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Deadly Chips: How a Belarusian State Firm Bypasses Sanctions and Helps Russia Prolong Its War

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The launch of a missile from an Iskander M tactical missile system. **Russian Defense Ministry**

This article is an adapted version of an investigation by the Belarusian Investigative Center.

A Belarusian state-owned firm is supplying Russia with microchips needed to build rockets using Western equipment, components and raw materials in defiance of international sanctions, a new investigation by the Belarusian Investigative Center has revealed.

The Western sanctions imposed on Russia in response to its full-scale invasion of Ukraine were designed to cut off Moscow's access to the technology and materials needed to produce missiles and precision weapons.

At first, it seemed like they were working. In November 2022, Ukraine's then-Defense Minister Oleksii Reznikov said that the Kremlin had just 119 Iskander missiles left out of the 900 that it had at the start of the invasion. The number of other precision missiles had also

decreased.

Two years later, in December 2024, Andriy Yusov, a spokesman for Ukraine's GUR military intelligence service, said that Russia had increased its stockpile of missiles "critically dependent on foreign components" despite regularly shelling Ukraine. He said Russia was producing some 50 Iskanders a month and was also building up its stockpile of other types of missiles.

Why doesn't the rocket stockpile run out?

Following a meeting with Vladimir Putin in October 2022, Belarusian President Alexander Lukashenko said the Russian leader expressed a readiness to "pay any amount of money for a microelectronics product."

A year later, Ukrainian electronics and weapons expert Serhii Beskrestnov published photos of the Zarya-61M onboard computer module used in Russian missiles on his Telegram channel. This controlling device consists of four main printed circuit boards.

"Yes, everything is outdated. Yeah, it's huge. But alas, it is made entirely from Russian components. It is manufactured, it flies, it kills," he wrote.

The BIC examined the photographs published by Beskrestnov and found that not all of the electronics in the device were Russian-made. Some chips show a logo in the shape of a lightning bolt or the Cyrillic letter "И" — a trademark of Belarusian state-owned company Integral.

An anonymous Ukrainian serviceman who runs a YouTube channel that examines rocket electronics confirmed the use of Integral microchips in Russian weapons. On his YouTube channel, the serviceman shows these components in the R-37, Kh-59M2A, S-300, Kh-101 and Iskander rockets.

The Ukrainian serviceman told the BIC that half of the chips in the latter two missiles were produced by Integral. As you can see in the photos, some were released in 2023.

Ukraine's SBU security service also confirmed to the BIC that components manufactured by Integral are used in Russian missiles.

This means that Russia can continue to fire missiles at Ukraine, thanks in part to supplies from Belarus. In total, Integral shipped more than 6 million microchips worth more than $130 million to Russia between March 2022 and June 2024, according to customs data available to the BIC. By comparison, the total value of Belarusian microchip deliveries to Russia during this period was just over $165 million. That is, Integral provided 80% of them.

Since the full-scale invasion of Ukraine, Integral's revenues have soared. In 2023, the company's net profit was more than 11 times higher than in 2022 — almost 150 million Belarusian rubles (about $50 million). That is 40 times Integral's 2021 earnings. Data for 2024 was not yet publicly available at the time of publication.

Customers from the Russian military-industrial complex

The BIC analyzed Integral's customers from March 2022 to July 2024 and found that Smolensk-based Integral-Zapad was the largest Russian buyer of its microchips during this period, purchasing $31.3 million worth of products. The company has no direct links with Belarusian Integral, but it is owned by a Belarusian citizen. The company's website reported cooperating with the Russian Defense Ministry until July 2022. The website was undergoing a redesign at the time of publishing this investigation.

The second-largest purchaser was Russia's Spets-Elektronkomplekt, which bought $30 million worth of microchips from Integral. The company's website does not provide information on defense industry links. However, the company's partner, the major Russian microchip manufacturer Angstrem, says on its website that Spets-Elektronkomplekt was certified by the Defense Ministry in 1998 and received Leader-Follower Certificate No. 1 (an official recognition as a reliable supplier to the military-industrial complex).

Integral Spb, the St. Petersburg-based subsidiary of the Belarusian company Integral, is another major buyer, purchasing $16.8 million worth of chips. Its CEO Vladimir Lazovsky has openly stated that the Russian military-industrial complex is one of its main customers. In 2021, the company received a certificate of conformity from the Oboronsertifika system. It was targeted by EU sanctions following the full-scale invasion of Ukraine.

