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## Italy: System Photonics, case study

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### About

Case study name:

[The greening of industries in the EU](#)

Country:

Italy

Organisation Size:

0-99

Sectors:

Energy

*System Photonics, established in 2009, is a new unit within the System Group, leaders in automation systems for the ceramic industry. The new operation produces photovoltaic panels by directly applying cells to ultra-thin large ceramics produced by another of the group's units, Laminam, which require less than a third of the energy input of a standard ceramic. The technical properties of the encapsulant ensure the panel is entirely recyclable at the end of its life. Currently, System Photonics directly employs 17 workers, five of whom were transferred from Laminam where they have been replaced. Thanks to a collaborative environment, transformed jobs display higher skills and better working conditions.*

### Introduction

In the second half of the 20<sup>th</sup> century, the Italian ceramics industry gained worldwide leadership and was overtaken in the 2000s to China in terms of quantity according to the [29th sectoral survey](#) carried out by the sectoral employers' association [Confindustria Ceramica](#). Around 70% of Italian ceramics were exported in 2008, with a €5.51 billion turnover and over 26,000 employees, 16,000 of which were concentrated the industrial district of Sassuolo. Italy's leadership in this sector focuses on technological innovation, short series and high quality design, thanks to the strict partnership with several engineering concerns such as the System Group.

The [System Group](#), established in 1970 in Fiorano Modenese, is one of the largest engineering groups in the ceramics sector, specialising in ceramics decoration, packaging and logistics. New solutions are usually developed in cooperation with local manufacturers. Currently it employs 1,300 employees with over €300 million of turnover, 5% invested in research and development.

The group includes three engineering business units (ceramics, logistics, packaging) supported by the electronics unit, and two manufacturing units, [Laminam](#) (established as an autonomous company) and [System Photonics](#).

Laminam was established in 2001 as a pilot manufacturer of large ultra-thin ceramics (3mm thick) based on internal patents. It has about 100 employees, mostly blue collar workers.

Sytem Photonics was established in 2009 and produces photovoltaic panels by putting photovoltaic cells on Laminam's ceramics. It has 17 employees and a €4.5 million turnover.

System Group is highly regarded by both local social partners and governments and renewable energy experts for both its innovations and its green business practices (GBPs): 'It displays that it is possible to innovate in a mature industrial district,' says the CEO of Solarexpo, the second-largest EU renewables and green building fair.

### Drivers and motivations

GBPs in System Group display an internal driver that is complemented by an external one.

System Group is a key partner of the ceramics manufacturers in its district, all of which have to cope with increasing pressure from environmental issues. Gas consumption (ceramics are fired at over 1200°C) and trucks transporting both clay and packaged ceramics are the main production costs and also cause considerable carbon emissions. Gas consumption still accounts for 25% of total costs, even though this cost has declined by 57% since 1980, according to the [EMAS](#) district certification launched by Confindustria Ceramica.

The core idea is that ceramics is just the 'skin' of products such as the photovoltaic panel. The thinner the skin is, the more can be sent by truck, thus proportionately reducing storage and transport costs and, more importantly, inputs of clay and gas. The engineering problem in achieving the thinnest possible ceramic skin was twofold; how the standard 11 mm thick ceramic could be reduced while preserving its mechanic properties (resistance to loads, atmospheric and chemical agents), and how to set up reliable manufacturing processes.

As local manufacturers displayed little interest in this product, in 2001 the System Group established Laminam to produce large surface ceramics (as large as 1 m by 3 m) just 3 mm thick (thus reducing inputs and emissions by 8/11) and to cut them to the customer's specifications. However, the Italian construction supply chain, including architects and designers, gave this innovation little attention until the 2007–2008 leap in oil prices.

The external driver is dominant for System Photonics' photovoltaic panel. The 2005 Italian regulatory framework for renewables set clear rules for bi-directional flows in power production and consumption ('conto energia', power account) for small panels with less than 20 KWh. This included considerable incentives for their production, and a further premium for power generated by photovoltaic plants placed on buildings with reduced energy needs. Over 12 photovoltaic units were installed from 2005 to 2010, thus making Italy in 2010 the largest EU market, favoured by ad-hoc banks loans with a nine-year repayment term. These incentives were cut in 2011. Reduction in demand was amplified by banks' withdrawal of their financial support, thus affecting System Photonics too.

