



[Real-life] Case Brochure

ELITE ROBOT, Expert of Collaborative Robots

**ELITE
COLLABORATIVE
ROBOT**

Social Media



Official Website



www.elite-robotics.com

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Statements

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ALWAYS EASIER THAN BEFORE

The founding team of ELITE Robot comes from the Robotics Institute of Beihang University and is thus born with the ability of research and development. Taught by Professor Wang Tianmiao, director of the Robotics Institute of Beihang University and chief scientist of China's National Robotics Project, the founding team developed China's first lathe control system and robot controller in 2003 and 2009, respectively.

Up until now, after nearly 17 years of accumulation in the field of robot control technology, ELITE Robot has completed the R&D and iterations of all categories of products in the field of industrial robots and eventually concentrated on the track of collaborative robots (cobots). Within 3 years, we completed the production and layout of the whole series of cobot products, which include 6-axis cobots with 12kg, 6kg, 3kg payloads, and accompanying software and hardware products.

Application cases cover 6 industries, including 3C electronics, automotive parts, metal processing, packaging and logistics, household appliances and daily chemical products, and new consumption. Application scenarios include material handling, vision detection, screw tightening, stacking and unstacking, gluing, polishing, assembly, automated guided vehicle (AGV) composite applications, and so on.

In July 2019, we officially adopted the logic of benchmarking our products against international head manufacturers of cobots, and in 2020 Q3, we released the latest generation of platform-level cobot product CS Series (Cobot Superior).

With the ambition of being integrated into the global cobot market, we are committed to providing easy-to-use cobot solutions for users of all sizes and industries and helping them realize single station renovation and automation upgrades.

As of January 2021, ELITE Robot's business teams in Shanghai, Shenzhen, Beijing, and Suzhou have established business relations with 300cobot end users, covering major first- and second-tier cities across China and 20 overseas countries. ELITE Robot now has 120 employees, of which 50% are in R&D and technical support teams, who are dedicated to providing professional and efficient support to local users. The cases included in this brochure are the real-life projects completed by ELITE Robot in 2020, which provide references for the users with cobot demands.



For more details,
please visit the official website
of ELITE ROBOT
<https://www.elite-robotics.com>

Product Model		EC63/EC63M	EC66/EC66M	EC612/EC612M
Robot Arm	Arm-weight	13kg	17.5kg	33.5kg
	Payload	3kg	6kg	12kg
	Degree of Freedom (DOF)	6	6	6
	Working Radius	624mm	914mm	1304mm
	Joint Range	+/-360°	+/-360°	+/-360°
	Maximum Speed	2.0m/s	2.8m/s	3.2m/s
	Repeated Positioning Precision	+/-0.03mm	+/-0.03mm	+/-0.03mm
	Tool Terminal IO	2 x DI, 2 x DO, 1 x 24V, 1 x AI, 1 x AO, 1 x RS485		
	Power for Robot	48V	48V	48V
	Cable Length	5.5m	5.5m	5.5m
	Installation orientation	Any angle	Any angle	Any angle
	Certification	EN ISO 10218-1:2011	EN ISO 10218-1:2011	EN ISO 10218-1:2011
	Power Consumption	150W +/- in typical a application	250W +/- in typical a application	500W +/- in typical a application
	Body Materials	Aluminum alloy	Aluminum alloy	Aluminum alloy
	Working Temperature	0°C-50 °C	0°C-50 °C	0°C-50 °C
	Working Humidity	5%-75% (no condensation)	5%-75% (no condensation)	5%-75% (no condensation)
Ingress Protection Code	IP54	IP54	IP54	
Controller	Communication Interface	16 x DI, 20 x DO, 2 x AI, 4 x AO. Ethernet TCP/IP, UDP, ModbusTCP. RS485/RS232, ModbusRTU. Profinet slave station (optional), EthernetIP slave station (optional), CCLink slave station (optional)		
	Controller Cabinet Dimensions	478*380*120 mm	478*380*120 mm	478*380*138 mm
	Ingress Protection Code	IP20	IP20	IP20
	Controller Cabinet Weight	15Kg	15Kg	17Kg
	Power for Controller Cabinet	220/110VAC(M:19-72VDC)	220/110VAC(M:19-72VDC)	220/110VAC(M:19-72VDC)
	Working Temperature	0°C-50 °C	0°C-50 °C	0°C-50 °C
	Working Humidity	5%-95% (no condensation)	5%-95% (no condensation)	5%-95% (no condensation)
Teach Pendant	Ingress Protection Code	IP65	IP65	IP65
	Working Temperature	0°C-50 °C	0°C-50 °C	0°C-50 °C
	Working Humidity	5%-75%(no condensation)	5%-75%(no condensation)	5%-75%(no condensation)

Product Model	EC63/EC63M	EC66/EC66M	EC612/EC612M
Weight	1.8Kg	1.8Kg	1.8Kg
Resolution	1280 × 800	1280 × 800	1280 × 800
Dimensions	290 x 225 x 118	290 x 225 x 118	290 x 225 x 118
Cable Length	5.5m	5.5m	5.5m

*M models work with 48/24V DC power supply

ELIBOT
COLLABORATIVE
ROBOT

Use Case Videos

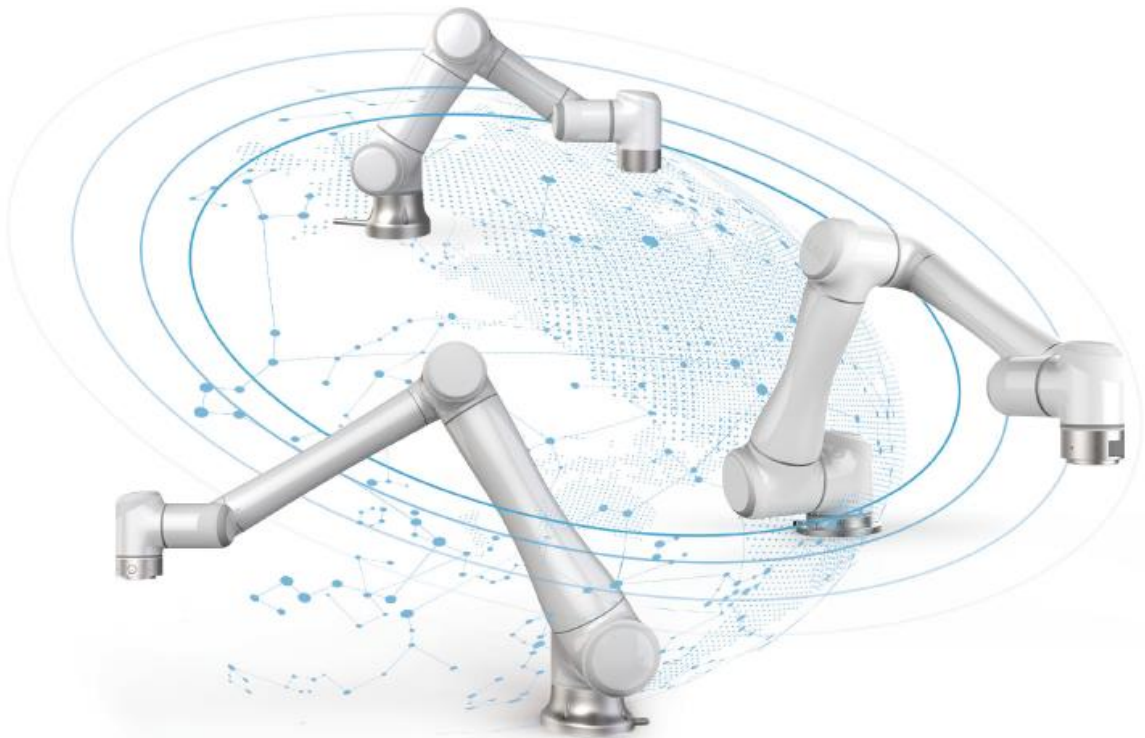
Some applications of cobots are in non-standard scenarios, which are used in many types of industries.

Meanwhile, because of the merits of openness, ease of use, and security, this lightweight and flexible instrument is more efficiently used for secondary development or automation transformation in place of human labor.

Besides the traditional industrial scenarios that have been widely adapted, such as automotive parts, 3C electronics, metal processing, packaging and logistics, food, and scientific research in universities, cobots are also gradually applied to some new industries, including health care, textiles, electricity, new retail and so on.

Progressive Automation, based on cobots, will be a more flexible and efficient mode of automation upgrades.

We recommend that clients use the Progressive Automation mode to control technical and business risks and make progress in a gradual way. With this mode, clients can further their understanding of the application characteristics of the collaborative robot arm in the process, and improve the application capability of their automation teams, so as to lay a good foundation for further promoting the automation in the future.



“

This will greatly improve the utilization rate of cobots. As users become more familiar with the product, one cobot can be used in multiple application scenarios, which is especially suitable for factories with low initial automation, or companies that plan to improve existing production mode by turning to comprehensive automation.

