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## Ring Magnets for IR-1 Centrifuges

By David Albright

*In late 2011, Iran sought via a Chinese commercial web site enough ring magnets for 50,000 IR-1 centrifuges. This case highlights the importance of China as a smuggling platform for Iran's gas centrifuge programs. The Iranian company involved should be sanctioned globally.*

Iran depends on smuggling vital goods from abroad to outfit its gas centrifuge program. These efforts to acquire banned goods are persistent and well documented. Its smuggling techniques range from mundane to sophisticated. In almost all cases, this Iranian smuggling violates supplier country trade control laws or United Nations Security Council (UNSC) sanctions.

In recent years, as enforcement efforts have increased in many parts of the world, Iran has become more dependent on using China as a platform for smuggling many of its targeted goods. Iran exploits China's inadequate trade controls and weak UNSC sanctions enforcement to purchase these goods. It uses private Chinese front companies which provide suppliers with false end-user statements. In the case of high-tech goods, Iran seeks in China goods made in industrialized countries which these suppliers sell in the Chinese market. After acquiring the goods, smuggling networks arrange their shipment to Iran. In this type of smuggling operation, China is considered a transit or turntable country between the supplier and Iran. ISIS has published a number of studies about Iran's illicit procurement efforts in China.<sup>1</sup> Iran has sought vacuum pumps, high strength, lightweight materials such as maraging steel and carbon fiber, vacuum measuring equipment, leak detectors, and many others, all made by European, Japanese, and U.S. suppliers.

Iran also seeks to purchase a variety of less technically sophisticated goods that can be made reliably by domestic Chinese industries.<sup>2</sup> In line with such efforts, ISIS obtained an enquiry posted on a Chinese commercial web site in late 2011 that shows an effort by an Iranian company to buy 100,000 ring magnets. Technical analysis by ISIS and a European government showed that these ring magnets match those used in Iran's first generation IR-1 gas centrifuge. The ring magnets are magnetized, making them ready for use in IR-1 centrifuges. Since these ring magnets can be used in Iran's centrifuge program, their export to Iran is banned under U.N. Security Council resolutions that forbid the supply of goods usable in Iran's enrichment programs.

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<sup>1</sup> See ISIS illicit trade studies: <http://isis-online.org/studies/category/illicit-trade/>. For a discussion of China as a country of diversion concern, see Project on U.S. Middle East Nonproliferation Strategy, *U.S. Nonproliferation Strategy for the Changing Middle East*, January 2013, <http://isis-online.org/isis-reports/category/iran/#2012>, pp. 46-50.

<sup>2</sup> See, for example, the case of the Chinese company, Limmt, which procures for Iran both foreign and domestically produced goods: Andrea Stricker, "A Smuggler's Use of the U.S. Financial System to Receive Illegal Payments from Iran" (Washington, D.C.: Institute for Science and International Security, February 11, 2011 update). [http://isis-online.org/uploads/isis-reports/documents/Limmt\\_Li\\_Fang\\_Wei\\_23Oct2009\\_update9Feb2011.pdf](http://isis-online.org/uploads/isis-reports/documents/Limmt_Li_Fang_Wei_23Oct2009_update9Feb2011.pdf)

Each centrifuge uses two ring magnets (see figures 1 and 2). Thus, this attempted purchase is enough for 50,000 IR-1 centrifuges. Such a large order implies that Iran remains committed to building tens of thousands of this model of centrifuge, despite its parallel push to build advanced centrifuges such as the IR-2m. This two track approach can be seen in Iran's recent efforts to deploy thousands more IR-1 centrifuges at both the Natanz and Fordow enrichment plants and its recent announcement of its intention to deploy about 3,000 IR-2m centrifuges there as well.

ISIS could not determine if Iran found a supplier willing to provide the ring magnets. Follow-up by interested suppliers is not readily apparent on these commercial web sites.

## Enquiry

In late 2011, a M. Tahmouresi of the Iranian trading company Jahan Tech Rooyan Pars Co. in Shiraz sent an enquiry to a Chinese commercial web site, 51buyers.com, requesting 100,000 ferrite barium strontium ring magnets. The enquiry contained detailed specifications for the specific ring magnet. Figure 3 shows the enquiry, although the numbers have been redacted by ISIS because of concerns about it being sensitive centrifuge information. Figure 4 is a copy of the redacted enquiry where the Chinese has been translated.

