The insourcing pioneer

Uni-Solar's thin-film roll-out modules are assembled in the plant in Tijuana, Mexico. This picture shows the finishing process.

Photos (3): Uni-Solar

Proximity to California, low cost production and highly skilled workers are the three selling points for Tijuana, Mexico, to attract global businesses – among others also photovoltaic business.

Tijuana is bordering San Diego back to back and has been growing a work force of more than 180,000 skilled workers, since the NAFTA free trade agreement in the early 1990s suddenly spurred up the industry. More than 600 so called maquiladoras, sub-contracting factories of global companies, with a direct and indirect work force of 640,000 people are the pioneers of the outsourcing business. After convincing industries like aerospace, automotives, medical and electronics brought growth to the region, the local business association now wants to expand further in the renewables and sustainable sector.

High industrial energy consumption

"Clean energy is not an option, it's a requirement," says Javier Martínez Luna, president of the "Asociación de la Industria Maquiladora y de Exportación de Tijuana" (AIM), an association which combines more than 600 maquiladoras in Tijuana, the biggest cluster in all of Mexico. "In 2009 the maquiladoras consumed 60 % of the electricity," says Martínez Luna, "and they are the cause of more than half of the CO_2 emissions. The other 40 % come from transportation, and that's again related to maquiladoras, because 650,000 people have to be moved around to get to work every day." This was reason enough for AIM to put out a pledge to reduce CO_2 emissions on a voluntary base, working together with governmental agencies to educate people, clean up the pollution and plant trees.

A sub-group of AIM, Valle Verde, was founded to promote an ecological culture of thinking and acting not only inside the maquiladoras but also to spread knowledge among the younger generation into schools and universities. One initiative is to help its members invest smartly in low and no emission bus transportation to offer to their workers. By promoting sustainable thinking in their action, Martínez Luna wants to turn the region with a big CO_2 footprint into one of the greenest industrial areas in the world. That way he hopes to make Tijuana a convincing site for global renewable business leaders to expand to.

"Tijuana has more than 40 years of experience in manufacturing," says Flavio Olivieri, Executive Director of DEITAC, which stands for Tijuana Economic Development Corporation, a non-profit industry organization to help attract businesses. In a calculation comparing a US and a Mexican site with 140 employees, DEITAC shows not only costs savings of

US$ 2.35 million per year, but also 20 % more production hours, due to a 48 hour work week in Mexico.

Maquiladoras have been critized for exploitation of cheap labour and unsafe working conditions, being the polluted backyard of the developed world. On the other hand Mexico has been implementing minimum wages, and social benefits, like paid vacation, health insurance and a doctor on site. “Regarding costs for labour, we can compete with China, but geographically we are much closer to the potential markets, like the US, and have free trade agreements with many countries in the world,” says Olivieri. After Tijuana lost the monopoly of the plasma TV production to Asia, the town picked up only more momentum, to spread out and discover new markets, like the renewables business.

Solar pioneers from Japan and the US

The solar industry is not that new to the region. Two global players established manufacturing facilities in Tijuana over two decades ago: the Japanese company Kyocera came in 1987, to design, engineer and build multi-crystalline photovoltaic modules in Mexico, and expanded in 2008 from 35 MW to a capacity of 150 MW projected to be reached in 2011. Kyocera also announced plans to open production in San Diego this year. United Solar Systems (Uni-Solar) settled in Tijuana in 1992, when founder Stanford Ovshinsky, who developed the thin-film roll printing process, decided to start a 500 KW PV line.

Right across the border, the Spanish PV company Siliken opened a production line of 12 MW output in San Diego in May 2008, which grew to 30 MW annually. The site is close enough to hire a good mix of Mexican and Californian skilled workers, and to build business with local developers in Baja California. Thousands of Mexicans cross the border every day and seek work in the US. By producing PV on US ground, Siliken, just like Kyocera, opened a big market segment of governmental installation, which will grow to a large scale in the coming years.

The lamination process – all in all the turn around time of a module is two hours, according to Uni-Solar.

A 130 kW photovoltaic installation, made in Mexico, was installed in November before the opening of the UN climate change conference on the roof of the conference center at the Moon Palace Hotel in Cancun. The installation was led by Enel Green Power using Uni-Solar technology. The installation was supported by the Italian Ministry for the Environment and SEMARNAT, the Mexican Secretariat of Environment and Natural Resources.

The United Solar Systems' Mexican division started with a 300 m^2 plant in 1992 and has outgrown its facility twice. In 2007 the company moved into a 30.000 m^2 plant with now up to nine interconnection (IC) lines running 24 hours, 7 days a week producing 130 MW thin-film products or 1.1 million solar module units per year. 200 associates work on schedule of a 12-hour work day–4 days on/3 days off. "We are certified annually by various international agencies, like UL, CE, TÜV, and Intertec," says Armando Sanchez, Uni-Solar Plant Manager.