”



Case Videos

*Please scan QR codes for detailed case videos



01 Bosch Automotive Electronics PCB tightening



04 Air conditioner inspection in SAIC



02 EA888 engine bolt tightening



03 MEB battery cover gluing



05 DAIKING circuit board inspection



Case Videos

*Please scan QR codes for detailed case videos



06 Hexin server cabinet inspection



07 Labeling of FMCG products



08 Loading and unloading materials for stamping machine



09 Allove's robot coffee station



Use case Videos

*Please scan QR codes for detailed case videos



10 Screwsdriving for Uniliver's water-filter



11 Loading and unloading materials in a injection molding machine factory



12 Spindles of Xinxiang chemical fiber factory





Automotive Parts Industry



01. Inspection of electronic touchscreen in a Tier One company

Background

The trend of intelligent vehicle-machine systems has prompted great changes in in-vehicle screen size for better visual interactive experience and content carrying, and more and more vehicle models have installed vehicle-mounted central control panels. The better expandability allows large screens to display more contents and have stronger customization capabilities. Thanks to earlier involvement in the research of large screen vehicle-machine solutions, this automotive accessory manufacturer focuses on interactive experience and user needs and has strong advantages in stability, safety, reliability, and other aspects. With the increasing demand for customization, manufacturers need to have more flexibility on the supply side to meet the needs of rapid switching and varieties of production lines, so they are looking for automation solutions that can help them improve the efficiency and flexibility of existing production lines.

Pain point

After years of development, one of the most extensive application scenarios of cobot technology is the automotive parts industry. Many major vehicle and Tier One manufacturers, including Continental Automotive Electronics, Valeo, BMW, Audi, SAIC Volkswagen, and Nissan, have introduced cobots in the later processes for handling, assembly, screw tightening, inspection, gluing, and other applications. Unlike traditional industrial robots, which have to be equipped with safety fences, cobots can share operating space with human beings. In addition, their rich interfaces and easy-to-use programming

experience enable these production tools to give full play to their characteristics of flexibility, lightweight, safety, and easy programming in the process of use. As a result, more and more manufacturers are learning from similar application scenarios of cobots and incorporate them into the single station renovation of their existing production lines.

In this case, the user wants to introduce cobots to the inspection station to ensure that the central control panel stays at the inspection station for 75 seconds without any errors. Each product requires a worker to inspect its buttons and touchscreen to make sure that the product meets the standard before moving on to the next process. "At present, we have been doing this task manually," the engineering director said, "as long as it is the manual operation, errors and omissions are inevitable. Therefore, we are always hoping to turn to automation solutions to improve product inspection efficiency and accuracy."

The user can choose to apply the ELITE EC63 (3kg payload) cobot on the position of touchscreen quality inspection. When the touch panel is touched by the EC63 stylus, if no quality problems are found, the material will flow out successfully. If any abnormality is detected, the sign of "NG" will be displayed on the display screen, and the signal light will be on and accompanied by an alarm sound, so the operator can immediately notice the abnormality and deal with it in time.



Automotive Parts Industry

01. Inspection of electronic touchscreen in a Tier One company

Solution

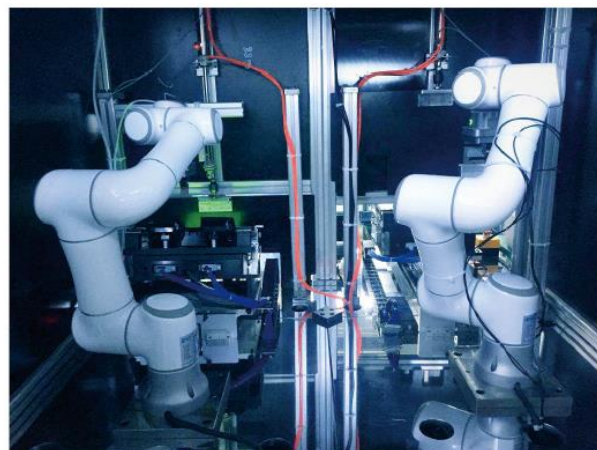
Two EC63 cobots, which can be installed on the desktop, are placed in the terminal inspection station. The left robot inspects buttons, and the right one inspects the touch control of the touchscreen. Cobots are particularly suitable for automation transformation in small spaces in accordance with the inspection requirements of curved screens or double-sided screens.

The entire cycle, from the delivery of the robot to the overall system design, installation and testing, and operation, took about one and a half months. The more difficult step is to connect the robot to external devices, such as PLC and PC. After about 2 weeks of trial and error, the user would set up their own peculiar system. The fixture design improvement is completed by ELITE Robot and the client together. After repeated fine-tuning of the fixture, the fixture touch achieves better adaptability and can support various touch modes required for inspection.

Workers inevitably make mistakes when using the touch screen system, but the cobot can accurately complete this task, which makes the client very satisfied. After starting up, the robot can complete the inspection task independently, so the productivity is significantly improved. Once an abnormal shutdown occurs, the

system will sound an alarm, and the technical director of production will come to check, so production will not be interrupted.

In fact, the application of a cobot can save the client about 1.5 units of labor costs, and the cost can be recovered within 18 months. Therefore, the company plans to deploy more cobots on other production lines. "The assembly process has always been labor-intensive. We won't rule out the idea of turning to automation from now on, because it is a big trend in the future." For the future, users, not just ELITE Robot, will gain more imagination from the confidence and experience accumulated in practice.





Automotive Parts Industry



02. Headlight inspection of a headlight manufacturer

Background

The automotive industry is the most typical industry that has higher requirements for robot flexibility, especially in manufacturing automotive spare parts. For example, headlight manufacturers are increasingly feeling the pressure of producing multi-variety headlights in small batches. The client of this project has more than 20 years' history of headlight manufacturing, and its products are mainly adapted to various vehicle models of the group to which it belongs, including passenger vehicles and commercial vehicles: SUVs, pickups, small passenger cars, and medium and large vehicles. In addition to the mainstream models in China, it also undertakes a large number of export orders. Therefore, *this client has very high requirements for the timeliness of delivery and quality stability*. On the one hand, it hopes to introduce automation solutions to maintain product consistency and complete full inspections of its products, and on the other hand, it also hopes that the equipment can be flexible enough to shorten the time of changing lines caused by frequent switching product types.

Pain point

The headlight manufacturer has an annual production capacity of 5 million headlights. To adapt to different vehicle models, its headlights are very complex in categories and diverse in specifications. Its *products have 17 series and more than 300 types*. Before the introduction of cobots, most headlight inspection work was done manually. With the increase of production capacity demand and labor costs, the client has been looking for the appropriate non-standard automation solution.

Due to the irregular shape of headlights, the robot must follow a more complicated trajectory during the inspection process and be aided by a vision camera to

complete the inspection through pictures taken in multiple positions. When the product batch is changed, the robot needs to execute the instructions according to the new program to complete the inspection task of different workpieces. *Therefore, simple programming and easy-to-use tools are what this station needs.*

Solution

These constraints have not baffled cobots. On the contrary, the advantages of this kind of robot are brought into full play. ELITE EC66 (6kg) cobot *adopts desktop installation, and the integrated camera takes photos and inspects the headlights according to the established trajectory*. The programming of cobots is very simple and can support drag and drop demo or interactive programming of teach pendant/PC, *so it has natural advantages for applications with more operation points and complicated actions*. In addition, ELITE Robot's 6-joint cobot can achieve ± 360 degrees rotation with a single joint. Taking the 6kg cobot as an example, the robot can work in a spherical space with a radius of 914mm, and all inspection surfaces of the workpiece can be reached, so engineers don't have to worry about how to avoid the robot's operational dead corner when programming.

In addition, *the cobot can also be competent for flexible production: for the small batch and multi-variety production mode that clients pay attention to*, the program of the cobot can be preset. When the product batch is changed, new programs can be quickly called and the robots can be debugged to quickly put into new tasks, helping users to greatly shorten the production line change time. What's more, the cost-effective cobots lower the threshold of automation for users, while *the ROI period is only 12 months*.



Automotive Parts Industry

02. Headlight inspection of a headlight manufacturer



Some extensions:

This kind of application is more suitable for automotive parts manufacturers. For example, auto air conditioners, headlights, interiors, and accessories, many of them are processed in small batches and multi-variety, with typical flexible requirements. ELITE Robot takes cobots as the core, and promotes cobot applications in the automotive industry around some typical production line processes, including headlight assembly line and air conditioning assembly line. In addition to integrating vision products in the above projects, the rich interfaces of cobots can be adapted to various end effectors and sensors.

The communication interface information of the ELITE Robot is as follows: 16xDI, 20xDO, 2xAI and 4xAO. Ethernet TCP/IP, UDP, ModbusT-CP.RS485/RS232, ModbusRTU. Profinet Slave station (converter required), Ethernet IP slave station (optional), CCLink slave station (converter required).



