

By Leo Simpson

While manufacturing in Australia is subject to unrelenting pressures from high labour costs and a somewhat elevated currency, the picture in Asia is radically different. That is particularly the case in Taiwan which has a booming electronics industry with thousands of companies turning out a mind-boggling range of products, ranging from simple items like plugs and sockets to the most complex, like computers and semiconductors.

o company typifies the scene better than Taiwan Semiconductor Manufacturing Company which had a net revenue of \$35.4 billion in 2015.

A large number of American and other western technology companies have manufacturing plants in Taiwan, together with often-bigger plants in mainland China.

But while many of the western high-technology companies have a big presence in Taiwan, the country also has thousands of its own home-grown companies which are competing strongly on the world market and also servicing the needs of other electronics companies in Taiwan itself. And while the cost of labour in Taiwan is certainly lower than in the Australian market, no-one should be under the illusion that working conditions in Taiwan are worse than in Australia or that technical standards are lower.

That would be entirely wrong, as was confirmed by my recent trip to Taiwan. In that brief visit, I joined a group of journalists from other countries, at the invitation of the Taiwan Trade Commission, as a preview to Taitronics, the Taipei International Electronics Show, to be held between October 6-9, 2016 (<u>www.taitronics.tw</u>). In three days, we made plant inspections of eight companies, some which are represented in Australia.





To say that these plant tours were an eye-opener would be an understatement. These plants are very modern, with highly qualified engineering staff, the very latest in manufacturing techniques and highly trained and motivated assembly line workers.

Nor would the very small sample of firms we visited be likely to give an unduly rosy picture. As I criss-crossed Taipei and also visited Taichung City over five days, it was abundantly clear that a large majority of manufacturing facilities in Taiwan are very large and modern.

In fact, to give an idea of the high standards involved, most of these plants we visited were fully air-conditioned and we had to don protective head and footwear before we were admitted to the factory floors. This was not to protect us – it was to avoid tracking dirt into their very clean plants. Furthermore, in some plants we had to don full plastic suits and go through air locks into clean rooms.

The eight companies visited, in chronological order, were Chroma Ate Inc; Good Will Instrument Co, Ltd; Mean Well Enterprises Co, Ltd; Excel Cell Electronic Co, Ltd; Geosat Aerospace & Technology Co Ltd; Printec H.T. Electronics Corp; Kinsun Industries Inc and Tenmars Electronics Co, Ltd. Some of these will already be familiar to SILICON CHIP readers, such as Good Will and Meanwell but most of the others are probably unknown, even though their products could well turn up in equipment sold in Australia.

Chroma Ate Inc (<u>www.chromaate.com</u>) was the first company we visited and it has more than 1900 employees spread across two production facilities. They have a diverse product range which is broadly split into a video range, mainly centred around comprehensive testing of flat panel displays; and their power electronics range, mainly devoted to load testing of large batteries, chiefly those used in electric vehicles.

Geosat Aerospace

This company is based in Taichung City and the tour group travelled





there from Taipei on the very impressive HSR train which made short work of the 170km trip between the two cities, reaching speeds up around 290km/h (Australia – eat your heart out!).

Geosat (<u>www.geosat.com.tw</u>) specialises in the manufacture of relatively large multi-rotor helicopters and fixed wing UAVs (drones). Typical of the multi-rotor designs is a hexacopter with a take-off mass of 9kg and a payload of 1.5kg, mainly intended for mapping and surveying.

Much more impressive was their unmanned helicopter which has a main rotor diameter of 1.9 metres, a maximum take-off mass of 20kg and a payload of 13kg. And the motive power? A single out-runner brushless motor with a high capacity Lithium polymer battery pack.

It is mainly intended for crop spraying but since it is surprisingly quiet, it could have quite range of other interesting applications. Its maximum flight duration with that payload is 30 minutes.

