



Morion

CASE STUDY 3

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Morion final crystal quality testing facility. Equipment banks contain crystals being subjected to continuous tests to weed out substandard performers.

INTRODUCTION

Morion is a St. Petersburg, Russia–based developer and manufacturer of high-end quartz frequency-control devices. These devices provide the precise time and frequency on which modern electronics depends. Applications range from watches and cell phones to navigation (GPS) and space and satellite technology. Morion’s customers include the International Space Station, Nokia, Motorola, and Alcatel.

Quadriga Capital, a private equity fund in which IFC has invested, invested in Morion in 2000 along with the EBRD. Morion remains privately held, and detailed financial data were not disclosed.

This sustainable business case study focuses on Morion’s successful efforts to improve operational efficiencies and profitability by reducing energy consumption and reducing water consumption and wastewater generation.

BACKGROUND

Morion means black quartz in Russian, and the conversion of synthetic quartz crystals into extremely precise oscillators is Morion’s business. Vibrating quartz crystals are the heart of nearly all frequency-control devices, which provide the basis for electronic clocks and the control of electromagnetic waves in virtually all modern electronic products. The use of quartz crystals began with military applications in the late 1930s and has expanded

TABLE 1.
MAJOR APPLICATIONS OF QUARTZ CRYSTALS

Military and Aerospace	Research and Metrology	Industrial	Consumer	Automotive
Communications	Atomic clocks	Communications	Watches and clocks	Engine control
Navigation	Instruments	Telecommunications	Cellular and cordless phones	Car stereo
GPS	Astronomy and geodesy	Mobile/cellular/portable radios, telephones and pager	Pagers	Clock
IFF	Space tracking	GPS	Radios	Trip computer
Radar	Celestial navigation	Aviation	Stereos	GPS
Sensors	GPS	Marine navigation	Color TV	
Guidance systems		Instrumentation	Cable TV systems	
Fuses		Computers	Home computers	
Electronic warfare		Digital systems	VCRs and video cameras	
Sonar buoys		CRT displays	CB and amateur radio	
		Disk drives	Toys and games	
		Modems	Pacemakers	
		Tagging/identification	GPS	
		Utilities		

to virtually all modern electronic technology (see table 1.)

Morion traces its history back to the establishment of the Siemens and Halske telegraph company in St. Petersburg in 1855. The company subsequently became involved in the early days of the quartz frequency-control business in the 1930s. In 1994, after the company had been state-owned for 70 years, Dr. Yakov Vorokhovskiy, head of the research and development department, initiated a management-led buyout and conversion of the company into a private joint stock company.

Dr. Vorokhovskiy soon began to reinvent the company. In 1990, the company had 1,500 employees and sales of US\$1.7 million. The staff was bloated, as in most Soviet-era state-owned enterprises, and the staff was gradually cut, but Dr. Vorokhovskiy

and the management team endeavored to retain the best employees and improve company morale. The process was not as difficult as it might have been in other settings, because as a state-owned company, salaries were very low and payment irregular. In the end, the workforce was reduced to 500, but average salaries increased from US\$17/month to US\$500/month. Dr. Vorokhovskiy implemented a number of other initiatives to make Morion a desirable place to work, including cleaning up and modernizing the bathrooms and bringing in an outside contractor to operate a cafeteria for the workers.

Morion has experienced steady growth since privatization. Sales were US\$2.4 million in 1997 and were projected to be US\$15 million in 2005. The company has continually improved its internal quality control and production

efficiencies, and this has helped it overcome the former market perception that Russian companies were incapable of providing consistent quality and on-time delivery. As a result, the company has both penetrated and in recent years increased its share of the international supply chain to the cellular telephone market and space industry and plans to continue to penetrate these markets and develop new ones.

ROLE OF THE QUADRIGA CAPITAL FUND

In the Soviet era the emphasis was on production versus efficient use of resources, as the state controlled

prices, and market forces were irrelevant. Heating costs, substantial given the long and cold winters, were paid by the state, and conservation measures such as insulation, double-glazed windows, etc. were not considered. Morion's building, a sprawling, multistory labyrinth typical of Soviet-era architecture, was quite inefficient in all aspects of building services, including winterization measures, heating and cooling, and boiler efficiency.

Quadriga was very familiar with the state of affairs in former Soviet enterprises, and specifically aware of how these costs impacted Morion's financial situation. The initial environmental due diligence screening of Morion had identified that the company was paying an annual US\$50,000 charge for raw water and wastewater discharged (in the Russian system, only the incoming raw water is metered, and wastewater volume is calculated on the basis of raw water consumption).

Given the company's tenuous financial condition in the early years of Quadriga's involvement, the \$50,000 charge was significant. While aware of these opportunities, Morion was focused on survival and did not have the time or capital to invest in developing solutions. Quadriga urged Morion to pursue remedies and agreed to finance the necessary investments. This led to the three programs described herein being implemented and the development of a corporate culture focused on optimizing manufacturing performance and reducing waste and pollution. To ensure success, Morion hired Sergei Olhovsky, a civil engineer, whose sole role would be to manage the development and implementation of the program. Mr. Olhovsky has been creative in his approach, using abandoned equipment in one application to save capital costs.