Automotive Parts Industry

03. The central control of internet car

Background

With the accelerated penetration of intelligent internet connection technology, cars are no longer a single travel tool, but are gradually evolving into a new generation of mobile intelligent terminals. In this development trend, the vehicle-mounted central control panel, which carries the interactive information display between people and vehicles, has become a highlight of all vehicle manufacturers, which also helps the vehicle-mounted display to become the third largest application market for small and medium-sized panels after mobile phones and tablet computers.

The enterprise in this case was founded in the early 1980s, with a number of R&D centers and production bases around the world. Its business covers intelligent cockpit system, active safety system, new energy vehicle electronic system, automotive electronic switch, etc. It mainly provides high-quality products and services for GM, VW, Audi, SAIC-GM, FAW-VW, Beijing Hyundai, NIO Borgward automobile and other famous vehicle manufacturers at home and abroad.

Pain point

Like other automotive manufacturers, although the automotive industry has a higher degree of automation and rich project experience than other industries, with the changes in the development trend of the manufacturing

industry, it is also facing the pressure of upgrading automation modification and improving flexibility. For example, the traditional scale automation can not meet the demand for small-batch and multi-variety production lines of automotive central control panels.

For the automotive electronics workshop, the internal space is usually tight, so the size limitation is strict when importing automation equipment without changing the existing production line layout. Especially, when turning to automation on existing manual stations, the engineering department must consider how to deploy automation equipment under the condition of reducing the stop time and making little changes to the existing layout.





Automotive Parts Industry

03. The central control of internet car

Solution

The emergence of cobots undoubtedly provides users with a perfect solution. The client uses ELITE EC66 cobots to tighten screws of the central control panel of automotive. A cobot has a small size and is lightweight. The self-weight of a cobot with the payload of 6kg is only 17.5kg. There is basically no dead point in the spherical working area with a radius of 914mm. After deployment, it only occupies 1-1.5 manual stations, and it is possible to share the operating space between human and machine without installing a safety fence, thus solving the space problem.

In addition, the cobot supports drag and drop demo and interactive programming between PC and the teach pendant, which makes the programming and task switching of the robot easier. The flexible deployment and easy-to-use characteristics of cobots have also become the reason why clients are impressed to import this tool. It is normal to have multiple production lines of central control panels and production lines are changed frequently. Therefore, more flexible and scalable cobots can not only help clients solve current problems, but also pave the way for future production requirements.

When the robot arm performs this task, the torque is 5N/m-5.5N/m, which is a perfect substitute for human hand for screw tightening operations. In addition, the mobile working platform with cobots as the core can also be easily pushed, pulled, and deployed to the production line side, and cooperate with end effectors such as various grippers, glue guns, screw guns and welding guns to undertake more tasks.





04. Screw driving of automotive bracket in Lear

Background

Lear factory has previously used cobots from the United States and Germany to assemble and transport parts, with the aim of freeing employees from heavy manual labor. After the pilot program of the factory, with the help of cobots, it has been determined that this lightweight and flexible tool can help the factory enter the field of flexibility automation.

The "Flexible Manufacturing" project promoted by the automation department of the factory plays a key role in lean production. Founded in 1990, the factory currently employs more than 1,000 people and is a leading enterprise in the automotive manufacturing industry. In order to further consolidate its development advantages, the client established the Automation Division in 2006. From body structure to parts assembly, it provides customers with all kinds of automotive parts including standard products and customized products. *The project team soon discovered that cobots can provide them with a lot of new ideas in developing modern assembly concepts.* Cobots can work with employees, which creates a new situation for automated production.

Pain point

This technology was not new to the engineer team since they previously already had experience with cobots. In 2020, the factory considered introducing more cobots in the parts assembly section. The robot arm is responsible for screwing bolts into the bracket by using the arm-end

screw gun, and there are two bolts on each bracket that need to be tightened. A screw gun provides a torque of 7.5Nm, and completes the tightening task in 16 seconds.

This task was originally done manually, and the manufacturing engineer explained: "The employees of the production line usually have to do heavy manual labor, and the cobots free them from it. In the past, they had to overcome the strong reaction force when screwing bolts. After a day's intensive work, they usually had sore hands and hurt shoulders." Now we try to use cobots to assist operators.

During the workflow of two shifts per day, the cobot *can handle up to 180 products per hour.* After the production process is optimized, the cobot can even identify the type of parts to be processed and always run correctly according to the corresponding program. Each robot completes about 5,800 screw tightening actions with 16 working hours per day. *These simple and boring actions are now all performed by robots, which greatly reduces the workload and improves production consistency.*

For automotive manufacturers, the benefits of using cobots are obvious, but the automation department is not really satisfied with it. Because they want to replicate this application with a shorter ROI cycle and improve the overall operational efficiency.



Automotive Parts Industry

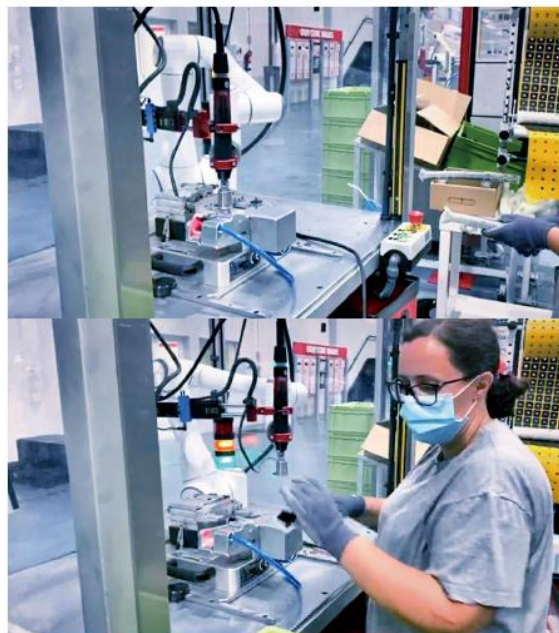
04. Screw tightening of automotive bracket in Lear

Solution

For automation engineers with 5 or 6 years of experience, they are beginning to look at "Made in China" cobot brands. With globalization and increasingly frequent division of work and cooperation among countries, international manufacturers' impression of "Made in China" is no longer just "cheap", and more and more people give positive comments on the stability of Chinese brands and the timeliness of service.

Thanks to the efforts of the European automotive manufacturer and integrator, they evaluated a number of Chinese brands and eventually approached ELITE Robot for cooperation. ELITE EC66 (6kg) cobot is deployed in the assembly station to cooperate with an operator. Firstly, the bracket and cushion are assembled manually, and then the bolts are placed in the position to be tightened in advance, and then are loaded to the tightening station of the cobot. After the robot detects that the workpiece is in place, it performs the screw tightening operation. After the assembly is completed, the workpiece is removed manually and transferred to the next process for assembly. The worker loads the unprocessed workpiece to the workstation again.

In addition to the simple programming of the cobot, a cobot can be quickly integrated with the (end effector) screw gun. Clients are particularly pay attention to the safety of cobots: the requirements of human-machine collaboration and frequent interaction are fully reflected in this application.





3C Electronics Industry

01. Fuse machine of a 3C factory in Chongqin

Background

Founded in 2010, this enterprise mainly produces laptop parts. The company's leading products are laptop shell molding and other business, and provides OEM contract manufacturing for well-known 3C electronic brands, such as Huawei, Xiaomi, DELL, and other laptops and tablet devices. Like most 3C electronics manufacturers, this company is constantly trying to upgrade automation and [trying to introduce new production automation equipment](#). On the other hand, the company is more cost-sensitive, and hopes to achieve an ROI period of no more than 18 months.

Pain point

Since the beginning of 2019, the automation transformation of this enterprise focuses on some flexible stations. Due to the increasing degree of customization at the consumer end, the [production line is facing the challenge of small batch and multi-variety](#). Even though the main processed workpieces are laptops and tablet computers, there are many models of the same brand and series of 3C electronic products, so the production line often needs to change the production batch. The reason why some stations have to retain manpower is also taking into account the flexibility of manual operation and meeting the requirements for orders without changing the layout of the existing production line as much as possible.

The production line of this cobot project is mainly to process and assemble the plastic shell of laptops. The process is as follows:

1. Gluing station of plastic laptop shells
2. Placing metal parts in gluing position
3. The robot arm takes the laptop plastic and sends it to the No.1 fuse machine or the No.2 fuse machine
4. The fuse machine bonds the metal to the plastic shell at a temperature of 80 degrees
5. The robot arm takes out the processed laptop plastic from the No.1 fuse machine or the No.2 fuse machine
6. The robot arm places the material into the No.3 machine, presses the material, cool it down and set the shape
7. The robot arm will unload the finished workpieces to the production line

STEPS





3C Electronics Industry

01. Fuse machine of a 3C factory in Chongqing

Solution

Finally, the client uses the **Elliot EC66 (6kg payload)** cobot for the 1-to-3 loading and unloading application of the fuse machine process. After using a cobot and three corresponding devices on this production line, the original loading station and the fuse machine station are combined into one, which is equivalent to saving 2 units of labor costs. In addition to improving production efficiency and reducing the waiting time of personnel, it also alleviates the problem of difficult recruitment in the factory: because the fuse machine station temperature is high. After the robots are deployed, the probability of work-related injuries is reduced. It is more economical for robots to complete such mechanical work with relatively low added-value rather than manpower.