The enquiry states that the magnets are for a "great factory" engaged in "new project." In fact, Jahan Tech Rooyan Pars is a relatively small trading company that seeks a range of goods and would not itself be running a large project, based on information from several internet websites.

On December 11, 2012, Canada imposed an asset freeze and a dealings prohibition on Jahan Tech Rooyan Pars Co. because of proliferation concerns. It was one of 98 companies sanctioned on that date by Canada. The specific reasons were not published. However, this company is known to have engaged in at least one other suspicious nuclear- or missile-related procurement.

Jahan Tech Rooyan Pars advertises that it handles composite, piezo ceramic, and high-tech materials. A Mohammad Tahmouresi is listed as owner. He has been on the company's board of directors since September 2008.<sup>3</sup> He has a Bachelor of Science in chemical engineering from Islamic Azad University, which he attended from 2003 to 2008.

From 2006 to 2007, Tahmouresi was a designer at the Iranian company Shiraz Kahroba, which lists as its main products: magnetic barium and strontium ferrite powder, rubber magnet granules, magnetic strip, and magnetic sheets.<sup>4</sup>

The enquiry appears to be an attempt by Tamouresi of Jahan Tech Rooyan Pars Co. to find a potential supplier or at least a middleman capable of supplying the desired quantity and quality of ring magnets. The web site 51buyers.com appears to be one of the larger internet portals where foreign buyers can meet potential suppliers. The enquiry provides few clues about Tamouresi's success in acquiring these magnets.

The enquiry mentions Ferrito Plastronics, a relatively small Indian company that appears to be offering its services in China.<sup>5</sup> This company is unlikely to have been capable of manufacturing such a large

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<sup>3</sup> See Tahmouresi's LinkedIn profile: <http://ir.linkedin.com/pub/mohammad-tahmouresi/36/a68/7a3>

<sup>4</sup> See website: <http://www.b2b77.com/Company/fw/03/ee92102.html>

<sup>5</sup> Ferrito Plastronics also offers its services elsewhere, such as on [www.indiamart.com](http://www.indiamart.com). It seems to be a rather small company based on the number of its employees and its annual turnover.

quantity of magnets. It is unclear from the enquiry if Ferrito Plastronics was responding to the enquiry or if Tamouresi was contacting this company.

Jahan Tech Rooyan Pars may be only one of several Iranian companies which tried to procure these ring magnets. For sensitive items, and confronted by greater counter-proliferation efforts, the Iranian centrifuge program may have contracted with more than one domestic trading company to buy the items abroad in order to increase the chance of successfully obtaining them.

A likely scenario is that several suppliers in different countries were contacted, via such “internet shopping malls,” and more promisingly, directly. Smaller companies like Ferrito Plastronics would likely have needed to procure the magnets from larger manufacturers.

## **Assessment of enquiry**

This type of ring magnet is made by compacting fine powder in a press and then sintering the compacted powder into a solid magnet. It is a relatively old style magnet, but the IR-1 and Iran’s advanced centrifuges are old European designs as well that depended on magnets available in the late 1960s and early 1970s. The IR-1 centrifuge is a copy of the P-1 centrifuge deployed in Pakistan that in turn was a 1970s Dutch design stolen by A.Q. Khan while he lived in the Netherlands at that time. The Iranian advanced centrifuge is derived from the P-2 centrifuge, which Khan also stole in the 1970s. It utilized an AlNiCo (aluminum, nickel, cobalt) ring magnet of different dimensions than those of the P-1 centrifuge.

Although magnet performance has advanced considerably since the days when these centrifuges were developed, Iran has few incentives to change to the most advanced magnets. Moreover, the procurement of older types of magnets, particularly those for the IR-1 centrifuge, tends to raise fewer alarms with authorities and responsible suppliers and thus may be easier for Iran to carry out illicitly. This enquiry is unusual in that it listed such a large number of magnets and contained surprising detail, which was bound to arouse the interest of governments interested in stopping Iran’s smuggling efforts for its nuclear programs.