Interconnection and lamination

The Mexican plant gets flexible modules, triple-junction amorphous-silicon thin-film, from the US plant in Auburn Hill, Michigan, which are shipped stacked in boxes, each module a little bigger than US letter size. In the Tijuana plant the modules are lined up, run through the interconnection line and get laminated; the functionality is tested and classified for different efficiencies. The turn around time for one module is two hours, says Sanchez.

By customer request, some modules come with a double-sided tape to attach to the roof. Uni-Solar since 1995 has been specializing in flexible rooftop modules and completely given up on framed products. The newest product line is the shingle module, which not only looks like a shingle, but can replace them on roofs and produce electricity. The biggest markets for Uni-Solar are Germany, France, Italy and Spain (70 % Europe) followed by the US, South America and the rest of the world (30 %).

Plant Manager Sanchez is very proud of his 750 workmanship, 200 in each shift: "All of our associates are certified. Through a bonus system, workers are rewarded for high quality and yield on top of their normal pay," says Sanchez. His company provides free transportation to work and home, additional health care, like dental and eye exams for the whole family, has a doctor on site and offers childcare, when children get sick. Because mandatory education in Mexico goes only up to the age of 14 years, workers often don't have a high school degree. Uni-Solar hired a teacher and offers its workers to study after work. After taking the high school exam, the worker is eligible for intercompany education to climb up the ladder to an operator position.

Another aspect of good work spirit, explains Sanchez, are suggestions to improve the work flow of the manufacturing process, coming from his own staff. Certain steps in the production process are either physically very hard or very repetitive, so the management is open for suggestions to automate them. Sanchez, while leading a tour through the plant, explained various short-cuts to alleviate labour, save time and improve quality, all thought out by associates on the floor. One of the improvements is a video observation system installed in the warehouse focusing on shelf units. One warehouse worker, instead of having to cruise around miles and miles of warehouse floors during his shift, observes the shelf units via camera, and when certain materials run out, he orders new material to restock the shelf.

During the economic downturn the Tijuana plant offered workers who they had laid off a temporary 90 % pay to stay available to be rehired. "We invest so much in our workers, we did not want to lose them. We want people to grow with us." By the end of this summer, Uni-Solar announced to rehire 200 workers.

Presence in the US market

The main reason for the Spanish company Siliken Renewable Energies to open a production line in San Diego was to "be present in the US market. It was the right time to be here," says Francisco Molla, USA Division Coordinator. He counts the proximity to the

Mexican market as an advantage. When arriving in California in 2008, Siliken took advantage of the US tax credit, and pretty quickly announced expansion plans up to 100 MW, reaching 50 MW by 2009. At the same time being hit by the financial crisis, these ambitions slowed down, and instead shifted to the Canadian market with its stronger signs for immediate growth. But nevertheless, Molla is convinced, the "US is going to be the biggest market. We are going to stay. We have a long term strategy here."

Progress will happen

Looking at developments in the Mexican market, Molla sees high political efforts coming from the federal and local government, but also says that progress "is slower than what we thought. But it will happen." On the other hand, he is excited to watch the progress in construction of Valle Las Palmas, a sustainable city project near Tijuana. The master plan, which was announced in 2007, includes 300,000 houses for low and middle-income families starting at US$ 18,000 and is supposed to be finished by 2030. There will be schools, hospitals, a zoo, parks and a university campus, as well as light industry nearby. Two construction companies, Geo and Urbi, won with their designs and divided the 13,000 hectares site into two separate areas, which will slowly grow together. Both companies have been building thousands of low income units in Mexico, and Urbi was awarded various architectural awards for its innovative and sustainable design for Valle Las Palmas. Construction started this summer, and families began signing contracts in October. "This is very unique, and it's already happening," says Molla.

According to Geo, one of the construction companies, the plan also includes solar thermal units on roofs and a solar farm, but no partner has been announced yet. When it comes to the development of private rooftop photovoltaics, the generation of electricity can basically only be used for private needs, since the government owned electricity company CFE has no feed-in system in place. "Its easier to focus on expanding PV production and electricity export to the US," says Flavio Olivieri from DEITAC.

Even though Mexico announced efforts for CO_2 reductions of 50 million tons per year, and is investing in cleaning up pollution from cars and its industry, the real market growth in the clean sector is happening in the neighboring state California. "They have a 33 % goal of renewables by 2020," says Javier Martínez Luna, the President of the maquiladora association AIM, "and we are the answer to that." Rubenius, who recently announced to build a 1,000 MW energy storage facility in the Silicon Border science park, chose the Mexican site because of the market potential in California, according to Jacob Rikard Nielsen, Vice President of Business Development. After the first 50 MW storage are built, Nielsen says, Rubenius is also looking into Mexico to possibly expand manufacturing capacities to produce sodium-sulfur (NAS) batteries close to the site.

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