ELITE EC66 cobot has a small base and occupies less space. Clients do not need to import an entire automation workstation, and can complete the deployment only by using a simple desktop installation mode. In addition, the drag and drop demo function of the cobot reduces the programming time, and can be put into production in 2 days. The feature of simple programming is convenient for users to change the installation position of the robot and debug it quickly after evaluation.

The ROI period of this project is about 8-12 months. After feeling the benefits of cobots and running stably for a period of time, clients have more confidence in the usage of cobots. At present, the production cycle time of No. 1 and No. 2 fuse machines is comparatively long, and the running time of each machine is 60 seconds. Therefore, the factory considers more boldly and plans to try the 1-to-4 mode to further improve the production efficiency.



3C Electronics Industry

02. PCBA loading and unloading

Background

Founded in 1991, the client in this case is an electronic equipment processing factory with complete technology R&D and manufacturing capabilities, and its end users are all over the United States, Europe, Japan, and Korea, as well as well-known household electrical appliance enterprises in China. As a professional OME factory, the client is a contract manufacturer for many well-known brands, including white household appliances, small home appliances, and smart devices. Since entering the automotive electronics industry in 2008, it has further provided products including sensors, frequency conversion drives and vehicle-mounted power supplies for mainstream manufacturers in the industry. As an established OEM, the client attaches great importance to product consistency and delivery commitment.

In recent years, with the expansion of business scope and the influence of large quantities and varieties in the terminal market, the factory is increasingly feeling the pressure of personnel management from the production side: except for the gradual disappearance of demographic dividend advantage, for some jobs with simple requirements and trivial actions, the difficulties of employment have always been a headache.

Pain point

The client is located in an open factory in South China, which is labor-intensive and requires frequent loading and unloading processes as its products transfer through multiple processes between work stations. For some established factories, the production line used to transfer materials manually, but now this kind of station is the most "unpopularity": For employers, the waiting time when taking materials is undoubtedly a waste of manpower. For workers, this kind of work is boring, and the work that needs to turn and move frequently will also cause physical fatigue. The client initially considered deploying traditional industrial robots for loading and unloading, which means that safety fences must be installed at this position. Obviously, the client cannot accept finding another place for robots in such a narrow space, and they are unwilling to change the existing production line layout easily. Therefore, they turned their attention to the cobot that is most suitable for such scenes.





02. PCBA loading and unloading

Solution

After discussion with the integrator, the client chose ELITE ROBOT EC66 cobot with a payload of 6kg, a working radius of 914mm, and repeated positioning accuracy of $\pm 0.03\text{mm}$. With the vacuum suction cup, the robot sucks 3 pieces of circuit boards at a time according to the cycle time of the conveyor belt, moves to the unloading position, and unloads them one by one in the tray plate. After the tray plate is full, the worker on the other side of the production line labels the circuit board, and pushes the tray plate to the next station: **man-machine shared working area, without installing a safety fence, the cobot does it.**



In addition, in this application, the **advantage of the compact structure of cobot is fully reflected.** The robot arm only needs to sit on one side of the production line, and then travel 180 degrees to unload the materials after taking the materials. The whole movement is effortless. Imagine that if it is changed to manpower, it is inevitable for the workers to turn around frequently within 8-hour working time, and the resulting emotional labor and fatigue will bring potential risks. **The cobot can cope with all these problems freely, and its 6 joints support $\pm 360^\circ$ rotation, so it can work almost in a spherical space without a dead corner!**

To the surprise of our clients, **the special drag and drop demo of cobots and interactive programming of teach pendant can make the robot deployment very easy.** With just one day, a whole set of actions are debugged and finished. "After the first try, ELITE Robot's cobots make us feel highly satisfactory! Automation transformation is easier than expected, we have more confidence to try to use cobots to perform other tasks." Good experience of first introduction for clients removes their doubts about the capabilities of cobots. A major step toward automation transformation is not that difficult!



Composite Application of AGV

Integrated Manipulator

01. Jiangsu Inspection Center: Composite Robot Inspection

Background

A robot integrator, located in Shanghai, can provide 3C manufacturers with engineering, manufacturing, and integrated solutions. They recently provided composite robots, used for handling and inspection tasks, for a Taiwan electronics factory. *With the help of cobots, the factory has improved the quality of production, reduced human error with 20% increase of operational efficiency*, meanwhile saved about 15% of the workspace. By applying cobots to the process of production, workers can engage in those work that requires higher skills and generate higher added value.

Pain point

Material transporting and loading from one workstation to another at present must depend on the manpower. Original material transporting between workstations is done by manually. *The factory expects automatic connection between single workstations. Due to the limited space of the factory, it is not suitable for major changes and layout adjustment.* Therefore, it is urgent for them to find a lightweight plan with less risk to have a try.

Solution

The factory turns to the integrator for providing solutions. After field evaluation, the integrator suggested the factory should try composite robots. AGV takes the workpieces with

robot arms from the previous workstation and sends them to the inspection table to unload, then the equipment will perform size and appearance inspection. After the inspection, the robots will take the workpieces and send them to the next station for inspection. *A composite robot consists of AGV laser navigation vehicle, ELITE ROBOT EC66 (6kg payload) cobot, and DH gripper.* ELITE Robot's cobots have lower power consumption compared with traditional industrial robots. The average power of 6kg payload robot is 250W. Optional 48V DC power supply version can be powered directly from AGV. Due to the *low power consumption, compact structure, and small loss of cobots to load capacity of AGV*, there is no need to charge the vehicle frequently during actual operations, thus stop time can be reduced and production efficiency can be increased.

"It's been 2 months since the introduction of the robots, we are satisfied with this mobile platform." *The factory has given good evaluation:* "Cobots combined with AGV have provided us with an ideal solution. The complete set of system is neat, in addition to being able to complete the established movement, it doesn't cover a large space. To be honest, this is the fact it should be that I've assumed about the material handling and inspection tools on the modern production line." *Small in size but great in applications. It is believed that cobots, in the future, combined with AGV will bring more surprises to users.*



Composite Application of AGV

Integrated Manipulator

01. Jiangsu Inspection Center: Composite Robot Inspection

More advantages:

The joints of ELITE Robot's cobots adopted lightweight and integrated design, different from traditional industrial robots. They include the motor, drive and control circuit, feedback circuit, reducer, bus, encoder, etc., which are all now integrated into the joint.

Robots have a higher payload to self-weight ratio with lightweight design as a guarantee. Not only can it reduce risks and protect people's safety in a collision with people; but robots' weight is also greatly reduced. For example, the self-weight of a robot arm with the payload of 3kg is only 13kg, for a robot arm with a payload of 6kg is 17.5kg. Therefore, this type of robot arm integrated with AGV offers flexibility.

ADVANTAGE





Composite Application of AGV

Integrated Manipulator

02. Jinan Metro Composite Robots

Background

Subway, as important public transport for people to travel in the city, carries tens of millions of people. As a result, ensuring the public safety of passengers is an important responsibility of the relevant departments of the subway.

When it comes to subway security, people usually think about security check and security cameras. As a matter of fact, it is far from enough that only security cameras and security check are provided for the construction of security facilities of modern subways. It is irreplaceable for inspectors to carry out field checks on the subway — Every inch of rail and each screw are related to subway driving safety. Inspectors can only perform measurement by their feet, without shortcuts. Although subways run only on two rails, it looks simple, a number of items need to be checked with a tremendous amount of manual labor. A city metro operating company in North China is facing such a problem.

Pain point

At present, most subways are inspected by people. Each railway line needs ten to twenty inspectors walking into the tunnel to carry out inspections in the morning every day. Only five kilometers of railway line can be inspected for an

hour. There remain many disadvantages such as low operating efficiency, potential danger of personal safety, no objective standard, no detailed record of original data, increased labor costs, and unavoidable missed inspections at night.

6,000? How can people stand walking 15 kilometers for one day and 25 kilometers for a night at most on the rails?" Faced with the recruitment difficulties for special positions, subway operators turn their eyes to the automation field. Since all walks of life are pushing for turning to automation, why cannot more robot solutions be introduced into subway operation to solve the current problems in view of the heavy workload of people?

Therefore, the company made contact with experts from the Rail Transit Industrial Technology Research Institute and partners with cross-industry automation integration experience. Finally, it came up with the idea of turning to automation with composite robots. The plan is made to achieve the function of movement inside the rails and inspection by AGV equipped with the collaborative robot arm, perform all kinds of routine inspection tasks, so as to reduce the labor intensity of people.



Composite Application of AGV

Integrated Manipulator

02. Jinan Metro Composite Robots

Solution

The whole plan can make continuous operation for eight hours on a single charge, which can basically ensure the successful inspection of a complete subway line. The application integrates ELITE EC66 (6kg payload) cobot with a self-weight of only 17.5kg. Compared to conventional industrial robots with the same payload, the power of an ELITE Robot's cobot is 250 w, which is less than 1/4 of the power of a conventional industrial robot. This ensures the longer endurance of AGV when running. In addition, the ELITE Robot's collaborative robot arm is available in a 48V DC version, which can be integrated with AGV and powered directly from the vehicle instead of the robot controller cabinet, making the system more compact.