In addition to the above, Integral supplied products to Russian companies Innovatsionnye Tekhnologii, which purchased $16.7 million of microchips, Don, which purchased $9.5 million of products, and Radiant-EK, which purchased $5.3 million of microchips. These companies are also linked to the Russian defense industry.

Western equipment

Belarusian and Russian state TV reports in 2024 detail how Integral uses Western equipment. The footage includes German-made Carl Zeiss Axiotron microscopes for chip quality control, Swiss VAT Vakuumventile valves and British Edwards vacuum systems for maintaining sterility in production processes.

Also on display are DISCO Corporation's Japanese slicers for micron precision wafer separation and HORIBA's material analysis equipment. U.S.-made Cascade Microtech's (FormFactor) test systems, which can be used to check the performance of microchips before they are assembled, are also demonstrated.

Integral's official catalogue states that it makes products using Western equipment. The operation of this equipment is dependent on a constant supply of Western raw materials and components, without which its use is impossible. Sanctions prohibit the sale of Western raw materials and components to Belarus.

The importance of these components is confirmed by data from the internal correspondence of Roselektronika, part of the Russian state corporation Rostec, Russia's largest arms manufacturer:

“In the current political and economic environment, the main suppliers of third-party components, such as AO Girikond, AO NZPP Vostok, and AO Elekond, have increased the delivery time to 540 days, which is 150% of the performance time of the supply contract for products to be delivered to AO SKTB RT. Also, suppliers of active components, such as AO Gruppa Kremniy-EL, AO Angstrem, AO VZPP-S, OAO Integral, which depend on the supply of imported materials and chemicals, find it difficult to guarantee the fulfillment of deliveries to AO SKTB RT,” reads the document, which we obtained thanks to the Organized Crime and Corruption Reporting Project (OCCRP).

However, despite EU and U.S. sanctions restricting the supply of strategic dual-use materials and equipment to Belarus, Integral continues to receive necessary components and raw materials from EU countries.

Hydrochloric acid for Integral

One of the critical materials for Integral is high-purity hydrochloric acid, also known as hydrogen chloride.

Hydrochloric acid is used to treat semiconductor wafers. This process ensures perfect cleanliness and smoothness. These are key parameters for the deposition of complex chip structures. Even the smallest amount of contamination on the wafers can lead to defects and reduced product quality.

In 2021, hydrochloric acid with a purity of 99.999% was supplied to Integral by the German company UrSeCo Handels.

But a new delivery scheme emerged in 2022, when sanctions banned the chemical from entering Russia. The supplies passed through Poland and Turkey to Kazakhstan before reaching Belarus. A local company, United Trading Group, is the recipient of the acid in Kazakhstan. Behind the big name is a company with just one employee. It was founded a few weeks after the outbreak of the full-scale war. It supplied Russia, particularly Siltron and Elektrosnab, with the same high-purity acid.

These two companies delivered acid with the same characteristics to Belarus. In the case of deliveries from Elektrosnab to Integral, the place of manufacture is specified as being in Germany.

Coincidences in the dates and volumes of successive sanction-evading shipments from Germany to Russia along the chain we have described may indicate that the same German acid was coming from Germany to Russia.

In particular, on June 9, 2022, Germany’s UrSeCo Handels delivered 860 kilograms of high-purity hydrochloric acid produced by Germany’s Wacker Chemie to Kazakhstan’s United Trading Group. The same month, United Trading Group delivered a consignment of the same Germany-made substance of precisely the same weight to the Russian company Elektrosnab. Elektrosnab supplied German acid to Integral until the end of 2023.

In July 2024, the EU imposed sanctions banning the supply of German acid not only to Russia, through which it had been supplied to Integral since the full-scale invasion, but also to

Belarus. The Russian company Siltron, founded less than three months after the invasion of Ukraine, also started delivering this chemical to the company. In September 2024, the company sold it directly to Integral. In July of that year, an intermediary was used — the Belarusian firm Digna-NTR.

United Trading Group is officially listed as the acid producer in the deliveries from Kazakhstan's company to Siltron. But this is hardly the truth.

Firstly, according to the official register of business entities in Kazakhstan, the company has only one employee (in the register, it is classified as "micro-entrepreneurship").

Secondly, this micro-enterprise's activities only consist of wholesale trade, not production. We also found no information that hydrochloric acid with a purity of 99.999% is produced in Kazakhstan. In September 2023, the Kazakh government adopted a decree stating that the only hydrochloric acid producer in the country is JSC Kaustik. The maximum available purity of the substance at that time was 35%. Since then, there have been no reports of new production meeting the parameters.

