

Passion Road.

How Mitsubishi Electric successfully adapted their new range collaborative robots to the challenges of the Asian market

When research suggested to us that collaborative robots, originally designed for manufacturers in Asia and Japan, had been more of a hit in the mature European market, but had struggled to gain adoption in the Asia/Japan market, it was time to address some key issues that had been thrown up. The study showed clear differences between the markets, as outlined in the table below.



	Europe	Asia including Japan
Differences in human cost	Higher employment costs make management reluctant to hire more people and more willing to introduce collaborative robots.	Lower employment costs make management reluctant to utilize collaborative robots over people.
Differences in robotics know-how	Long-term interest in robotics has helped to embed robotics utilization know-how in many European companies.	Robotics utilization in Japan has been limited to large enterprises with sufficient engineering expertise. Robotics has been difficult to establish in SMEs with comparatively few specialist robotics engineers.
Differences in thinking	While collaborative robots have not been cheap they were introduced at a range of manufacturing sites for customers who would otherwise lack full-time engineering expertise.	In mid-sized companies that lacked robot engineers, barriers such as system design and start-up and costs became a bottleneck, making introduction limited.

"We concluded that with different market backgrounds and conditions, we simply won't qualify for the European method," said Keiichi Sato, Robot Technical Center, Robot Manufacturing Dept., Nagoya Works, Mitsubishi Electric.

We also had to address these further challenges emerging from the survey:

- How can robots replace people in the Asia region, where labor costs are relatively low?
- How can robots be introduced to Japanese SMEs, where there are relatively few specialized robotics engineers?
- How can introduction costs be kept low for SMEs vulnerable to labor shortages?
- How can we use the reliability of our collaborative robots to differentiate ourselves in Europe?



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Collaborative robots are not just an extension of industrial robots

At our Policy Meeting of June 2017, it was broadly agreed that collaborative robots were actually much more than just an extension of industrial robots. At this point, we decided to embark on development of a prototype for the International Robotics Exhibition in Tokyo – happening in just three months' time.

Safety at all costs

Safety is a huge consideration – and one that makes collaborative robots significantly different from conventional industrial robots. With robots operating within the operating sphere of workers, we considered it essential that we develop a mechanism based around international standard ISO/TS15066, ensuring conflict with people could never occur. Key to this challenge was to develop a sound understanding of potential risks between 'moving people' and 'robotics'.

User-friendly programming tools

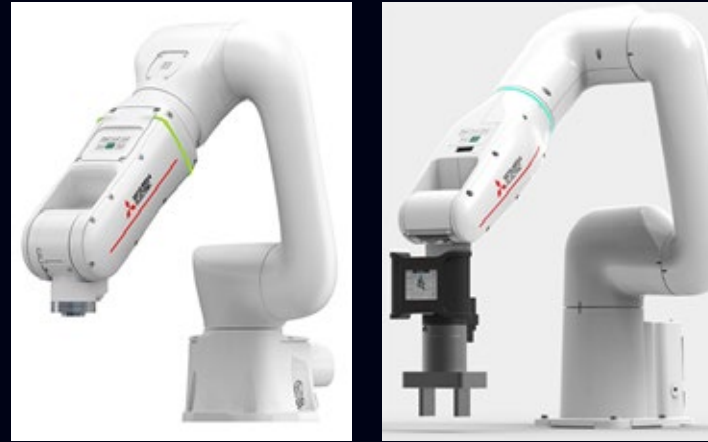
We also saw it as essential that anyone should find it easy to learn to control the robots – via programming tools which are conscious of consumer design and which can be accessed via touchscreen or operated via voice-recognition.

Teaching attachment

Much thought was needed on the area of teaching. Although this could be offered via button operation at a terminal, it could never be as satisfactory as giving people the ability to move the arm of the robot by hand. Our eventual answer was to develop a removable 'teaching attachment' sandwiched between the robot arm and the hand – which would then have both functions.

International Robotics Exhibition, November 2017

"As a developer, I want to listen to customers' voices and directly feel their evaluation of the products we made." said Daisuke Terada, MELFA ASSIST Team Leader. However, at the International Robotics Exhibition, our prototype received a mixed response. While the programming tool RT Visual Box was very well received, the same could not be said of



MELFA ASSISTA (left) and prototypes with teaching attachment in 2017 (right).

teaching attachment. It was pointed out by many interacting with the robot that it stopped the folding arms moving freely and also that when the arms moved up, the screen could become difficult to read. We therefore made the decision to discontinue the attachment's development. And so, at last, in October 2018, specifications of the co-operative robots were finalized.

Overcoming a weight issue

The engineering sample for was completed in June 2019. Objective evaluations by distributors and users made one point very clear to us, however. Everyone said it felt heavy when they moved the robot arm during direct teaching. Riku Sugawara, from Nagoya Works Robot Section undertook further face-to-face research and commented "We had to understand the situation from the customer's point of view. And you cannot do this without asking people."

"The problem was the theoretical value calculated on the desk did not match the measured value of the robot." said Rintaro Haraguchi, of the Robot System Group. The reason for this became obvious – we had not made enough use of torque sensors which could accurately calculate the force needed to assist without being affected by friction. Eventually, the problem of weight was solved by calculating the load from the current value of the motor.

MELFA ASSISTA: The official launch

In May 2020, MELFA ASSISTA was officially launched in Japan, against a strong prevailing headwind which was at that time affecting all industries, not just the manufacturing industry – the Covid-19 pandemic disaster. Even with all of the issues surrounding that, we had made a very good beginning indeed.



MELFA ASSISTA "Direct Teaching" instructions can be easily entered using the key pad at the top of the arm.



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*Daisuke Terada,
Team Leader of TEAM MELFA ASSISTA.*



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*Riku Sugawara,
Sales Department, Robot Section, Nagoya Works.*

Since the time of launch, the easy-to-use functions of MELFA ASSISTA have begun to attract many companies in the Japanese small and medium-sized manufacturing industry – enabling them to overcome many of the market issues mentioned at the outset.

The passionate developers of Team MELFA ASSISTA continue to drive towards an ever-developing future of human-robot collaboration. ■