of the problem. Heidsieck also had to address problems within Leybold. To fully change the export culture, Heidsieck was forced to fire or push out several employees, including a top corporate official, who were linked to the most questionable past sales. Given Germany's strong laws protecting employees, this proved a challenging task. Because many of the controversial sales were approved by former leaders of the company or heads of the sales division, several employees could not be fired for these sales. This meant that at least a few bad apples needed to remain—but who were these people?

In 1992, Leybold received a warning from the United States that a German trading company was buying a large number of Leybold items, likely for export to Pakistan or other sensitive countries. Wirtz investigated and discovered that the address matched that of the trading company owned by the wife of a senior employee. This employee was in charge of sales to a range of sensitive countries including Syria, Iran, Iraq, Israel, Pakistan, South Africa, Taiwan, and North Korea. He was familiar with members of the Khan network and its associated fronts, including Arshad, Amjad, and Abid, or Triple A, the Pakistani trading company and Leybold agent that fronted for Khan's enrichment program in the late 1970s and early 1980s.[6]

Senior Leybold officials speculated that this saleman was worried about his loss of sales and commissions following the reforms and had decided to use this trading company to buy items

directly from Leybold as a way to bypass the internal checks on end users. He would then route the items himself. In essence, a domestic company down the street from their headquarters was purchasing its own materials for a hidden Pakistani client.

This trading company had ordered from Leybold DM 750,000 worth of products. The employee was also suspected of selling Iran many items, some in quantities large enough to suggest their use in a centrifuge program. Wirtz took the information to Heidsieck, who wanted to fire this employee, but the offense of establishing a side business competing with Leybold was not serious enough to warrant dismissal under Germany's employment regulations. Cleverly, Leybold management offered this employee a lucrative termination package that led him to resign.

A few years later, in 1994, German authorities tipped off Leybold that its agent in Pakistan, the Industrial and Scientific Equipment Company (ISEC), could be selling to Pakistan's nuclear program. This information had come from the United States in the form of a non-paper, a diplomatic note stripped of official U.S. markings to hide its origin. According to the tip, ISEC was linked to Triple A, Leybold's original agent. An internal Leybold investigation discovered that Leybold-Heraeus middle managers had helped form ISEC secretly after Leybold's agent Triple A was exposed in the early 1980s as a key Khan buyer. The investigation uncovered that Leybold managers had formed ISEC, with Mohammed Azlam Sheikh as head, expressly to avoid the problems caused by Triple A's exposure.[7] The new Leybold management was unaware of ISEC's clandestine connections to Triple A and Pakistan's nuclear program. The old top management might have been likewise uninformed of ISEC's true role, since middle managers used to have considerable discretion to conduct their

sales. Nonetheless, Heidsieck remained suspicious that some of these former officials knew about ISEC or had looked the other way to gain more black market business.

One of the items found during the investigation was a 1989 memorandum written by a middle manager establishing that ISEC was in the same group of companies as Pakistan Air Conditioning and Refrigeration Corporation (PARC). The German government considered PARC a purchaser for Pakistan's nuclear program. This information established a clear link and as a result, Leybold fired ISEC as its agent in November 1994, mere days after it had received the initial tip from authorities.

Leybold's new policy created a virtual embargo on business with sensitive countries but Herkert quickly learned that tough restrictions were not enough to dissuade persistent clients, especially those desperate for spare parts essential for aging Leybold equipment. The same requests now filtered in from trading companies. For example, Herkert received an enquiry from a trading company in Bangkok, and later from one in Russia, for a near identical order that had been denied to India. Since the orders matched so closely, Leybold's new export tracking system could detect these attempted purchases.

With Leybold's tighter regulations and the general strengthening of controls over exports in the early 1990s, more customers went underground, developing a number of strategies to fool suppliers about an item's true end user. Some trading companies, like ISEC and Krisch Engineering, knowingly engaged in fronting for the real customer to hide the true buyer from the supplier and any prying authorities. Most trading companies, however, are engaged in legitimate business, acting as middlemen for a wide range of companies. Legitimate trading companies, which can

be located anywhere, pose difficult challenges to responsible suppliers. These companies mark up the price of the supplied goods and live off commissions from their clients. Out of fear of losing those commissions, trading companies usually hide the identity of their clients, complicating any attempt by the supplier to confirm the end user is not nefarious. Herkert, however, discovered that secret nuclear programs were using these legitimate trading companies to disguise themselves.

What if an enquiry came from a trading company, whether acting as a front company or an inadvertent middleman for a sensitive program, and Leybold had no information to challenge the sale? What could it do? In almost all cases, the company could legally export the item, even if it suspected that the item would then be illegally reexported to Pakistan or another sensitive country. To prohibit the sale, the company needed a governmental warning to not deal with a specific trading company or needed to obtain evidence that the export could be for a secret nuclear program. At the time, such warnings were infrequent and the ability of companies to develop evidence limited.