## Green business practices

The System Photonics photovoltaic module is supported by an ultra-thin drilled large ceramic sheet produced by Laminam electrical circuits, strings of photovoltaic cells in two sheets of transparent encapsulant – a PVB-derived resin – and protected by a tempered solar glass. These components are welded and, thanks to the properties of PVB, can be separated out at the end of its life and fully recycled. Similarly, components in modules failing the quality tests are easily retrieved and re-used.

Photovoltaic ceramics can be directly integrated into a building, offering better aesthetics than modules with a metallic frames which are difficult to recycle, especially low-cost and low-quality ones imported mainly from China. Photovoltaic ceramics can be installed directly on the roof beams instead of tiles, or can be employed as a thermal insulator on external walls. These characteristics make them eligible for the highest incentives in Italy.

System Group is just an engineering company which considers the performance of its equipment as its most powerful marketing tool. Both Laminam and System Photonics are intended to be pilot plants that can be shown to other manufacturers and hence System Photonics is close to the engineering units in order to make detailed feedback as efficient as possible and to make it possible to develop new technological solutions accordingly.

Both management and trade union officials are well aware that both products require a marketing strategy similar to ceramics manufacturing in order to fully exploit their potential. Unions have expressed some concern about both business sustainability and employment creation. Higher volumes, in fact, would lower the cost of the products. In the meanwhile, they seek the support of local government in encouraging the replacement of asbestos roofing sheets with photovoltaic panels.

## Anticipation and management of the impact of green change on quantity and quality of jobs

### Impact on quantity of jobs

Currently System Photonics has 17 employees. Before the cutting of government incentives, it had 21 staff. Five members of staff were recruited from Laminam in order to both develop their skills and to moderate a temporary decline in demand. When Laminam recovered, the vacancies left by the transferred employees were filled by new employees. A System Group technician provides full-time support to System Photonics for technological updates. When required, the technician coordinates a small team that varies in size according to the workload required. However, this engineering need cannot be considered as a job transformation since is part of the variety of tasks that characterise System group.

### The HR philosophy: focus on the whole process

The System Group has a strong reputation in the local labour market for its good work climate and focus on innovation that challenges individuals' creativity. The industrial district atmosphere plays a key role in this because of the constant and intense information exchange between enterprises and individual employees.

The System Group is very attractive to young people with technical secondary and tertiary qualifications because of its variety of products with superior performance. It promotes the development of their achievement competences, namely problem setting, initiative and problem solving. 'Here you breathe an organisational environment seeking products that offer something more,' is how the HR manager briefly summarises the company culture. Both ceramics manufacturers and engineering companies poach from System Groups' employees to meet their professional needs, especially in equipment regulation and engineering, moderated by informal agreements.

Laminam does not implement the standard manufacturer's approach of focusing on process optimisation. The product requires more attention (costs of non-quality for 1 m by 3 m ceramics are higher than for a 30 cm by 30 cm one) by leading plant operators to 'look more at the process as a whole'. It combines the (governed) engineering units' 'creative chaos', with a process for a quite standardised product, thus providing the 'right' approach for Photonics' key professional profiles.

The System Group insertion approach runs aims to develop employees' attention to both process, product and workmates at an early stage. New employees rotate extensively through the various jobs required by the manufacturing process in order to widen their skills, and to become accustomed to multi-tasking and taking responsibility for the whole process. Loose job profiles, such as 'regulating means tightening', the focus of supervisors on skills development, and a non-constraining pace of work are the main enabling features. As a consequence, teamwork is spontaneous and employees, once they have fulfilled their allotted tasks, look to see whether colleagues need support.

The System Group's learning organisation thus relies on the following principles:

- a variety of tasks both in manufacturing and in engineering;
- mutual support with a feeling of shared responsibility;
- extensive and bi-directional communication flowing along a flat hierarchy line;
- a climate of mutual trust that favours internal mobility among units, and fosters the feeling of job security.

High levels of well-being at work, with low turnover, are a 'natural' outcome, by reducing pressures for higher compensation, especially from technicians and professionals: 'Those professionally 'born' here own such characteristics, but they are unaware of what's outside; while those who have worked elsewhere appreciate our well-being at work,' summarises the HR manager, and this is echoed by both blue collar workers and the trade union officer.

Extensive collaboration and focus on achievement competences made any specific intervention to support GBPs unnecessary since workers had sufficient resources to anticipate any adaptation needed and find their balance spontaneously.

## Impact on quality of jobs: skills development

System Photonics is a pilot plant that is still evolving. It is composed of two sub-units, assembly and testing staffed by 13 employees, and finishing staffed by a further four employees.