In addition, broader sustainability and technical demands were pushed down the supply chain by the multinational firms considering purchase of Morion

products. For example, Nokia, which has subsequently become a major purchaser of Morion products, had stringent material requirements for suppliers, including a prohibition on the presence of lead and cadmium in soldering of circuits. Nokia would not agree to purchase Morion's products until these standards were met, resulting in adoption of these standards for all its products.

Second, Nokia also required that Morion be ISO 14001 certified, which the company subsequently achieved. Morion would likely have had a very difficult time achieving these higher performance standards without Quadriga's financial support.

Last, achievement of these international standards has allowed Morion to access other international markets where these same standards are applied.

Hence, Quadriga was able to significantly influence Morion's environmental sustainability, which has contributed to the company's overall financial sustainability.



Dr. Vorokhovsky in a Morion control room.

THE MORION SUSTAINABILITY STORY

This case describes three Morion programs that have enhanced the company's sustainability and profitability, or triple bottom line:

- Measures implemented to reduce natural gas consumption
- Measures implemented to reduce water consumption
- Measures implemented to reduce electricity consumption.

These measures are described below, preceded by a description of the context for the measures.

Natural Gas Use Reduction

Morion began its program for reducing natural gas consumption in 2000. The first and most significant measure was to redesign and retrofit the boiler to make it more efficient. Morion was able to realize considerable cost savings in this project by obtaining an abandoned boiler from another plant, rehabilitating it, and using it to replace the previous boiler, which was oversized and inefficient.

In addition, as Morion's primary use of water is for cooling production machinery, hot water was recycled from the cooling line back into the boiler feed stream to take advantage of the already elevated temperatures. The total investment was approximately US\$5,000, and the investment was paid back within six months.

In Year 2 (2001) Morion focused on improving the thermal efficiency of its building. The major effort, and cost, was installing double-glazed windows throughout the building. The company also improved the seals around the doors and cut off other leaks to the outside, generally improving the building's performance.

In Year 3 (2002), Morion made a series of additional incremental improvements to the heating system to improve performance.

The net result is that Morion has reduced absolute gas consumption by more than 55 percent, from approximately 700,000 m³/year to approximately 300,000 m³/year. The reduction versus an output metric (e.g., versus

FIGURE 1.
NATURAL GAS CONSUMPTION AT MORION, 2000-2004

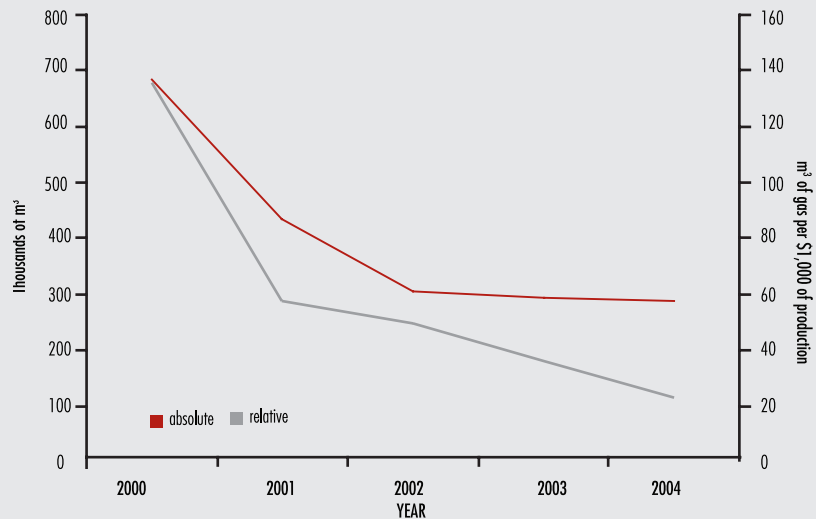
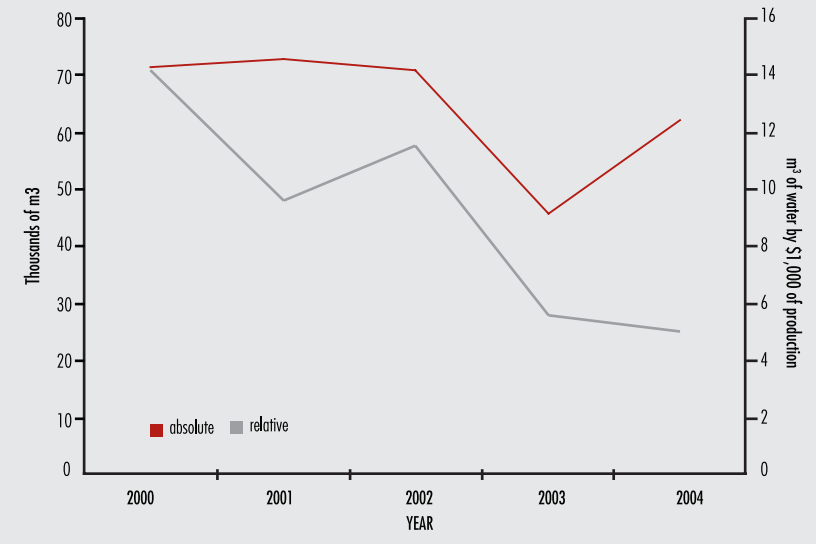