At present, the client begins to use this set of equipment for accurate inspection of more than 10 standards of 3 major systems including rail bed, fasteners, and routine rail check.

When the fasteners suffer missing, fracture, floating, rail cracks, bed water, or foreign bodies appear etc., all these problems can be found and reported in time.

Turning to automation with the Cobot + AGV solution makes the rail inspection process "Safe, Efficient, and Accurate" and liberates people from the heavy and poor working conditions, thus improving the overall operational efficiency.





Composite Application of AGV

Integrated Manipulator

03. Wuha Fozuling Community: Disinfection Robots during Pandemic

Background

Pandemic prevention requires not only strict control, but also intelligent control. On March 8, 2020, the robots on the job can act as doormen and workers in charge of disinfection in Wuhan Optics Valley Fozuling Community, as well as perform temperature measurement. In case of abnormal temperature, the robots will issue alarms. The flexible robots will collaborate with the robot arms in spraying and disinfecting people. In addition, "eyes" of this set of system — An iris recognition device can quickly and accurately collect and recognize the iris and face within a distance of 0.8m to 2m, even when people wear a mask.

Pain point

Infectious diseases have always been a major threat to the safety of people. The large-scale outbreak of COVID-19 is largely related to the long incubation period of virus infection and the transmission through contact, droplets and aerosols.

Adopting quarantine measures is the most effective way to

control the pandemic, but it requires a lot of healthcare staffs to care for suspected and confirmed patients after quarantine, to dispose of materials that may have been contaminated by the patients, to inspect and disinfect quarantine areas, and to distribute medicines and supplies. All of these have greatly increased the risk of infection for healthcare staffs and the work intensity. Therefore, the introduction of robots can actively assist in the prevention of infectious diseases.





Composite Application of AGV

Integrated Manipulator

03. Wuhan Fozuling Community: Disinfection Robots during Pandemic

Solution

An intelligent telemedicine robot platform developed by ELITE Robot and integrator can provide a platform for remote unmanned operation, which has the characteristics of strong autonomy, high intelligence and good platform extensions. It can be rapidly extended and deployed to realize functions such as disinfection, distribution, identification of personnel, and medical testing.

The intelligent telemedicine robot platform is composed of an autonomous mobile vehicle (Slam AIV), a 6-DOF cobot, a central control computer, an algorithm software, and some remote core communication components. It can be quickly connected to the iris recognition device, infrared thermal imager, inspection and disinfection and other equipment according to actual needs, and realize one machine for multiple purposes, rapid deployment and adjustment.

The platform is uniformly powered by the lithium battery of the Slam AIV, and the platform data and vehicle-mounted equipment data are uploaded to the remote server through the 5G network for monitoring, and for remote diagnosis, treatment and dialogue.

The SLAM-based AIV can autonomously realize the functions of path planning, collision avoidance and elevator floor switching, and autonomous charging. The 6-DOF cobot has a flexible spherical working area, low self-weight, low power consumption, and open interfaces to realize remote operation, which can greatly enhance the functions of the platform, such as remote instrument operation (e.g. bedside ultrasound), drug distribution, and quarantine area disinfection.

The central control computer and software are based on an extensible architecture design, which can be compatible with various medical and inspection equipment interfaces and rapid function expansion. At present, ELITE Robot's self-developed cobots have completed the design, assembly and debugging of the first generation prototypes, verified the functions of the platform, and were finally deployed in Wuhan Fangcang Hospital for disinfection and identification of personnel and quarantine areas, and medical communication between healthcare staffs and patients.



Daily Chemical Packaging Industry

01. Nivea Packaging and Handling

Background

Clients' factories in China are currently facing challenges caused by high labor costs. In the subsequent processes of the production line, most workers perform operations manually. For example, when in the packaging and palletizing process, it often **leads a heavier labor load to the workers** — such as frequent waist rotation or heavy work during moving ups and downs. It is easy to cause health risks due to "anti-ergonomics".

From an economic point of view, the more frequent product batch switching requires the production method to be more flexible to meet the production mode of **large batches and multiple varieties in the existing production line layout**. Therefore, this also puts forward requirements for **production equipment to be easier to operate and switch, more flexible to deploy, and even more safely to interact with workers on the production line**.

Pain point

Based on the experience in Europe and previous ergonomics risk analysis, the Chinese factory quickly realized that workers need to do more manual work in the subsequent assembly and packaging stages of production, which are risky for the workers. Taking the palletizing process as an example, workers need to put boxes of different specifications in each batch on pallets. Sometimes, a single person's hourly operation can reach 1,000 kg, and

a worker needs to pick and place items with a total weight of up to 8,000 kg if calculated in eight hours per shift. This has almost reached **the highest rating in the client's internal ergonomic hazard level**. Such intensive work for a long term will cause more serious damage to the human body. In addition, the Chinese factory has also found that it is increasingly difficult to recruit workers who are willing to work in a long-term and stable manner for such heavy work. Even when the salary was increased by 30% in 2019, the labor shortage issue remains. The employer side often complains that **the attrition has a bad effect on work efficiency, and** has to repeatedly conduct on-site training.

In fact, such problems are not uncommon in other industries. The conventional automation solution is to deploy traditional industrial robots. Industrial robots are deployed for depalletizing and palletizing operations at the input and output ends of the production line, to replenish materials on the production line or transfer semi-finished or finished products produced. However, the problem with traditional industrial robots is **the space utilization of the production line and some practical restrictions — including the plant structure** such as column spacing. Once the depalletizing and palletizing work station designed with traditional industrial robots is deployed, its layout cannot be greatly adjusted or even completely no adjustable. This obviously cannot meet the needs of clients for fast variety switching.



Daily Chemical Packaging Industry

01. Nivea Packaging and Handling

Solution

Cobots are flexible and compact, and share working space with people, so they have great advantages. Generally, the standard tray is 0.8-1.2 square meters, and the height of the pallet is less than 1.8m. Choosing a fixed robot that meets the working range requirements will need industrial robots of hundreds of kilograms. The high self-weight, large size, and the need to install safety fences make them difficult to adapt to the layout changes of the production line and cannot be installed in a small space. Although cobots may not be high enough in the working radius, it has light weight and flexible installation, only needs to be equipped with a lifting column to complete the de-palletizing without additional space and cost, and could improve the overall efficiency of the factory and the working environment.

Finally, the client chose the ELITE EC612 cobot (working radius 1,304mm, maximum payload 12kg). During the testing process, the robot runs at 50% of normal speed, and it takes 15 seconds to complete picking and placing a carton. If it runs at full speed, it takes a total of 95 seconds to complete the stack-shaped palletizing.

It is worth noting that the advantage of cobots is that they can learn from the teach pendant about the interactive programming and drag and drop demo to quickly realize

the planning and debugging of motion trajectory, thereby greatly shortening the project integration cycle. In practical applications, when the product batch is switched, the client can quickly call the pre-set program and fine-tune the point to allow the robot to start working according to the new stack shape requirements.

The ELITE Robot adopts standard interface, to realize the adaptation with common end effectors of major manufacturers in the market (including pneumatic, electric gripper, air suction, electric vacuum suction effector) through flange IO or RS-485 communication interface, control box IO or network port and RS-485 communication interface. The client is engaged in a business related to beauty (cosmetics), and the introduction of cobots makes life and production better.





Daily Chemical Packaging Industry

02. P&G Packaging and Palletizing

Background

A small automation solution provider located in Shanghai has clients including 3C, metal processing, and auto parts industries. As one of the first integrators who came into contact with cobots, they have accumulated rich experience in many non-standard customized projects. But at the same time, they have been unable to scale their business because of the high degree of customization. In 2020, the integrator began to cooperate with some daily chemical manufacturers to consider the introduction of cobots in palletizing applications.

After cooperating with ELITE Robot, the integrator quickly designed a safe, compact and easy-to-use palletizing solution consisting of an EC612 (12kg payload) cobot and the lifting column, the integrator's linear motion component. The solution can help clients in the daily chemical industry to perform palletizing operations on demand, optimize

production space, and quickly obtain a good return on investment.

Pain point

The end client of this most recent project is Procter & Gamble. The factory in this case has been established for more than 10 years. The automatic palletizing process was not considered when planning the layout of the production workshop, and the action of stacking boxes of products on pallets was still done manually. When they wanted to turn to automation, this caused a problem in the use of space as there was no reserved space for the existing production lines. The task of the integrator is to provide intelligent solutions and design efficient palletizing systems for the client, taking into account flexibility, ease of use, safety and compactness, allowing the client to make full use of the existing plant space.



