

Energy Saving Measures based on ISO 50001 at Augsburg Site in Germany

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The Augsburg site of Fujitsu Technology Solutions in Germany is actively involved in an environmental project focusing on energy savings. This project assumes the observance of international standards and the participation of company employees. Detailed energy analyses began in 2012 and are based on European policy and regulations on energy savings and international standard ISO 50001 for energy management systems (EnMS). Measures to reduce the amount of energy consumption established after the management department compiled the results of these analyses and gathered ideas from all employees led to a significant decrease in greenhouse gas emissions and costs. Specifically, by decreasing the amount of energy consumption, they reduced greenhouse gas emissions by more than 15% and the power consumption of most products developed and manufactured at this site by 20%. The latter is especially appealing to customers who seek energy saving performance in the products they purchase since a reduction in power usage represents a tangible benefit. This paper introduces energy saving activities based on ISO 50001 at the Fujitsu Technology Solutions site in Augsburg, Germany.

1. Introduction

The European Union (EU) has set a target for energy savings in the form of a 20% reduction in projected energy consumption by 2020.¹⁾ The EU member countries, meanwhile, have agreed on an energy efficiency target of 27% or greater by the end of 2030. The energy savings policy of the EU can be summarized as follows:

- 1) Mandatory energy efficiency certificates for buildings
- 2) Labeling system indicating minimum energy efficiency standards for products such as household appliances, lighting, and televisions
- 3) Rollout of smart meters for electricity and gas usage by 2020
- 4) Mandatory energy audits for large enterprises at least once every four years (unless ISO 50001 certification is acquired).

The EU Energy Efficiency Directive²⁾ is a common EU framework establishing targets for 2020 energy efficiency improvements. These are minimum targets that must be satisfied, but there are countries within the European region that are enacting stricter laws and

regulations in this regard.

The current trend in the EU is to promote efficient energy use to reduce costs, decrease dependence on oil and gas, and protect the environment. For example, the EU promotes the introduction of combined heat and power (CHP) systems to improve energy efficiency. The EU has also introduced energy labels³⁾ as an energy saving measure targeting products (**Figure 1**). These energy labels enable customers to choose products with low energy consumption and thereby save money. They can also encourage companies to develop and invest in energy saving products.

The Fujitsu Technology Solutions site in Augsburg, Germany, has been involved in the development and manufacturing of personal computers, servers, and storage systems since the 1980s. Manufacturing up to 13,000 product units daily, this site has about 2,000 employees in a variety of departments including procurement, development and testing, manufacturing, logistics, sales, service, and data processing.

The amount of electricity used at this site in 2012 was equivalent to that consumed by 10,000 typical

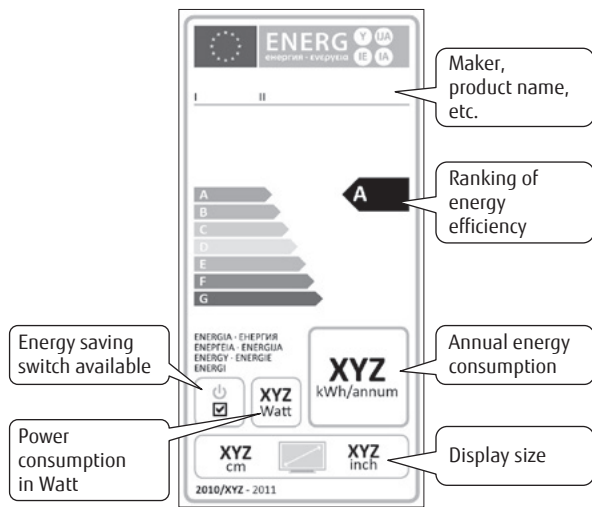


Figure 1
Example of EU energy label (for displays).

households in Germany, and the annual cost of this power increased from 1 to 4 million euro over a ten-year period. It was therefore decided by top management to analyze energy use and put a stop to this increase. A “Green Team” was established to promote this project.

In this paper, we report on this energy savings project and describe its activities with both environmental protection (reduction in greenhouse gas emissions) and cost savings in mind. This approach to saving energy at the Augsburg site can also be applied to improving energy efficiency, energy usage, and energy consumption at other organizations.

2. Achievements in energy saving measures (products and production systems) based on ISO 50001

ISO 50001⁴⁾ is an international standard for energy management systems (EnMS) aimed at helping organizations formulate processes to improve energy performance in terms of efficiency, use, and consumption. It is also aimed at reducing greenhouse gas emissions, environmental load, and energy costs through systematic energy management. This international standard can help organizations draw up an energy policy, set targets, and establish action plans. It is a guideline for making continual improvements based on the Plan–Do–Check–Act (PDCA) management cycle.