The detail in the enquiry allows for a technical assessment of the magnets’ intended purpose. The European government and an ISIS centrifuge expert arrived at the same conclusion. Both concluded that the ring magnets were of the IR-1 type. The dimensions in the enquiry match almost exactly ring magnets of the IR-1 centrifuge. Moreover, the ring magnets would be ready for use in those centrifuges. The inside diameters and thickness are identical and the outer diameters differ by less than one half percent. The specifications in the dimensions are either identical or differ slightly. The orientation of the magnetic field is the same.

The assessments also concluded that it would be very difficult to use these ring magnets in an advanced Iranian centrifuge without a major redesign of the centrifuge. The P-2’s used the AlNiCo magnet which was thinner and had a larger inner radius, reflecting the larger diameter of the hole in the P-2 top cap.

In particular, the ISIS assessment reached the following conclusions:

- The specifications for the ferrite barium strontium ring magnets referred to in the enquiry appear to be a replacement for the Ferroxdur 360 (ferrite barium) sintered ring magnets used in the IR-1 centrifuge design.

- Some minor re-design would be necessary of the top end cap and top magnetic bearing of the IR-1 design but these are seen as fairly trivial.
- The ferrite barium strontium ring magnets could be used in a re-designed P-2 centrifuge or in a modified P-2 design (advanced Iranian centrifuges) in which the overall length, mass, and number of flexible elements (“bellows”) is not substantially different. However, this would lead to significant design changes which would result in new R&D proving trials, which would not have been an attractive prospect.

## **Conclusion**

This large potential order by Iran in late 2011 for 100,000 ring magnets ready for use in IR-1 centrifuges implies an Iranian intention to greatly expand its number of these centrifuges. Governments should take seriously efforts by Iran to continue expanding its IR-1 centrifuge program at the Natanz Fuel Enrichment Plant. As Iran starts to deploy IR-2m centrifuges at Natanz, they should not decrease their attention aimed at detecting, thwarting, and interdicting IR-1 related procurements.

Potential suppliers should be warned about Iran’s continued needs and attempts to procure older model ring magnets for the IR-1 centrifuge. Company vigilance is warranted in cases where obvious or potential Iranian illicit procurement efforts are seen on commercial websites. However, this enquiry may have represented but one piece of the procurement scheme. Diligent, responsible manufacturers should turn such enquiries over to authorities or seek to learn who is behind such requests.

China needs to do more to show that it is a responsible member of the global economy. In particular, it should crack down on the efforts of Iranian smuggling networks, as shown by the fact that this company appeared to feel comfortable in openly seeking illicit goods from Chinese companies through such websites. In addition, both the Indian and Chinese governments should warn companies that there is zero tolerance for any of their domestic companies entering into such transactions.

Canada has sanctioned Jahan Tech Rooyan Pars Co. Additional countries and the United Nations should sanction this company because of proliferation concerns. It also makes sense to add M. Tahmouresi to lists of sanctioned individuals.



