

CASE STUDY

State-of-the-Art SMT Manufacturing in Russia

In recent years, many positive trends have been observed in the Russian SMT market, the most prominent one being the introduction of new automation tools that increase the speed of production, raise the product quality, and reduce the final costs. Today, there are many companies in Russia that are highly competitive in terms of quality and manufacturing speed successfully producing electronic products that are affordable. In this article, Panasonic Factory Solutions would like to illustrate one of such striking examples, ScPA StarLine digitalization of which exceeds 90%.

“Turnkey” manufacturing of finished product

Since 1988, StarLine has been developing and producing automotive security

and telematic equipment. The unique and complex engineering solutions that are implemented in StarLine product portfolio must reliably protect vehicles from theft. This means that these security systems must be of top quality. In this regard, in 2014, the company launched its own production of radio-electronic products, followed by the production of plastic products and cable products. Production is carried out on automated and robotic lines from the leading industrial equipment manufacturers from Japan and Europe. There is hardly a comparable production site with similar equipment in Russia today.

StarLine production plant is located near St. Petersburg. It spreads over an area of 75,000 m². Most of the production processes are fully automated. Human participation in the serial production of products

is minimal. Maximum automation and the use of the latest technologies ensure 100% quality control of products at every stage of the manufacturing process as well as a high level of productivity. This allows the company to both produce its own products and provide EMS services.

Another unique EMS service feature of StarLine is its sophistication in integrating all stages of production at one place. For example, you need to produce a finished product. At StarLine, all stages - from idea to finished product - are carried out in one place. Customers can immediately order the electronic “filling”, and the plastic case, and a set of cables for the product, as well as testing and packaging of the finished product.

StarLine facilities allow for the production of high-quality electronic devices of





any complexity without restrictions on the component base. Even very complex customer projects can be implemented there.

As a Russian idiom states, “it is better to see once than to hear a hundred times”, StarLine offers virtual tours through the production site.

There are regular excursions for partners, schools, universities, and everyone interested in advanced technologies. Customers can visit production and personally see the process of manufacturing products for audit purposes. The company’s philosophy is complete transparency for its partners.

Everything’s under control

Production lines, carts, storage areas, employees’ workplaces - everything has a strict organization and order according to the 5S system. StarLine production is certified by the international E1 certificate (TUV SUD, Germany), technological processes comply with ISO 9001: 2015 and GOST R ISO 9001:2015.

StarLine SMT production is based on four automated lines for mounting SMT

components on printed circuit boards, as well as three lines for selective soldering for THT components.

The heart of all these lines is Panasonic NPM-W2 machines. In total, StarLine production is equipped with 15 NPM-W2 machines. This comprehensive setup allows the installation of up to 30,000,000 electronic components per day.

After the blank boards are loaded onto the line, they start at the laser marking stage. Here, a QR code is applied to each board. What for? For complete traceability of the product at every stage of production. Each board is assigned an individual «name». From this moment on, all operations that will occur with it will be recorded by the PanaCIM software solution. Moreover, all electronic components that come to the warehouse from suppliers are also marked and entered into the PanaCIM databases. Therefore, if a defective batch is found, it is easy to find and to withdraw from production.

In the meantime, the future product has already gone on the conveyor belt, because all processes on the line take

just some seconds or even fractions of seconds. The next step is to remove the smallest dirt from the board using an adhesive system. After that, a Panasonic SPG stencil printer applies the solder paste to the board with an accuracy of 20 microns. The composition of the paste can be of different types, depending on the required technology. And again, the PanaCIM system helps to check if the correct paste or stencil was installed by the operator. The high-speed printing process with Panasonic SPG machines takes less than 20 seconds, and the system of automatic dispensing of paste on a stencil allows a significant reduction of the operator’s work time.

Once this process is complete, a 3D Solder paste inspection is used to check the solder paste pad on each board. Only a board that has passed 100% quality control is sent further along the conveyor.

If the boards are planned to be used in an aggressive environment, they are additionally covered with a special protective coating. For example, such a coating is applied to the boards of StarLine security

equipment, which has to withstand temperature drops, condensation, and humidity in the engine compartment of a car.

Surface mount with deep approach

Having successfully passed the 3D inspection, the product enters the “heart” of the production line - the SMD-mounter. All components come in reels. They are assigned a unique code and then entered into the PanaCIM database,



which allows tracking of the products and components. Each operator has a wireless PDA scanner that scans the code on the reel and the code on the feeder. The Panasonic NPM machine detects the component. If the component is wrong, it reports an error. So possible human factor is excluded as much as possible.

The Panasonic NPM-W2 high-performance machines assemble the SMD components. Surface mounting is carried out with an accuracy of 20 microns. Moreover, the size of such components can range from 0.4mm × 0.2mm to 120mm × 120mm.

Three Panasonic NPM-W2 machines are installed in each SMT line. Two of them are “chip shooters,” which mount small, lightweight chip components: resistors, capacitors, and others. There are always more chip components on the board, so more machines are also used for them. Each machine has two mounting heads with 16 nozzles. The third

machine is multifunctional - it also has two heads, but one with three and on the other eight nozzles - for mounting huge IC and large, heavy components. The machines are programmed remotely (outside the line) so that the line does not stand idle. Special Panasonic DGS software allows you to optimize the assembly process so that all machines run simultaneously. This increases the productivity of each SMT line to 280,000 components per hour.

Automated THT assembly lines allow mounting of components such as connectors and relays and then selectively soldered under nitrogen. These lines are equipped with the same Panasonic NPM-W2 machines but with special options for mounting THT components. For example, special feeders or cameras particular for recognition of the THT lead.

The factory production is equipped with an X-ray machine, which checks the quality of the solder joints. The testing of the electrical circuits of the board is carried out by an ICT testing system with “flying probes” technology.

At the functional testing site, products undergo 100% functional quality control. The board is placed on a special stand, the test software is “uploaded” and then its work is checked. This process is also carried out by production staff in a semi-automatic mode. The approved products finally enter the technical control department. Here, the products are

visually checked by the production staff once again - the QR code of the product is scanned, whether or not there were any defects during the production is clarified and the specialists check if the defects were eliminated. Only after that, the product goes to the warehouse.

All automated processes are managed by the PanaCIM MES system. StarLine became the first enterprise in Russia to start using it. The system made it possible to eliminate the so-called human factor and the transformation of the entire paper document flow to electronic. It meets all the requirements of modern production: full traceability, an automated engineering preparation process for production, acquisition, and automated accounting of material consumption.

The symbiosis of humans and robots

Today, we often hear skeptical statements that digitalization and Industry 4.0 are leading to an increase in unemployment. However, at StarLine, people are one of the company’s most important assets. Simply, with the advent of new technologies, specialists retrain and acquire new knowledge and competencies.

It would seem that the automation of production requires significant investments and building up competencies on the part of the manufacturing company. Is it all worth the cost? StarLine experts debunk this prejudice: it’s worth it. At a digital enterprise, the product manufacturing process becomes completely manageable and transparent at all stages, a single information space is created in which high-tech equipment and management IT systems are constantly exchanging data. This allows to increase the volume of manufactured products, gradually control the quality of production, and also influence the final cost of the product.

Thanks to all these factors, the concept of the fourth industrial revolution (“Industry 4.0”) becomes more and more popular every year in the leading countries of the world. Meanwhile, Russian manufacturers today already have technologies, resources, and competencies that allow them to proudly say: “Made in Russia”. 