Heidsieck and his export control staff wanted to do more about the trading company loophole. Leybold instituted procedures that required trading companies, whether in Germany or in other countries, to provide evidence that the end user was not a sensitive nuclear program. If Leybold officials remained suspicious, it would not make the sale even if the export was technically legal. This unprecedented policy ran into fierce resistance from trading companies that insisted Leybold had no right under the law to ask for such information. After a careful explanation of its intent, Leybold won many converts, though not enough to plug this major loophole industry wide, which largely remains today.

Heidsieck's departure from Leybold in 1998, along with Leybold's sale to Oerlikon, raised concerns that its nonproliferation commitment would fade. Such was not the case. Wirtz continues to look for suspicious enquiries via his office's centralized data system where orders from sales agents around the world are checked against enquiries from other Leybold offices or sales agents.

As Oerlikon Leybold's export officials became more familiar with enquiries from sensitive countries, they noticed that increasingly the requested items were not on lists of nuclear dual-use items subject to the stricter licensing requirements of the newer laws. Instead of custom ordering vacuum pumps and valves manufactured specially for gas centrifuge plants and thus on the lists, sensitive programs ordered similar items from the Leybold catalog. The procurement specialists and scientists running these programs in Iran, Pakistan, or North Korea had learned that items on dual-use export control lists could be avoided by substituting another item from the catalog that was less capable than the listed item but still good enough for its intended purpose. Such items may need to be replaced more often, but the sacrifice is worth it if they're easier to obtain.

Starting in August 2002, right before Iran's Natanz site was revealed, Leybold received a series of enquiries from trading companies for large numbers of fast-acting valves suspected for use in P1 centrifuge cascades. These valves were not of the type found on lists of nuclear dual-use equipment that require a government-issued license to export.[8] Countries like Pakistan and Iran had learned that despite not being specifically designed to handle the highly corrosive uranium hexafluoride gas found in a gas centrifuge plant, these less-controlled valves

worked adequately, although perhaps not as long. They also realized that such purchases would attract far less scrutiny from suppliers and authorities.

The first order was from a German trading company which said the valves were destined for a petrochemical factory in the UAE. Leybold officials linked this company to Iran and did not make the sale. This enquiry was followed by one in October from another German company, which cited Iranian universities as the end users. The trial order of 3,000 valves and a total order of 50,000 valves was an unusually large number for a university. Other requests followed. The largest order was from a South Korean company in May 2003 seeking an annual quantity of 50,000 to 100,000 valves. The end user of this request was an Iranian nuclear power plant, another unusual customer for such a high number of valves.

Wirtz was convinced the orders were for the Natanz enrichment plant, which would need at least 150,000 valves for all the P1 centrifuges Iran planned to deploy. In September 2003, he brought the enquiries to the German government agency responsible for exports. This agency, after doing its own internal technical evaluation, confirmed Wirtz's hunch that these valves were suitable for use in a centrifuge plant and should not be approved for export to Iran.

Many sensitive programs have approached Oerlikon Leybold for vacuum pumps, but as in the case of the valves, they do not order vacuum pumps specially manufactured for a centrifuge plant.[9] The purchaser again avoids ordering explicitly controlled items by buying less controlled items from a company catalog. Advancements in vacuum pumps make it easier for customers in Iran and Pakistan to then transform standard vacuum pumps into those able to handle uranium hexafluoride.

In 2006, Indian Rare Earths (IRE), the Indian governmental entity that procures items for the gas centrifuge plant near Mysore, advertised among European suppliers its desire to buy several vacuum pumps. The IRE advertisement sought vacuum pumps able to handle corrosive gases but that would likely be used for the corrosive gas uranium hexafluoride inside centrifuges. As this modification does not meet the condition of being specially prepared for a centrifuge plant, these modified pumps would not be on the usual suspect orders list. Leybold ignored the advertisement. Subsequently the German government learned of this Indian sales request and ruled that such an export would not be allowed by any German company. Although the government agreed that the pumps are not explicitly controlled by any export control list, the purchaser is a well-known procurement agent for India's gas centrifuge plant that makes enriched uranium for military purposes.

As is standard practice among members of the Nuclear Suppliers Group (NSG), the German government shared its decision to deny exports of the pumps with other NSG members. This practice reduces the chance that the Indian government could make the purchase in another country. This case is an example where catch-all export controls are useful. They can work when a supplier learns of a nuclear end user or determines that the end use is more likely than not nuclear. This stands in sharp contrast to Leybold's condition not to make a sale if it merely suspects that the end user is nuclear. In most cases, however, suppliers cannot concretely establish the former condition without government assistance.