Daily Chemical Packaging Industry

02. P&G Packaging and Palletizing

Solution

There are two reasons for the integrator to choose ELITE Robot. The first is because ELITE Robot's open platform — which allows the integrators and end clients to write applications flexibly. The second is ELITE Robot's abundant experience in the application of cobots. This solution is used for palletizing applications in the shampoo product lines, and the stack shape in the video is 3*2*8.

In this application, the advantages of the cobots are very clear, as the compact and small self-weight robots are installed on the lifting column. The cobot with a 12kg payload is only 33.5kg, which is very lightweight compared with traditional industrial robots (over 50kg).

Coupled with the safety features of cobots, there is no need to install safety fences and they can share the space with workers. Therefore, there is no need to redeploy production lines in the factory, or to reserve a safe distance, which greatly reduces the application restrictions of robots. Due to the long distance between the pallet and the transmission line, the lifting column helps the robot to reach the carton of the lower place when palletizing the lowest two layers of goods, and the robot uses vacuum suction cups to load and unload.

When selecting an end effector, ELITE Robot suggested to the integrator, "For palletizing and de-palletizing applications, there are many types of effectors to choose from, such as clamps, grippers, suction cups, or the composite effector combining grippers and suction cups. According to the different power source, they are divided into two categories: pneumatic and electric. Choosing an effector usually needs to consider factors such as the product form (box or bag), attributes (easy to deform, surface leakage, or the clamping position) and stack type."

"The palletizing application of the end client is for boxed packaging. As the arrangement is tight and there is no

space for gripping on both sides, the top suction method is usually used. Lighter or flat box packaging can apply multiple suction cups. For packaging of more layers, after taking out the product through the top suction, the clamping mechanism is used to execute mechanical limit, so the composite effector is used to improve the stability during rapid acceleration and rapid deceleration.





New Retail and New Consumption

Industries

01. Monster Noodle-making Robots

Background

As early as 3 years ago, Allove planned to combine the concepts of "fresh noodle cooking" and "robot cluster" into one concept, creating [the first smart noodle restaurant in China with an "unmanned" kitchen and internet technology innovation, according to new ideas, new technologies and new styles](#). The intelligent unmanned dining experience they envisioned starts when the customer enters the restaurant. After the client is seated, they can enter the ordering interface by scanning the QR code, and order by themselves, and then the cooking and delivery of the catering are all completed by robots. Noodles are available in different specifications, with fixed cold dishes, and hot drinks such as tea and coffee, and beverages for those who want to drink cold. Two mobile food cars are responsible for the distribution of food and beverages. In the most critical part of noodle cooking, how could the robots complete the standard process operation, and also allow customers to feel the warmth of technology?

Pain point

The client splits the entire cooking process into eight steps:

- Dough making robot
- Dough packaging robot
- Dough storage and retrieval robot
- Fresh noodle cooking robot
- Dishware disinfection and distribution robot
- Ingredients and topping distribution robot
- Bone and topping cooking robot

In the stage of dough making, storage and noodle cooking, the client designed a set of mechanisms to complete a series of actions in a smooth manner. In the second half of the topping and distribution stage, the client observed that the robots need to pick and place the noodles after cooking, and required panning actions, which all have detailed requirements, and could not be performed with the "simple and rude" mechanisms. [They need flexible equipment to do the work, so the client turned their attention to cobots.](#)



New Retail and New Consumption

Industries

01. Monster Noodle-making Robots

Solution

Lightweight, attractive appearance, and compact installation size have all become the reasons for the selection of cobots. The ELITE EC66 (6kg payload) cobot is only 17.5kg. It can be installed on a desktop and occupies a very small area. In addition, the [single joint of the 6-DOF cobot supports \$\pm 360^\circ\$ rotation, with flexible actions and basically no dead spots](#). Therefore, it can complete the toppings of fresh boiled noodles with a more supple and dexterous movement, and delicately complete a bowl of robot-cooked noodles.

"The programming of cobots is easier than we thought. Robots developed by [ELITE Robot's support drag-and-drop demo, teach pendant and PC interactive programming, which is also an unexpected discovery during the integration process](#). The engineers would have simpler work during programming and debugging, and everyone will be more motivated to use this device frequently, and have more imaginations," the client said. At present, 1 robot can manage 2 different toppings, and the client plans to use 2

robots to manage 8 toppings to further expand the "menu" of the noodle restaurant and increase work efficiency.





New Retail and New Consumption

Industries

02. Tea Monster Robot Station

Background

It is an obvious trend to allow robots to enter the kitchen and automate catering. The client Tea Monster started planning an unmanned bubble tea workstation in 2019, hoping to support 18 SKUs (Stock Keeping Unit) with a robot, and place the entire system in a fully enclosed transparent glass room, which shows the whole unmanned operation process — ordering, making and taking. Customers can see the bubble tea making process directly in front of the machine.

Clients are optimistic about the upgrading of traditional chain bubble tea shops. "New Tea Drink" has been favored by capital in recent years as an independent subsector. The market for the made-on-the-site tea drinks is large and growing rapidly. However, it has low entry barrier, serious product homogeneity, and fierce competition. Even leading brands are often caught in product plagiarism disputes, and stores rely heavily on manual labor. The tea production process includes many links such as tea extraction, bubble boiling, milk capping, and ice cube addition, and standardization is a big problem. Preserved sample blending and streamlining operations have become the key to ensuring uniform taste and product stability — which also means the brand needs the investment in employee training, product monitoring, etc., in order to achieve a unified standard.

Pain point

The major premise of turning to automation is to ensure product quality-consistent. For business owners, the driving force of turning to automation lies in the *quality standardization of machine-made products, stable efficiency, working all day long, no worries about recruiting people, and easier management and operation*. But the acceptance of robots depends on whether the deployment and operation and maintenance costs reach the replacement threshold.

According to a third-party survey, the cost structure of a bubble tea shop during ongoing operations is generally 50% rent and 30% labor cost (different store types may vary). *Therefore, the idea of increasing sales per unit area comes from two aspects: reducing the store size, and reducing the labor cost.*

Therefore, the ideal store type for clients is a small store of about 6 square meters (the equipment requires less operating space than manual operations), with the introduction of robots other than manual labors. This means that if the operation and maintenance costs are not too high, as the operation continues, the cost advantages of the robot bubble tea shop will be more obvious with low rent of small shops, fewer employees and low labor costs. With the solution, the client turned his attention to the cobot after comparing it with the small 6-axis industrial robots, as *the former has tight structure, can be flexibly deployed and is relatively simple to program.*



New Retail and New Consumption

Industries

02. Tea Monster Robot Station

Solution

The Tea Monster experience store in Shanghai still chose a larger operating area, and **two ELITE EC66 (6kg payload) cobots were deployed in the store.**

The 2 bubble tea robots start working to the fullest. The **tasks in the fresh milk area on the left are completed by the robot on the left**, including loading and unloading tea cans, extracting tea with negative pressure, making tea, ultrasonic knife (cutting the milk), and pouring milk into the milk cans. This robot is responsible for the entire movement. **The robot on the right is responsible for the fancy feeding process** — This store has 18 bubble tea flavors to choose from. The system sends instructions to this robot according to the information on the customer's orders, and prepares flavored milk tea according to the ordered taste. After the feeding is completed, the robot places the cup on the conveyor line, and a cup of "fresh tea" made by the robot is quickly delivered to the customer.

A cup of bubble tea can be made in 60 seconds, and it can truly realize the ordering, making, taking process in an unmanned on-site production.

In addition to the advantages of compact structure and small space, the single joint of the ELITE Robot's cobot supports $\pm 360^\circ$ rotation, which makes the robot basically meet no dead ends in the spherical working area, so it can easily reach various points. The interactive programming of the teach pendant makes the robot debugging easier, which is especially suitable for projects with diverse and complex actions such as bubble tea preparation — An engineer plans the robot path through the drag and drop demo and fine-tuning of operation points to ensure that the project launch time is greatly shortened.

As more experience stores and mini-robot bubble tea shops are launched, cobots are believed to give a new look to the business of "made-on-the-site tea".





New Retail and New Consumption

Industries

03. Cooler Unmanned Coffee Station

Background

The COVID-19 will definitely change the way of working in many jobs, whether it is patient care or sample testing. If more robots are introduced, it may be able to reduce the risk of infection of medical staff. *In addition, in occasions with close human-to-human contact, the introduction of robots may be able to reduce the possibility of virus transmission and cross-infection*, such as catering and retail industries. People now would be hesitated to go out to order a takeaway drink, not to mention a dinner.

Pain point

After experiencing the impact of the pandemic, "rest assured restaurants" will usher in huge market demand. Under this, the business model represented by new retail and new consumption may become popular — as contactless cooking ensures physical safety while improving production efficiency.

