

Radiation processing enables small businesses to enter global value chains in Malaysia

By Miklos Gaspar



Cables such as these produced at Wonderful Ebeam Cable will be used in the engine compartment of cars. They are made heat resistant and fire retardant using irradiation.

(Photo: M. Gaspar/IAEA)

“By using radiation technology, we have been able to improve our product line and meet the requirements of the car manufacturers.”

— Ir Chan Chang Choy, Managing Director, Wonderful Ebeam Cable Sdn Bhd, Malaysia

To maximize the benefits of globalization and increase their revenues, many small and medium-sized businesses (SMEs) would like to join a global supply chain. Meeting the quality requirements set by the multinationals that head these value chains is often tough for SMEs operating on shoestring budgets. The country’s nuclear agency, Nuklear Malaysia, is doing its bit to help.

Thanks to the support of Nuklear Malaysia, Wonderful Ebeam Cable Sdn Bhd has become the first SME in the country to supply cables to Malaysia’s booming automotive sector. “By using radiation technology, we have been able to improve our product line and meet the requirements of the car manufacturers,” said Managing Director Ir Chan Chang Choy. “This has allowed me to grow my business and increase the workforce.”

Owing to the high temperature in engines, cables that are used in the engine compartment of cars need to be heat and

flame resistant to make sure they, and the car, do not catch fire. To improve the heat resistance and flame retardance of the insulation of copper wires, their polymers need to be cross-linked, forming an extremely tightly packed network of interconnected polymer chains (see The Science box). Cross-linked insulation material increases the service temperature of the cables; for instance, from 75°C in the case of normal polyvinyl chloride (or PVC) to 100°C for cross-linked PVC.

Although cross-linking can be achieved using chemicals, the process requires high temperatures. The alternative, the irradiation of polymers, leads to the formation of permanent bonds between the polymer chains at room temperature — which requires lower operating costs.

No SME in Malaysia has the technology in place to carry out such irradiation, and banks are reluctant to provide loans for the purchase of irradiation equipment, Chang



Choy said. “These machines are expensive, and the banks do not accept the equipment itself as collateral because, as there is no second-hand market for irradiation equipment, they cannot sell it if my company were to go bankrupt.”

Nuklear Malaysia, however, irradiates the products of small businesses like Chang Choy’s for a small fee.

“The automotive industry has long been recognized as one of the key sectors towards the realization of Malaysia’s aspiration to become an industrialized nation by 2020,” said Zulkafli Ghazali, Director of Radiation Processing Technology at Nuklear Malaysia. “This requires domestic capacity in cable manufacturing.” Through this support, the nuclear agency is doing its part to support the Government’s SME Masterplan to accelerate the growth of SMEs and increase their contribution to the economy from 32% of GDP in 2010 to 41% by 2020.

Wonderful Ebeam Cable ships its products to Nuklear Malaysia’s irradiation facility three times a week. After a few days, the cables are returned, ready for the car companies.

Nuklear Malaysia is working with several SMEs in different areas of radiation processing — using ionizing radiation such as gamma radiation and electron beam to change the physical, chemical or biological characteristics of materials to increase their usefulness and value or to reduce their impact on the environment. It is most widely used to modify plastic and rubber materials, sterilize medical devices and consumer items, preserve food and reduce environmental pollution.

Nuklear Malaysia’s scientists have benefitted from various IAEA technical cooperation and collaborative research projects, through which they were able to perfect the technologies used in radiation processing by working with experts from around the world. “The IAEA helps turn global expertise into local expertise,” Ghazali said.

The IAEA helps Member States strengthen capacities in adopting radiation-based techniques that support cleaner and safer industrial processes. Nuklear Malaysia has participated in several such projects and has been recognized, since 2006, as an IAEA Collaborating Centre for radiation processing of natural polymers and nano-materials.

THE SCIENCE

Radiation Processing

Radiation technology can be used to modify diverse materials. It brings about certain changes in their properties, many of which can be used in a wide variety of commercial applications.

Various radiation sources are used to modify materials, such as high-intensity radioisotope sources, electron accelerators of various energies, and the X-rays they produce. Radiation is also used for the grafting.

The main commercial application of the technology is the cross-linking of polymer chains, used in producing wire and cable insulations, car tyres or natural rubber latex for medical items, such as gloves. This method achieves superior material properties without the need to use toxic chemicals.

A cross link is a bond that links one polymer chain to another, resulting in changes in the polymers’ physical characteristics. For instance, when cross links are added to long rubber molecules, the flexibility decreases, the hardness increases, and the melting point increases as well.

Other worldwide commercial applications are heat-shrinkable tubing, food wraps and self-regulating heaters. Cross-linked water-soluble polymers, also known as hydrogels, are commercialized for wound dressing, specifically for burn wounds and diabetic ulcers.