Leybold has noticed that trading companies engaged in unlawful procurement are aware that their enquiries will often be met with skepticism and that many will be ignored and unfulfilled.

As a result, the trading companies might send out enquiries for the same items to as many manufacturers and their sales agents as possible. These trading companies also try to exploit any lack of communication among a single manufacturer's sales agents by sending a barrage of enquiries to many of its sales agents within a short period of time, or all at once. Without Leybold's centralized export control office, its individual sales offices would be unaware of the identical enquiries sent by the same trading company to other sales offices.

This system was tested in late 2006. Leybold's export control office noticed a suspicious pattern of enquiries from trading companies. On one day, Leybold offices in France, the Netherlands, and the main office in Cologne received identical enquiries for vacuum pumps from a trading company in Rawalpindi, Pakistan. A few days later, Leybold's daughter company in Singapore received a similar enquiry from a Dubai trading company. The export control office suspected that the items were for use in Pakistan's gas centrifuge uranium enrichment program and ignored the enquiries. The same Dubai and Pakistani trading companies continued to seek items from Leybold in 2007 and 2008 for what was suspected to be Pakistan's nuclear weapons programs.

Leybold's export control office has over the years become deeply experienced in receiving and analyzing suspicious enquiries from the manufacturer's many subsidiaries and sales agents. It is now an entrenched part of Oerlikon Leybold, functioning as a "detection hub" aimed at finding and stopping potential procurement attempts. This system, however, is by no means foolproof, depending increasingly on help from friendly governments to detect suspicious enquiries.

In 2006, a South Korean manufacturing company wanted to

buy vacuum pumps. For many applications, including use in centrifuge plants, two or more vacuum pumps work in tandem, each achieving a portion of the desired vacuum. This order was for fifteen such systems. A friendly European government notified Leybold that the end user could be Iran's centrifuge program, so it ignored the enquiry. Yet as with the earlier valve orders, South Korea was a place where smugglers successfully sought items from European suppliers. The country had passed stringent export control laws and had become member of the elite Nuclear Suppliers Group. But according to an experienced U.S. government official, the South Korean government's export laws were poorly implemented at that time. He said that South Korea was "part of the gap," a weak link in the international system to thwart smuggling. South Korea is not alone. The number of turntable countries, or "countries of transit concern," remains high. Secret nuclear procurement efforts have also used trading companies in Singapore, the UAE, Malaysia, and Poland to disguise their orders. In some cases, they also use companies in countries with highly developed national export control systems, such as the United States.

China poses special challenges for a company like Leybold. A rapidly industrializing country, it has struggled to implement effective export controls. Following tips from a European intelligence agency, Leybold discovered a new strategy used by Iran to circumvent export controls, in this case a clever scheme to obtain vacuum pump systems for its centrifuge program. The elaborate ruse involved a Chinese manufacturing company, an "original equipment manufacturer," or OEM, that had an established relationship with Leybold.

After reviewing enquiries and contracts, Wirtz soon found

that the OEM had ordered fifteen such pump systems, seven of which the OEM had already received via Leybold's Chinese subsidiary. The OEM had ordered the pumps as part of a larger order it had received to build oil purification equipment for electrical power plants. The supplier did not need its government's approval to supply the pumps because the sale did not require a license and was not overtly suspicious. The OEM had not previously been associated with unlawful activities but after the discovery, Leybold immediately contacted them and asked for the end user of the equipment. The head of this OEM said that the vacuum equipment, including the pump systems, had already been exported to an overseas customer that he refused to name. Leybold stopped any further shipments of pumps. The OEM, after demanding the rest of the pumps or all its money back, cancelled the order, perhaps to prevent admitting that its customer was Iran, which ended up receiving the pumps.

While these types of diversionary procurements are more common, by exercising vigilance and cooperating with friendly governments, Leybold is in a strong position to inform authorities early about suspicious enquiries. With its key position in the international vacuum market, Leybold is a valuable lookout. Few, if any, governments have the accumulated knowledge of these commercial companies. Their assistance can be invaluable in detecting and thwarting smugglers. In the end, according to a U.S. Department of Energy official, "Export controls are a net, not a brick wall." Increasingly, dual-use items sought by sensitive countries can be caught only by invoking catch-all laws or restrictive company policies. The former are difficult to make work, leaving the latter as the most practical strategy.

Oerlikon Leybold provides us with a valuable lesson. Work-

ing alone, government and industry are each weakened in stopping the spread of dangerous technologies. Private industries, no matter how adept their internal compliance systems, cannot on their own prevent smuggling networks from eventually obtaining targeted goods without cooperation from their respective governments. Government loses valuable information and assistance if industry is not actively involved. With just a small fraction of companies in a potentially sensitive industry acting responsibly, like Oerlikon Leybold, industry could become an effective first line of defense against nuclear proliferation.