Gengku Technology, a high-tech company located in Shanghai, saw this trend as early as 2017. It is an enterprise with rich experience in robot application and strong software and hardware system development capabilities. They have always been committed to "let robots serve humans" and enter more business scenarios. Therefore, they have begun to plan application development since 2017, including unmanned coffee stations, ice cream stations and bubble tea stations, *and finally chose ELITE Robot to jointly develop new retail applications.*

Take the unmanned coffee station as an example. Unlike the station with human labor, *the Cooler Coffee Station uses a cobot, which has more advantages than humans.* Its precise control of time and angle makes each coffee bean evenly ground and extracted, and the milk foam fully blown to release all the flavor. *The unmanned coffee station can meet 24/7 business hours, and it can be started with simple electricity. Customers can place an order in front of the station or remotely through the app.*



New Retail and New Consumption

Industries

03. Cooler Unmanned Coffee Station

Solution

The ELITE Robot makes flavored coffee according to the client's order. The robot places an empty cup at the coffee outlet, and pushes different buttons to add coffee, milk and flavored syrup in different proportions. The lid drop system inside the coffee machine tightly puts the lid on the paper cup, then picks up the prepared coffee and moves it to the exit. The coffee cup slowly lands on the outlet under a circle of white lights full of technological sense, and a cup of fragrant coffee is delivered to the customer.

Cooler Coffee Station uses the ELITE EC63 cobot, which is the lightest and flexible cobot in the ELITE Robot's cobot family. It has a lighter self-weight of only 13kg and a stronger payload of 3kg. In addition, the appearance of this cobot has been praised by many clients, as the overall industrial design of the body is transparent and flexible, and the screw hidden design presents a simple and atmospheric streamlined shape, which makes it outstanding in new retail applications and matches the very futuristic sense of the overall system. The maximum speed of the ELITE EC63 robot can reach 2.0m/s, with high operating efficiency, smooth trajectory and continuous motion. The ultra-sensitive dragging demo function can completely reproduce the dragging trajectory, and is very useful even when programming complex coffee station actions, thus greatly shortening the project development cycle.





Furniture/Household Appliances

01. China Building Material Inspection & Certification Group

Background

The client in this case is a professional organization, which has the largest scale and provides inspection services for manufacturers of sanitary ware and household appliance spare parts. In recent years, by means of the continuous introduction of automation equipment and robots, the efficient, flexible and reliable testing process and working mechanism are established, which can improve service level and work efficiency.

Before the deployment of cobots, the client had introduced an automation mechanism in the stage of product life testing to replace manual work. *The introduction of automation equipment is intended to reduce the number of workers and increase the efficiency — fatigue operation and manual errors can pose risks to both safety and production during testing.* Therefore, the client is always focused on turning to automation throughout the system in the stations of low added value. The goal is to continuously improve the efficiency, flexibility, and reliability of inspection and service.

Pain point

With the improvement of automation, clients began to pay attention to the need for automation transformation and upgrading in some processes. For example, in the switch testing station earlier, the client designed a set of

mechanism: A 3-axis device was built with the motor and module. It, coupled with robot arms, was used for picking, placing and testing of workpieces. But in the actual use process, the robot arm needs to move the workpiece to a certain position to test the top part, but the path of the top handle part during turning back is an arc with a curved surface. As a result, the structure of a single motor and a robot arm cannot solve these problems at the same time, and it is difficult to meet the needs of clients in actual applications.





Furniture/Household Appliances

01. China Building Material Inspection & Certification Group

Solution

Finally, the integrator recommended the solution of cobots and soft gripper to the client. With [flexible joints and a compact shape](#), this type of product can be used in collaboration with people, without the need for installation of safety fence to partition the existing stations, and can be installed from [multiple angles](#) in the limited space. In particular, [cobots are easier to program than traditional industrial robots](#), which is also a surprise to the clients when they make a choice. As a professional inspection organization, they do need flexible equipment to meet the needs of testing for multiple types of products.

Therefore, ELITE EC66 (6kg payload) cobots solved the clients' existing three major problems once and for all: [The first problem is about the curved surface rotation](#). The joints of a 6-joint cobot support $\pm 360^\circ$ rotation, basically equivalent to working in a spherical space, with no dead angle. So the engineer doesn't have to spend much effort on considering reachability when programming. [Secondly, the cobots can edit the point quickly through drag and drop demo](#). With a smooth movement track, it can perform switch movements smoothly just like humans. [Thirdly, programming is simple, the robot can be easily disassembled and flexibly deployed to different positions](#). Therefore, it can perfectly meet to the needs of small batches, multiple varieties and quick change. For users, it is

not that difficult to perform the following programming and debugging and use.

"A single sample needs 100,000 times of tests in a row with a 3-second switch testing. Such work cannot be done by human hands," the client said. Turning to automation has become a major trend in the automation upgrading of a factory. Only by selecting the appropriate robot solution according to the specific scenario can the advantages of different varieties be truly played. With the development and widespread application of cobot technology, automation is no longer tied to standardized products and mass production. ["Automated production lines can also produce and test a variety of customized products in small batches. We are very optimistic about the future of the ELITE Robots."](#)





Furniture/Household Appliances

02. Loading and Unloading of a Sony Fab

Background

Users in South China introduced ten EC66 cobots for product handling in early 2020. Although more than 60% of cobot applications are used for material handling with low added value, many factories often hesitate to collaborate in such station when introducing cobots. Therefore, the electrical appliance manufacturer, after many evaluations, finally decided to introduce a large number of cobots to perform loading and unloading operation at a time, which is somewhat unexpected.

The company, established in 2002, has actively developed and optimized the manufacturing process of household electrical appliances for over ten years and is committed to the production of high quality products for top brands from China, Japan, Korea. As a company with many years of experience in ODM, although its industry experienced a slowdown and cost increase in recent years, the client had the foresight and introduced automated production equipment step by step in this case, constantly achieving the goal of stable quality, cost reduction and efficiency improvement. In view of small but various customization needs, it provided more comprehensive service and became a rare company going in the reverse direction. In this process, they first felt the urgency of the trend of "automation and flexibility" and began to lay out for the future.

Pain point

Several years ago, the client introduced some medium-sized automated production equipment into the production line, and successively used SCARA and small six-axis industrial robots. After several years of automation upgrading, there is not much room for automation

transformation of production — in addition to many processes that have adopted mature automation solutions, it is not suitable to make big changes to the production line due to the limited space of the factory. So their first attempt to introduce cobots started from a simple workstation.



Since the overall planning was not made during the automation transformation of production line, the material transporting and loading between some work islands and workstations was still carried out manually. As the employment problem has intensified in recent years, clients are in urgent need of automation of these stations.

When making the choice on the first production line modification, the client introduced a solution of cobot + vision which is a Taiwan-funded brand for sorting, picking and placing, considering the easier application of cobots integrated with sensors. However, after using for a period of time, it did not achieve the ideal goal — low cost efficiency. Due to the fact that this workstation does not need interaction with people and low demand of quick change on this line, the cobot is only used as an actuator. Because of the high cost of single purchase, the measured return on investment over a set period of time is not ideal. Therefore, after using for a period of time, the client finally chose the SCARA + Vision with better cycle time and lower price to the same kind of production lines.



Furniture/Household Appliances

02. Loading and Unloading of a Sony Fab

After the first failed attempt, users hesitated to use a cobot. Their integrator approached ELITE Robot in late 2019 to re-evaluate the project feasibility. After the field visit, the integrator and ELITE Robot found a new application opportunity — material handling. "Do we need a cobot for the simple work of picking and placing?" The client's first reaction is not a surprise to ELITE Robot when hearing the suggestions.



Solution

Finally, the user chose the EC66 (6kg payload) cobot to work with SCARA in the work island and small 6-axis industrial robot. The advantage of mixed line application is to bring into play the characteristics of different type of robots: SCARA supports high cycle time and plane movement. In this process, the first SCARA is used to lock screws of the metal parts of materials, and the second SCARA Vision is used to detect the positioning and lock screws of the plastic parts of materials. Later, two small 6-axis industrial robots are used to complete the picking, placing and assembling: The first one is to remove the metal parts and place it in the vision station for positioning. The second one is to assemble the workpieces and load them to the fuse machine, where materials are processed. And metal and plastic parts are bonded. When the materials processed by fuse machine at a high temperature of 150°C are unloaded, the cobot picks the materials and places them on the belt. A manual appearance inspection will follow.

The advantage of cobots, as the final process in the automated work island, lies in the fact that, in addition to

being able to perform dangerous tasks like other robots, it is safe to allow machine and people to interact at close range without the need for safety fence. In order to reduce the space occupied by the work island, the design adopts the method of machine and people on a same line. The user does not need to redeploy and adjust the production line, or to leave extra safe space for the robot. In this way, the introduction of cobots can help users achieve automation at the lowest overall cost.

To the satisfaction of our clients, the original production line runs with 17 to 20 people for a long time. After this application was extended to the same kind of production lines, twelve people would leave, which largely solved the employment problem. More importantly, the "simple" application inspired users' imagination of the cobot.

"When we were using robots with a fixed pattern of thinking, we simply judged whether an automation solution can be deployed at a station through cycle time, payload and working range. In fact, it is necessary for us to reanalyze the current production process and further disassemble the processes related to people. We can absolutely consider adopting the method of people + cobot, because in some cases it is more efficient than the method of all people or all machines." The client said. Cobots are so remarkable!