The Augsburg site of Fujitsu Technology Solutions

in Germany received ISO 50001 certification in 2014, the first Fujitsu Group site in the world to do so (Figure 2). This certification applies to all activities, from the design and manufacturing of information and communications technology (ICT) products and design of ICT solutions to service and data processing.

Energy saving measures based on ISO 50001 at this site were driven by the project’s Green Team and product managers, both of whom analyzed in detail the amount of electricity and gas used at the site and the power consumption of major products (desktop computers, displays, notebook computers, servers, and workstations) manufactured at the site. These analyses provided a basis for setting targets and introducing a mechanism for making periodic reports.

A variety of energy saving measures were established and implemented, leading to the following results for FY2016 compared with FY2013 (New target year of the Fujitsu Group Environment Action Plan, Stage VIII):

- 1) 21% reduction in greenhouse gas emissions at the Augsburg site (Figure 3),
- 2) Increasing of gas consumption, caused by Introduction of high efficiently Combined Heat and Power system (CHP) in 2015 (Figure 3),
- 3) 20% reduction in typical power consumption of desktop computers and displays, and 40% reduction at workstations (Figure 3), and
- 4) 80% improvement in energy efficiency (spec power) of FUJITSU Server PRIMERGY.

3. Energldeas: Energy savings competition for all employees

A competition called “Energldeas” targeting all employees at the Augsburg site on energy saving ideas was launched in 2014.

As a first step in this competition, more than 400 ideas submitted by employees from all departments were evaluated, and those deemed beneficial were put into practice. A guidebook with energy saving tips was also compiled as a subproject. All employees at the site could download this guidebook from an intranet website. A version of this guidebook was also prepared for our customers. It was warmly received, and a third edition has already been issued.

Next, an energy competition among the departments was held. The criteria for evaluating department

performance in this competition were number of ideas submitted, energy-related behavior of department employees, and energy consumption in the department. At the end of the competition, the winning department

received prizes.

Here we introduce some of the top ideas and measures implemented at the Augsburg site.

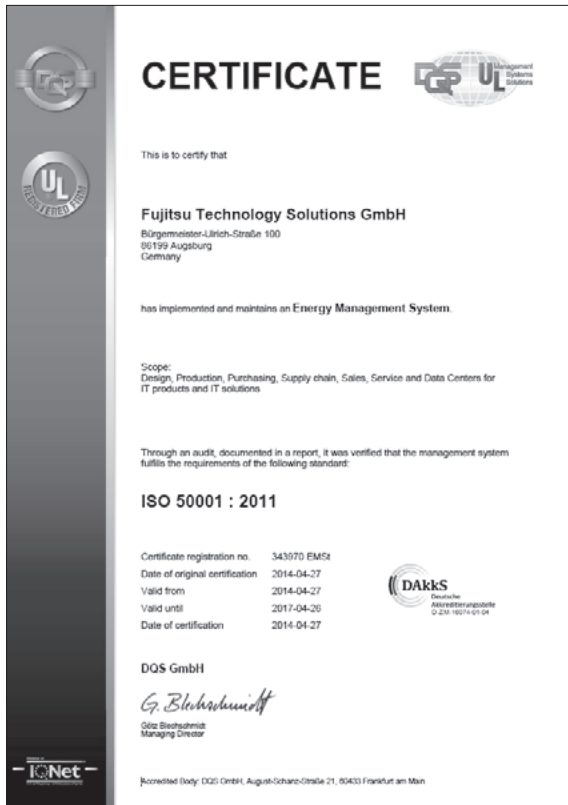


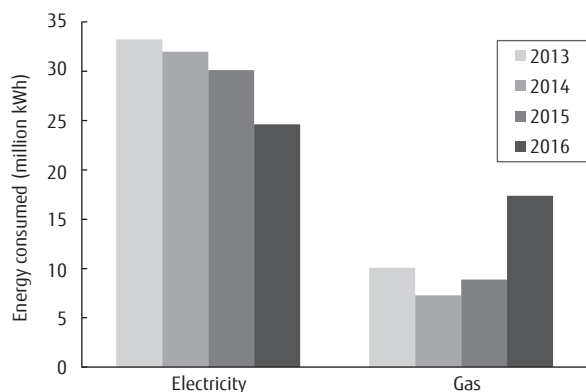
Figure 2
ISO 50001 certification.