Figure 1. IR-1 ring magnet. Source: ISIS

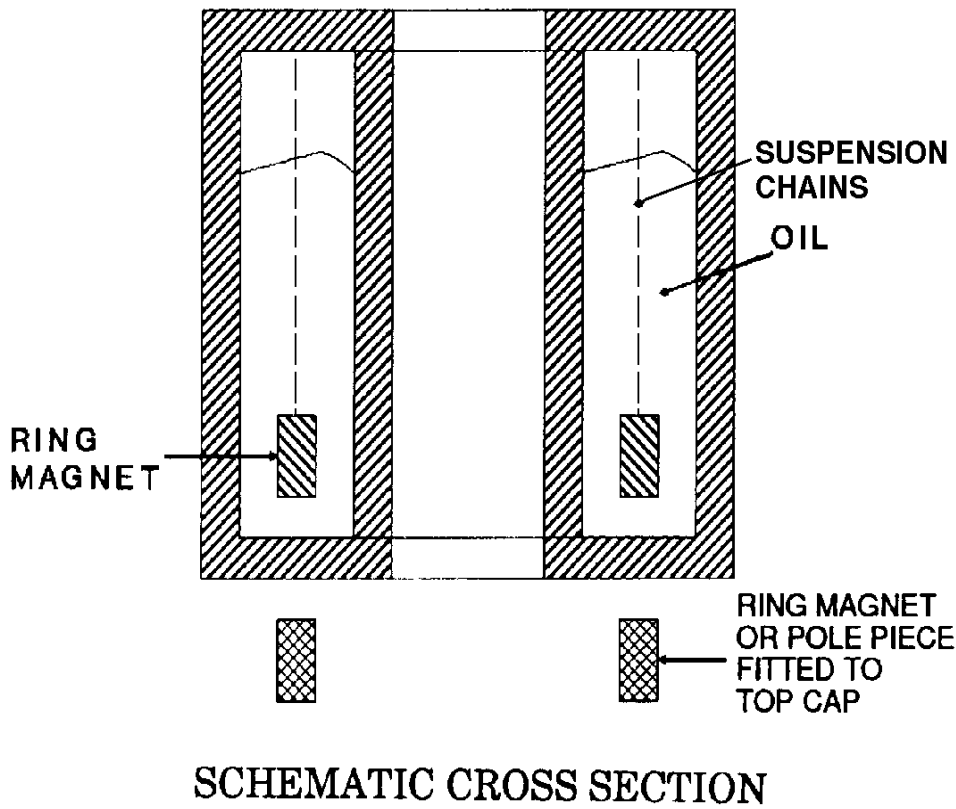


Figure 2. Schematic of top ring magnet in a gas centrifuge, showing the position of the two ring magnets.



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**Inquiry theme:** Buy Ferrito Plastronics

Dear Sir We are a great factory in south of Iran and for our new project we need 100.000 pcs Ferrite Barium strontium ring magnet. Our specifications are as following: Specification: Inner Diameter [redacted] Outer Diameter [redacted] Length [redacted] Perpendicularly [redacted] Magnetic off centering [redacted] Angle of fillet

**Inquiry content:** [redacted] Surface roughness [redacted] Hc Min [redacted] Br Min [redacted] BHmax Min [redacted] also I enclosed the drawing of this magnet. We would like buy from you company. We should be glad if you supply this magnet for us. Thank you in advanced and looking forward to hearing from you 500n. Best regards M.Tahmouresi International Communication Dep. Jahan Tech Rooyan Pars .Co Floor 9- C2 Tower- Science and Technology Park-sanye Square -Shiraz - Iran Zip Cod: 718-8843115 P.O. Box: 71955-893 Tel: [redacted] Fax: [redacted]

**Inquiry contact method:** Buyer's Contact Information Name: Tahmouresi Company: Jahan Tech Rooyan pars Country: Iran State: Fars City: Shiraz E-Ma [redacted]@ [redacted]ntech.com Phone: [redacted] Fax: [redacted]

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Figure 3. Translation of the Iranian order for ring magnets with redacted measurements.

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**询盘主题** Buy Ferrito Plastronics

**询盘内容** Dear Sir We are a great factory in south of Iran and for our new project we need 100.000 pcs Ferrite Barium Strontium ring magnet. Our specifications are as following: Specification: Inner Diameter [redacted] +0.1 Outer Diameter [redacted] +/- 0.008 Length [redacted] +0.25 Perpendicularly [redacted] Magnetic off centering [redacted] Angle of fillet [redacted] Surface roughness [redacted] Hc Min [redacted] Br Min [redacted] BHmax Min 3MGo also I enclosed the drawing of this magnet. We would like buy from you company. We should be glad if you supply this magnet for us. Thank you in advanced and looking forward to hearing from you soon. Best regards M.Tahmouresi International Communication Dep. Jahan Tech Rooyan Pars .Co Floor 9- C2 Tower-Science and Technology Park-sanye Square -Shiraz - Iran Zip Cod: 718-8843115 P.O.Box: 71955-893 Tel: [redacted] Fax: [redacted]

**询盘联系方式** Buyer's Contact Information Name: Tahmouresi Company: Jahan Tech Rooyan pars Country: Iran State: Fars City: Shiraz E-Ma [redacted]@ [redacted]ntech.com Phone: [redacted] Fax: [redacted] ?

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Figure 4. Copy of the original Iranian order request for ring magnets. Measurements have been redacted.