01 Handling of Agricultural Pipes in Leiria, Portugal

Background

Founded in 1958, the client is headquartered in Leiria, Portugal, and its main business is to produce all kinds of plastic products. In 1960, it set up a new company, the Ovar factory where this project is located. The business scope of this factory is to develop, produce and supply plastic products to meet the needs of different types of clients in various industries. The client has insisted on the family business of "plastic products" for 60 years, and has always aimed to become a benchmark enterprise in the plastic industry, to not only provide the public with products of great variety and reliable quality, but also constantly explore cutting-edge technologies — including raw materials, process and production methods.

Pain point

In recent years, the orders of plastic pipes used for three-dimensional planting accounted for a large proportion of the received orders. As the concept of three-dimensional planting is becoming more popular in Europe, and the

traditional farming has changed. Growers can put soil in pipes, and put plants, seeds and seedlings to be cultivated in holes. With this planting method, the sown area is greatly increased, the plants are ensured to get sufficient water, and *the cultivation and multiple cropping are also very convenient, so it is getting more popular.*

The client is producing various models of pipes, and one of the working processes is to move the plastic pipes from one side to the drilling equipment and punch holes in the pipes. In the past, this was done by hand. Although the materials are not heavy, workers need to turn around when picking and placing long pipes from the material station. *When running at full load, each worker needed to turn waists about 2,000 times every day,* making the work the last post for the workers to choose from. The factory has been considering turning to automation. Due to the frequent changes of material number, *the solution is required to be flexible and can meet the flexible production requirements of various varieties.*



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Solution

At the suggestion of the integrator, the client thinks that they can try the cobots, and hopes to get a shorter return period for the investment with a solution of high cost performance. Coincidentally, the integrator is a company with more than 20 years of automation experience, and has been looking for Chinese cobot partners since 2019.

They are keenly aware that although using European and American brand cobots can save labor cost in Europe where labor costs are high, *many medium-sized factories are still cost sensitive*. Enterprises are gradually under the highly competitive pressure brought by the globalization. The society is aging and it is difficult to recruit workers, but the medium-sized enterprises cannot afford the expensive equipment procurement cost, so the flexible automation demand from small and medium-sized enterprises has not been fully met. If there are stable and reliable cobots developed and manufactured by Chinese manufacturers, *they can save a lot in the system solution — which is attractive to both integrators and end users*.

At the end of 2019, the integrator established a special department for cobot automation through cooperation from various parties, and began to cooperate with the ELITE Robot engineer team. Finally, ELITE EC66 (6kg) cobots were used for material handling for the client's project in Leiria. At present, EC66 helps to produce a kind of plastic pipes,

which are used to support the growth of plants with soft stems. As expected, the cobots are compact in structure and do not occupy a large space after installation. The robot arm grabs the pipes on the loading mechanism, moves them to the other side, inserts the pipes into the casing, and *then moves the punched pipes with holes into the unloading mechanism. The whole process takes about ten seconds*. The client doesn't need to redeploy production lines, and can write programs suitable for materials of different sizes and use them flexibly in the production process. It is worth mentioning that the client was satisfactory about the whole system cost, as they recovered the cost in less than ten months.





02 University Project: Remote Control to Operate Excavators

Background

It is a research project initiated by universities in North China. As a conventional construction machinery, the excavator is carrying out heavy and difficult tasks. Because the operating conditions on construction sites are variable, full of diversities and uncertainties, this kind of work still relies on manual operation. However, the operation of excavators is undoubtedly difficult and tiring. The outdoor working environment with high temperature, exposure to the sun and dust is not only harsh, it can also bring great challenges to the health of workers. Therefore, an integrator in North China tried to perform the task with robot arms. *The project idea was simple — the robot arm like human hands would be installed in the cab of excavator to control the movement and operation of excavator through remote control of robot arm.* However, it is quite difficult to perform this seemingly "simple" task.

Pain point

There are four operating rods of an excavator. According to the operation habits of people's hands, one hand controls two operating rods — one joystick (2 DOF) and one pushrod (1 DOF). Therefore, the most obvious solution is to

turning to automation with two robot arms to imitate the existing manual operation habits.

This requires three characteristics of robots: *First is the compact structure and small cab space*, there is a limited space for robot installation. *Second is the flexibility of robots*; Each joint has enough DOF in a limited space to ensure that there are no dead spots and interference when setting the trajectory. *Third is the simple programming.* The robot arms need to identify the positions of the joystick and pushrod, so that the robot can respond to the joystick in real time when it is operated remotely. In the end, the cobots gave a satisfactory answer.





02 University Project: Remote Control to Operate Excavators

Solution

ELITE Robot was involved in the development and design of this project, including **two EC63 (3kg) cobots** that can replace the left and right hands to operate the joystick and pushrod. The operator does not need to sit in the crowded operating cab, and **the robot can be operated remotely in the remote control cab to start the excavator operation**. In this project, ELITE Robot defined the remote-control rods as 255 signal positions. The robot arm can identify the different positions of the operating rods, **and then accurately control the positions according to the signal input**, so as to achieve a real-time response control of remote operation.

Each joint of the 6-joint EC63 cobot supports $\pm 360^\circ$ rotation, with a working radius of 624mm and selfweight of only 13kg. The compact structure and flexible movement space make the robot work well in a limited space.

It is worth noting that ELITE Robot also specially designed the seat for this project — two robot arms drive the excavator to work during remote operation. When operator wants to enter the cab for operation, the robot arm can be moved to the rear side of the cab to leave space for the driver. **The cobots can share the working space with people, which also ensures the safety of human-machine interaction.**

2. By means of CAN bus communication, a remote control cab can control several excavators.
3. Using the ELITE Robot's internal motion interface, only 9 points on the joystick and 3 points on the pushrod in the process of programming are needed and demonstrated to complete the programming;
4. As a groundbreaking attempt in the construction industry, it is possible to be extended to other outdoor operations;
5. The compact installation space can not only realize the operation of excavator by the robot in the automatic mode, but also move the robot to other positions, leaving space for the operator, thus increasing the flexibility of the operation mode.
6. The cobot is easy to program, and the whole project only takes two weeks!

The introduction of cobots brings imagination and new ideas to these traditional jobs:

1. Turning to automation can reduce outdoor work;



COBOT SUPERIOR

New CS series of ELITE ROBOT
Platform-level Collaborative Robot



Scan for more details



CS612

Payload: 12kg
Repeated positioning
accuracy $\pm 0.05\text{mm}$

CS66

Payload: 6kg
Repeated positioning
accuracy $\pm 0.03\text{mm}$

CS63

Payload: 3kg
Repeated positioning accuracy
 $\pm 0.02\text{mm}$

Model	CS63	CS66	CS612	
Robot Arm	Payload	3kg	6kg	12kg
	Working Radius	624mm	914mm	1304mm
	Repeated Positioning Precision	±0.02mm	±0.03mm	±0.05mm
	Degree of Freedom (DOF)	6		
	Joint rotation range	±360°		
	Maximum joint speed	Base, Shoulder, and Elbow: 180°/s, Wrist: 225°/s	Base and Shoulder: 150°/s, Elbow: 180°/s, Wrist: 225°/s	Base and Shoulder: 120°/s, Elbow: 150°/s, Wrist: 180°/s
	Maximum tool speed	2.0 m/s	2.6 m/s	3.0 m/s
	Compliance standards	EN ISO 10218-1:2011, EN ISO 13849-1:2016 Cat3 PLd, ISO/TS 15066		
	Ingress Protection Code	IP54		
	Operating temperature	0-50°C		
	Humidity	90% RH (non-condensing)		
	Typical power consumption	150w	250w	500w
	Installation Method	Any		
	Tool I/O	2 DI, 2 DO, 1 AI, 1 AO		
	Tool I/O power supply	12V/24V, 2A (Dual pin), 1A (Single pin)		
	Tool communication	RS485		
	Occupied area	∅ 128mm	∅ 150mm	∅ 190mm
	Self-weight	14kg	20kg	33kg
	Body Materials	Aluminium, plastics, steel		
	Cable Length	5m		
Control box	Ingress Protection Code	IP44		
	I/O Interface	24 DI, 24 DO, 2 AI, 2 AO		
	I/O power supply	24V 3A		
	Communication	3 Ethernet, 1 RS485, TCP/IP, MODBUS TCP/RTU, EtherNet/IP, Profinet		
	Power supply	90-264VAC, 47-63Hz		
	Operating temperature	0 °C-50 °C		
	Humidity	90% RH (non-condensing)		
	Dimension of control box	505mm x 432mm x 257mm		
	Weight	15kg		
Material	Aluminium, steel			
Teach Pendant	Display dimension	12.1 inch		
	Resolution	1280 × 800		
	Material	Aluminium, plastics		
	Weight	1.5kg		
	Cable Length	5m		
	Ingress Protection Code	IP54		

Model	CS63	CS66	CS612
Operating temperature	0 °C-50 °C		
Humidity	90% RH (non-condensing)		

ELIBOT
 COLLABORATIVE
 ROBOT



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