3.1 Implementation of low-temperature soldering in electronic production of printed circuit boards

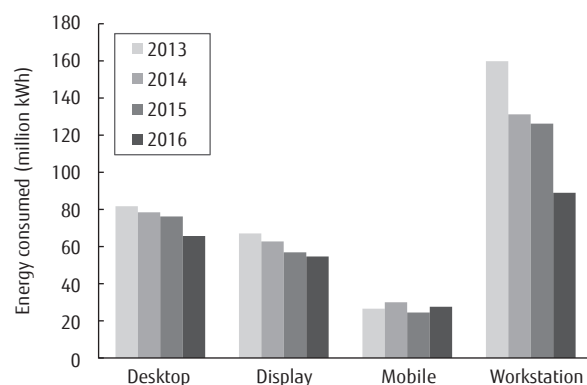
Introduction of a flow soldering process using low-temperature solder led to a 40% reduction in electrical energy usage compared with past processes. This process passes a printed circuit board on which electrical components have been manually installed (Figure 4) through a wave soldering machine (Figure 5) and solders those components in a non-oxidizing atmosphere consisting of nitrogen gas (Figure 6). The power saving effect of this process comes to more than 250,000 kWh per year, which is equivalent to approximately 140 tons of greenhouse gas emissions based on the German electrical power mix. This process also improves the quality of the printed circuit boards and cuts down the amount of waste in the production of electronic devices.

3.2 Introduction of measures for switching off in-house machines and devices

We have introduced up-to-date manufacturing equipment at the Augsburg site for the production of printed circuit boards, enabling daily manufacturing of approximately 10,000 units in a nearly totally automatic manner. For some of this equipment, automatically switching off the power on holidays, during break time, etc. can save energy.



(a) Energy consumed at location Augsburg site



(b) Power consumption by product based on Energy Star

Figure 3
2013 – 2016 Energy savings.

In addition, a very simple technique based on a proposal from a production team member was introduced as an energy saving measure for not only manufacturing equipment but also devices such as personal computers for controlling it. Specifically, one of the following labels is attached to each piece of manufacturing equipment and each device (including personal computers) so that production personnel can effectively switch off equipment and devices in accordance with current conditions or the state of operations and thereby save energy.

- Red: do not turn power off
- Yellow: power may be turned off after confirming that there is no problem in shutting off the manufacturing equipment or device
- Green: power may be turned off

These labels provide information needed by production personnel in deciding whether a machine or device should be turned off. The information is important in saving energy because it prevents problems such as disconnecting the power of a machine being used in manufacturing operations from occurring.

3.3 Reduction of ceiling lighting by more than 40%

The ceiling lighting on production floors was installed more than 20 years ago. Since then, the production processes have been upgraded several times to new systems so that some floors have come to be used for completely different functions. As a result, some floor lighting may no longer be suitable for the current

situation, so a survey was conducted on the basis of safety regulations with the cooperation of employees and the occupational safety officer.



Figure 5
Wave soldering machine.

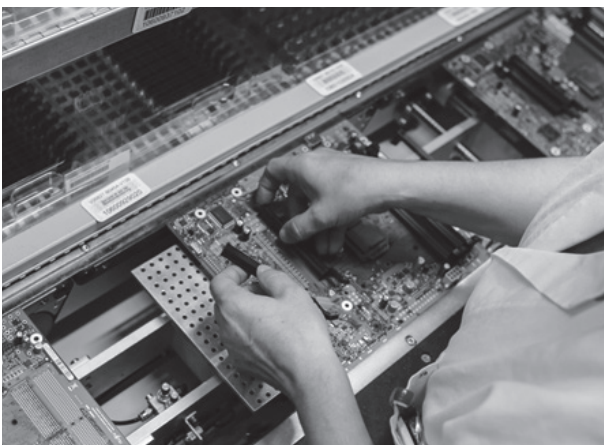


Figure 4
Manual placement of components on a printed circuit board.

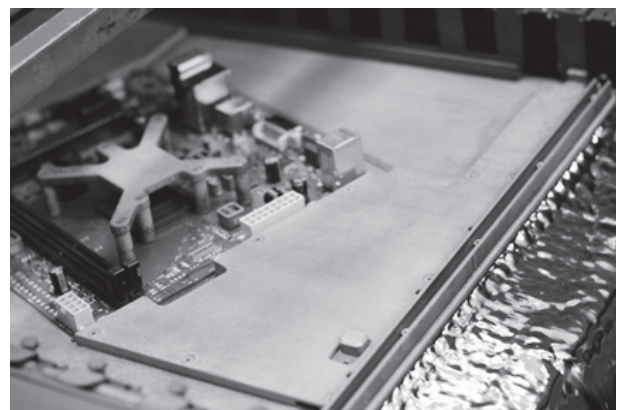


Figure 6
Wave soldering of printed circuit board.