FIGURE 2.
WATER CONSUMPTION AT MORION, 2000-2004



each \$1,000 of production) is even more impressive (see figure 1). Morion has reduced gas consumption from approximately 140 m³/\$1,000 of production to 22 m³/\$1,000 of product, or approximately 85 percent.

Water Use Reduction

In 2000, Morion implemented a parallel program to reduce water consumption.

Morion obtains water from the municipality of St. Petersburg. Enterprises are

charged Ruble 22/m³ (approximately US\$0.78/m³), and the charge covers both water and wastewater, though only the incoming fresh water is metered.

Morion used to discharge all its heated water. As part of the gas reduction program described above, Morion now recycles the hot water, thereby saving both energy and raw water costs. In addition, Morion purchased a system of electrical coolers that allows them to recycle water used for cooling multiple times.

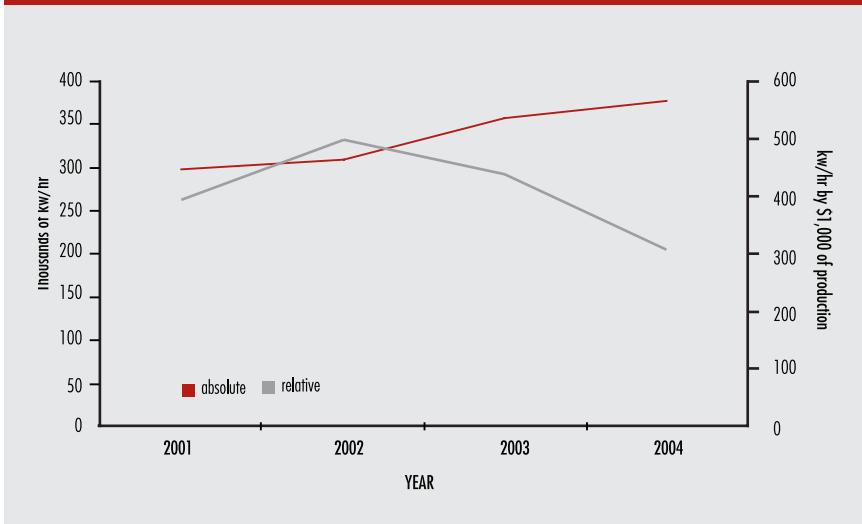
Absolute consumption of water decreased approximately 10 percent from 2000 to 2004, from over 70,000 m³/year to approximately 63,000 m³/year. In terms of product output in dollars, Morion reduced consumption in that period by approximately 65 percent, from 14 m³/\$1,000 of production to 5 m³/\$1,000 of product (see figure 2).

Electricity Use Reduction

Morion began its program to reduce electricity use in 2001. There were four primary programs under this initiative:¹

- Replacement of older equipment with more modern and efficient equipment
- Replacement of boiling/evaporation unit for distilled water with a reverse osmosis unit
- Monitoring of consumption to determine use patterns and processes with heaviest usage to then reexamine for possible efficiency improvement
- Parallel improvement programs throughout the plant to improve production quality, one of which

FIGURE 3.
ELECTRICITY CONSUMPTION AT MORION, 2000–2004



was installing an air conditioning system to improve “clean room” standards and working conditions for staff.

As shown in figure 3, Morion’s net consumption of electricity from 2001 to 2004 actually increased by 150,000 kW/hr with increased production, but consumption relative to production decreased from 380 kW/hr to approximately 300 kW/hr per US\$1,000 of production, a 21-percent decrease in electricity consumption per US\$1,000 of product.

CONCLUSION

Morion’s investments in energy and water efficiency have reduced its production costs, improved working conditions and worker productivity, and allowed the company to meet

environmental supply chain requirements. Further, the investments helped Morion overcome a major negative market perception: that Russian companies utilize dated technology and are incapable of meeting stringent Western quality standards and on-time delivery of products. Morion’s efforts to reinvent the company and optimize its production efficiency and consumption of resources are helping it overcome this stigma as well as contributing directly to the triple bottom line.

All of the investments made have had rapid payback, with the longest payback being the reverse osmosis system (14-month payback), and the shortest being the boiler upgrade, which had a 6-month payback.

1. This initiative was financed by an EBRD credit for modernizing production, and Quadriga managed the process.