Compared with conventional piloted helicopters or fixed wing

aircraft, the Geosat helicopter would have considerable advantages for crop dusting. No doubt they could have precise GPS way-points for spraying paddocks and the fact they can safely fly much lower than piloted aircraft would mean less over-spray onto adjacent paddocks and crops.

In fact, they could fly all day on farms, provided their battery packs could be changed over quickly. And since they can take off and land directly on the paddock, that means that hazards such as high voltage power lines should be far less of a problem. The whole concept could revolutionise crop spraying.

Geosat also have two fixed wing UAV designs, with wing spans of 3 metres and 3.8 metres. The smaller plane has maximum take-off weight of 24kg, 105km/h cruise speed, 145km/h maximum speed and a ceiling of 4000 metres. Its payload is 6kg and its twin-cylinder petrol engine has an endurance of four hours and a range of 350km. The larger model has a maximum take-off weight of 40kg and double



Power supplies on a heat soak cycle at Mean Well. **Considering that** each power supply is connected to a programmed electronic load, this room must have been using lots of energy. which would place a even bigger load on the air conditioning system. Funnily enough, the English sign above the doorway to this room was "Burning Room". There was no evidence of escaping smoke!

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the payload at 12kg. It also has double the endurance and its range is 800km. Both use a pusher propeller.

Good Will Instrument Company

This company's oscilloscopes would be familiar to many readers of SILICON CHIP although they are now branded as GW Instek; same company, different name (<u>www.gwinstek.com</u>). As well as oscilloscopes, they make a large range of other test equipment such as arbitrary function generators, spectrum analysers, signal generators, LCR meters, digital multimeters and so on. Again, their plant was large and modern but we did not get to the factory floor.

Mean Well group

One Taiwanese electronics company which is certain to be wellknown to many readers is the Mean Well group (<u>www.meanwell.</u> **com**) ranked sixth in the world as a manufacturer of switchmode power supplies, chargers and inverters.

They make a wide range of switchmode drivers for LED lighting of all types, including indoor, outdoor and street lighting. In fact, they manufacture an astonishingly wide range of supplies with power ratings up to 24kW – that's not a mistake! By contrast, their inverters range up to 5kW – quite modest in comparison.

Our party visited the headquarters plant in Taiwan but there are a number of other plants in Taiwan and China, with a total staff of about 2500. The production lines we saw were dedicated to relatively modest power supplies with ratings up several hundred watts.

The production lines were quite conventional in their layout and operation and would be typical of the lines in thousands of plants throughout the world. The PCBs use mainly SMDs (surface mount devices) for the smaller components and through-hole types for





the power semiconductors, transformers, chokes, capacitors etc.

Every supply goes through a range of quality control tests before being packed and a sample of each production run goes through heat-soak tests, as depicted in one of the photos in this article.

A particularly interesting plant was that for Printec HT Electronics Corp. (<u>www.printecht.com.tw</u>). They make a large range of medical sensors and membrane switches, along with touch panels and flexible and rigid PCB assembles. This plant really gleamed, with large machines running continuously and many of the processes carried out in clean rooms.

Kinsun Industries Inc (<u>www.kinsun.com</u>) is a large manufacturer of all sorts of connectors and microwave antennas but I really did not expect to see much of interest. I was certainly wrong on that point.

They have so many processes for making connectors and they are pushing the technical boundaries in so many areas. For example, they are developing a range of connectors and microwave antennas to meet IP69K (IP stands for ingress protection or International Protection Marking), with potential applications for use in cars and high speed trains which will be subjected to rain storms at very high speeds.

Naturally they had a very comprehensive laboratory and testing installation, including a large anechoic chamber for testing microwave antennas. But it was the plant itself that really impressed with countless presses working at very high speeds thumping out streams of parts for tiny connector.

Interestingly, they made all their multi-stage dies in the same plant and they had very fancy machines to make the various cutting tools in those dies. One of those machines is pictured above.

All told, this was a whirlwind tour and really only a small glimpse of the huge range of manufacturing in Taiwan. Would I go back to see more of Taiwan and its high-tech plants? Definitely.