The survey revealed that some of the floors needed new types of lighting or additional lighting and that more than 40% of the ordinary fluorescent lighting tubes installed on ceilings could be removed. As a result, energy savings of more than 40% was achieved on three of the site's four production floors. This is a significant savings considering that production lines run for 18 to 24 hours a day and up to six days a week.

3.4 Introduction of CHP system toward self-supply of heat and power

The annual environmental load at this site for the last few years came to about 30 million kWh of electricity and 10 million kWh of gas. In Germany, preferential treatment is given to off-grid, self-generation of power. A call for bids was made for locally supplying heat and power to the site so as to make the use of energy in site operations more efficient and to promote environmental activities. As a result, an on-site, gas-fired CHP system commenced operation at the beginning of 2016 (Figures 7 and 8). This system was implemented on a contractual basis, so no Fujitsu Group funds were invested. Calculations indicate that approximately 15% of electricity usage at the Augsburg site can be supplied by this CHP system, which has an energy efficiency of more than 85%, which is about twice that of a standard thermal power station in Germany.

4. Results of activities

Energy reports on the Augsburg site have been compiled and released since the introduction of the EnMS. Energy consumption figures are also released on the company's intranet so that all employees can

check the amount of power used per hour, per day, and per month at the site. Green Team members can also access power usage figures for each department and for each location or system that consumes power such as data processing systems, air pressure systems, and vacuum systems.

These energy reports provide quarterly information on CO₂ emissions, electricity and gas usage, and energy performance indicators. The goal is to improve energy performance including energy efficiency, energy usage, and energy consumption. The following energy performance indicators have been established mainly for those locations using large amounts of electricity.

- Power usage effectiveness (PUE) in data centers
- Electricity usage per manufactured component in the production process

The main achievements of the environmental project at the Augsburg site for the third quarter of FY2016 are summarized below.

- CO₂ reduction surpassed the new target
- The CHP system functioned properly
- Targets for FY2016, FY2017, and FY2018 were discussed and set on the basis of the Fujitsu Group Environmental Action Plan (Stage VIII).

5. Conclusion

We introduced energy saving activities based on ISO 50001 at the Augsburg site of Fujitsu Technology Solutions in Germany. Within three years, we reduced greenhouse gas emissions and energy consumption for manufacturing major products by more than 15%. Such a reduction contributes to environmental protection while providing benefits to customers. This



Figure 7
CHP in Augsburg.

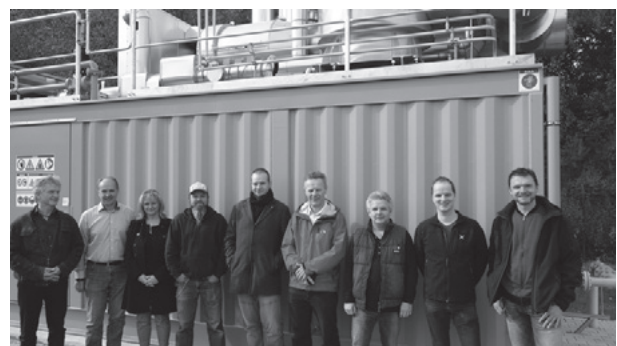


Figure 8
Energy team (in front of CHP station).

undertaking also helped to increase awareness of the Fujitsu brand through participation in a variety of activities such as the Augsburg ÖKOPROFIT Klub (ECOPROFIT Club) and the Bavarian Energy Prize competition. We also received the key project award from KUMAS,⁵⁾ a local network for environmental topics, for our use of low-temperature soldering. Our next important step for 2017 is to participate in a national energy efficiency congress in Bonn, Germany, where we plan to introduce “Energldea-Management–Employees as key for energy savings,” an initiative that we implemented at the Augsburg site.

As part of the project, we have already begun to replace tubular fluorescent lighting with LED lighting, which has the potential of saving 1 million kWh annually (50% of total electricity usage for lighting) at this site. We also introduced CO₂-emission-free clean electricity beginning 2017 in cooperation with Fujitsu asset management in Germany.

Another measure that can contribute to environmental protection is to increase our use of locally produced renewable energy based on photovoltaic power generation. This is a new challenge for us at the Augsburg site. There are also plans by “Idea Management” and the Green Team to start additional activities to support resource savings and biodiversity in relation to packaging, waste, and energy.

The ISO 50001 standard states: “Successful implementation depends on commitment from all levels and functions of the organization, and especially from top management.” This is also our aim in all future activities at the Augsburg site of Fujitsu Technology Solutions in Germany.

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Mr. Bernhardt is serving as the energy management representative regarding ISO 50001 at the Augsburg site in Germany from May 2017.



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Mr. Böttner has been serving as the energy management representative regarding ISO 50001 at the Augsburg site in Germany until May 2017.