Finally, some shipments of alleged Kazakh acid from Siltron to Belarus were marked with the brand name SEMICOSIL HLC 5.5. Wacker Chemie, a German concern, owns this trademark. Integral's documents relating to the acid purchase from Digna-NTR, which received the chemical from Siltron, list Germany as the place of acid production.

In July 2024, Siltron delivered two batches of acid to Digna-NTR: one of 150 kilograms and the other of 100 kilograms. In both shipments, Kazakhstan was indicated as the country of origin. At the same time, the substance brand was German SEMICOSIL HLC 5.5. Digna-NTR, in turn, delivered the same amount to Integral. [*]

Russia's Siltron is directly linked with UrSeCo Handels, an acid supplier from Germany. Both companies are owned by members of the same family. The managing director and 45% owner of the German company UrSeCo Handels is Alexander Andreyevich Zhdanov. In November 2023, a person with the same surname — Alexander Alexandrovich Zhdanov — provided a loan to the Russian company Siltron. On Jan. 13, 2025, he also became the owner of 90% of this company, according to the Russian database of companies and entrepreneurs SPARK.

As the BIC discovered, Alexander Andreyevich and Alexander Alexandrovich Zhdanov are probably father and son. The Russian passport database shows they are from the same family. [*] [*] [*]

Workarounds

Hydrochloric acid is one of many examples of how Integral continues to purchase banned Western equipment, spare parts and materials to circumvent sanctions. Among the materials and technologies critical to Integral are MWM 2032 gas engines and spare parts. These German motors ensure a stable power supply for production processes. Intermediary companies help the company circumvent the export ban to Belarus and Russia introduced in 2022.

For instance, in the spring of 2024, the company purchased spare parts for these engines five

times through the Belarus-based companies Motory i Transmissiya, Promelcom and Imperiya Zapad. In addition, on Dec. 20, 2024, Integral placed a new tender for the purchase of parts and spare parts for MWM engines for $300,000.

Integral's suppliers confirmed the use of schemes to circumvent the sanctions when contacted by BIC journalists posing as potential customers.

“Sanctions are a non-issue," said Illia Barouski, deputy head of Imperiya Zapad. He said they also have "their own company in Poland, which facilitates the purchase of goods, and these goods are then sent from Poland to Belarus, Russia, and other countries, initially imported from Poland."

Promelcom founder Evgenii Kazakov said that sanctions circumvention schemes ensure prompt delivery of products: “In terms of, we will bring it quickly — within a week or two. We have already established this. It should say 'through Kyrgyzstan.' But it’s us who delivers. So, it will be quick."

Gaps in sanctions

Another example of sanctions circumvention that BIC journalists discovered was the purchase of mini-electric motors manufactured by the German company Faulhaber Group. In May 2024, Integral purchased 44 such devices from the Chinese company Hebei Nanuo Alloy Material Co.

Supplies of Western components allow Russia and Belarus to learn how to reproduce them, which could be dangerous, Ukrainian aviation expert Anatolii Khrapchynskyi told the BIC.

“There is a concept called re-engineering. This is when they copy some Western element: they take it apart, grind it down layer by layer, study how it works and can reproduce it,” Khrapchynskyi said.

For some of these components, there is no need for this. Among Integral's purchases, BIC found Western components that are not included in the U.S. and EU sanctions lists. These include argon-ion lasers, polishing slurries, polishing wheels and parts used in the production of semiconductors and microelectronics.

And although Integral's main enterprise is sanctioned by the U.S., the EU has not added it to its list of restrictions.

BIC sent a request to the European Commission and relevant regulators asking them to explain the discrepancies in the sanctions policy against Integral and its suppliers.

“Russia and Belarus are constantly seeking ways in which to procure key products for Russia's war in Ukraine in violation of sanctions,” Tom Keatinge, director of the Center for Finance and Security at the U.K.-based Royal United Services Institute (RUSI), told the BIC.

“This inevitably means that countries that border Russia — particularly those that are members of the Eurasian Economic Area — will be involved in this evasion activity. ... Ukraine's allies need to be tougher in the use of the powers they have to 'name-and-shame'

and sanction those companies (or even whole countries) that allow circumvention to occur. There has been a lot of diplomatic dialogue, but at some point the talking needs to be backed up by action," he said.

The BIC sent requests for comment to Integral and all participants in the supply chain — Digna-NTR, Wacker Chemie, Elektrosnab, Siltron, United Trading Group, and UrSeCo Handels — about the sanctions violations discovered by this investigation. At the time of publication, we had not received any responses.

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