Assembly is composed of two sections. The preparation of the panel along two parallel automated lines converges at the taping position, the only fully manual process, and re-lamination (heating of the panel in order to melt the glue). Adhesive tapes are then removed and the modules submitted to both a visual and functional check. Those displaying functional anomalies are re-opened by heating them, and non-functioning cells are replaced. The module is finally sent to the finishing unit and then packaged.

Professional profiles of the staff can be compared with similar ones in any ceramics manufacturing plant, such as Laminam. They include the plant conductor in charge of the preparation phase, the taper, the feeder, and the quality controller.

The key competences of the plant conductor include a deep knowledge of its functioning. This is gained by having supported fitters and technicians in the installation phase, which ensures timely and fast regulation in case of minor anomalies and the relaying of precise information to both maintenance and engineering. This has strategic relevance because the process technology is still under development. Further, the conductor shadows new employees in accordance with the learning process described above, in a similar way to Laminam senior conductors.

Tapers and quality controllers were previously ceramics inspectors and are usually women. Visual inspection is complemented with manual and cognitive tasks, which strongly reduce stress, feelings of monotony and overall fatigue. The taper has a key role, although their job is fully manual, intervening on product anomalies (particularly cell alignments and quality of welding) and thus strongly affecting product quality.

The feeder launches the re-lamination phase and oven download. During the day shifts, the feeder's role is to feed the preparation line, and to maintain the line when it is stationary during night shifts. When compared with a ceramics feeder, the profile of this job gains immensely in terms of both multitasking and multi-skilling, acting as the real system integrator.

All workers have wide discretion both in methods and in process regulation. They agree the most suitable methods in order to favour each others' activities. Formal training is limited to occupational health and safety issues, thus playing a complementary role in anticipating and managing change, while the most relevant part of their learning is the outcome of mutual exchanges about work problems they are facing.

## Impact on health and safety at work

The greatest perceived risk is cuts from cells and the sharp edges of the ultra-thin ceramics. However, operators always wear protective gloves and protective shoes, and act in a non-risky way and display good information levels. They are provided with an initial 16 hours' OSH training module. The main risk to which workers are exposed is noise from the washing station for both ceramics and glasses and an alternative location is under assessment. Ergonomic risks are quite low, thanks to the absence of any pre-assigned time cycle, and the alternation of manual and cognitive tasks ensures both variety and room to manoeuvre. Further, buffers between each station prevent time pressure when regulatory interventions are required. Required high levels of attention may generate psychosocial risks, especially stress but this is countered by workers' mutual support and the sense of performing meaningful tasks. Tapers and quality controllers display the most improvement in their working conditions compared to ceramics inspectors who have a highly monotonous position that requires high attention levels.

## Impact on other job quality dimensions

As discussed above, the System Groups' social compromise relies on job security combined with rich lateral career patterns, ensuring both meaningful tasks and a holistic approach to the ceramics supply chain, fostered by a calm work climate. The launch of new products opens some vertical career opportunities, although this is not the main motivation lever. When orders for System Photonics declined after incentives for renewables were cut in 2011, temporary agency workers' contracts were not renewed and some permanent employees were temporarily moved into other units, such as ceramics' choice and plant conductor in Laminam. Employees are therefore confident that innovation fuelled by massive research and development investment and product diversification would not pose a risk to their current employment, while their employability is high thanks to their above-average skills.


Finally, shifts are alternated on a weekly basis: 5am to 1pm, and 1pm to 9pm in preparation line and taping; 4am to noon, noon to 8pm, and 8pm to 4am for oven-control positions, Monday to Friday. These are the standard shifts in the district and model community life and social services. A satisfactory supply of good quality public childcare facilities, which characterises Emilia-Romagna, does the rest.

## Conclusions and recommendations

The main lesson from the System Group is the immense potential of a high-trust work environment based on collaborative approach in anticipating and managing both product and process innovation, and high motivation generated by promotion of achievement competences. This ensures high levels of well-being at work with a sound social compromise on the one hand, and active contribution to new challenges, such as greening products and technologies, on the other.

The System Group's GBPs show that its orientation to new solutions beyond the engineering aspects cannot be explained only in terms of intense partnership with manufacturers. It is strongly affected by the industrial district atmosphere where competitive challenges are shared by all stakeholders without separating 'economic' from 'civic' issues, including environmental impact. Thus, both cultural change and development of 'green' skills are mainly endogenous, while knowledge about the functioning of a photovoltaic plant, a quite widespread and relatively simple technology, is the only external input. Finally, the System Group's focus on achievement competences means that all transformed jobs, especially the least qualified, benefit from both skills development and improvements in working conditions.

## Annex

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