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for a sustainable future

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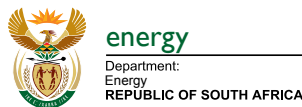
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Results and impact in the Automotive Sector

Industrial Energy Efficiency Project in South Africa







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Overview

The IEE Project was launched in 2010 and aims to contribute to the sustainable transformation of industrial energy usage practices in South Africa, thereby reducing carbon-dioxide emissions and pressure on energy resources, whilst demonstrating the impact of energy efficiency practices in terms of monetary and environmental benefits.

To achieve this, the project employs a holistic approach based on a number of key elements, or components:

- Encouraging the creation of an **enabling policy environment**;
- Supporting the adoption and promotion of **energy management standards** (ISO 50001);
- **Building local capacity** to implement EnMS and ESO in industrial enterprises, through specialised training courses and extensive in-plant implementation support; and
- **Demonstrating the potential and impact** of IEE on the bottom line and sustainability of a business through case studies, demonstration plants and awareness-raising.



Since 2011, the Industrial Energy Efficiency Project (IEE Project) in South Africa has assisted industry to **save over R 344 million** in energy savings through the implementation of **Energy Management Systems (EnMS)** and **Energy Systems Optimisation (ESO)** in **54** industry plants.

Services to industry

The IEE Project currently supports South African industry through a subsidised service model. Participation in the Project is at no cost to companies.

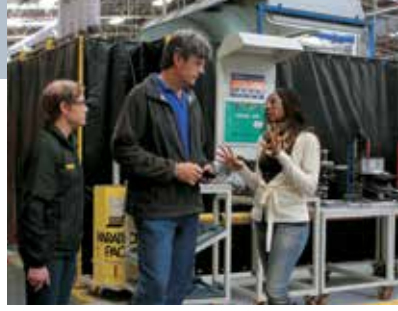
Energy Management System (EnMS) implementation

The IEE Project assists companies in developing and implementing an EnMS in line with the SANS/ISO 50001 Energy Management Standard, and support companies' efforts to achieve ISO 50001 certification.

Implementation takes place over a period of 9 to 12 months and can either be facilitated internally by the company with the support of the IEE Project, or by an IEE Project EnMS expert, with the company agreeing to serve as demonstration project to showcase the benefits of EnMS.

Energy Systems Optimisation (ESO) implementation

The IEE Project equips companies to systematically target selected systems within their processing facilities and interrogate their performance and effectiveness. Currently support is available for the optimisation of five energy intensive systems, namely steam, compressed air, fans, pumps and electric motors.



Did you know?

Component Optimisation vs. Systems Optimisation

The traditional **components** approach – analysing the performance of various parts or components of a system and addressing how to make these work better – typically results in an energy saving of between 2% and 5%, whereas evidence indicates that a **systems** optimisation approach – looking at how an entire group of parts or components functions together and how changing one will impact on others and the system as a whole – achieves savings of 10% - 50%.

Expert skills development to maximise energy efficiency

To ensure the development of skills needed to sustain energy efficiency in industry, training courses have been developed to train professionals in EnMS and ESO in a variety of industrial systems.

Training is presented at two levels: a technical advanced level offered in a two-day workshop format, and expert level training, which is completed over a period of months and includes theoretical and in-plant training, and an actual workplace implementation component. More details on the IEE project training is provided on page 12.



Private sector participation opportunities

In addition to the services already mentioned, industrial enterprises can participate and benefit from the IEE Project by becoming a:

HOST OR CANDIDATE PLANT

By allowing expert level training at their plants, companies are enabled to identify energy saving opportunities. In the case of ESO, participating companies receive a systems assessment report, compiled by UNIDO/NCPC-SA experts at no charge. They also qualify for the enrolment of two delegates in the advanced training programme and one in the expert-level programme at no charge.

DEMONSTRATION PLANT

Companies that choose to implement some or all of the recommendations from the assessment report have the opportunity to volunteer as a demonstration plant. The IEE Project will partner with the company to develop a case study on the implementation process and the energy savings resulting from it. The case study will be used on national and international communication platforms, increasing the visibility of the company.

The South African automotive sector: a snapshot

“ Developing countries, increasingly integrated into the global automotive value chain of global role-players, not only have to cope and incorporate the direct impact of the major global trends on their operations, but also have to compete with each other for sourcing and outsourcing opportunities.

“It is within this fast changing environment that many developing countries, such as South Africa, are seeking to create for themselves a role as producer of vehicles and automotive components. The South Africa automotive industry possesses unique qualities and a natural ability to add value to global strategies of parent companies and multinationals. South Africa’s attractiveness as an investment destination of choice and production base for products to be exported to global markets is increasing.”

Automotive Export Manual 2013

Trends

Global trends show that the automotive industry has improved. Annual production has escalated and profits for global original equipment manufacturers (OEMs) are expected to increase (*The South African Automotive Industry: An overview, B&M Analysts, August 2014*). While signs of recovery from the economic crisis are encouraging, some challenges still exist. These include regulatory pressures around emissions and safety, and increasing competition from emerging markets.

South African trends show that annual sales have escalated since 2012. Imports and domestically

produced vehicles continued to recover in 2013 but sales are far below those reported for 2006.

While exports remain the focus with production output increasing from 28% in 2005 to an estimated value of 54% in 2013, new vehicle exports in November 2013 showed a decline of 4.8% in comparison to the same period in 2012, due to industry strikes.

In general, the South African automotive industry showed modest growth in 2013 and the projected increase in export sales for 2014 bodes well for a positive contribution to the country’s economy.





Automotive sector significant

The potential of the sector to contribute positively to the South African economy has been recognised by government in various fora and has led to a number of initiatives set to strengthen the sector.

The first Industrial Policy Action Plan (IPAP) launched in 2007/2008, identified the automotive production sector as a critical segment of the economy. Contributing some 7% to South Africa's GDP and being responsible for nearly 12% of the country's manufacturing exports, the sector also holds great potential for job creation.

According to the Automotive Export Manual 2013 (produced by the Automotive Industry Export Council (AIEC)), some 65 000 people are employed in the component manufacturing industry, 28 000 are directly employed in automotive manufacturing and 200 000 people in retail and aftermarket activities.

Focusing initial efforts on the implementation of sectoral plans for automotives and components, IPAP undertook the design and implementation of an industrial upgrading programme, revised industrial financing mechanisms, reduced input costs through the implementation of a competition policy, and reviewed import duties on intermediate goods. The automotive industry remained a key focus sector in IPAP 2 (2010/11 – 2012/13), which addressed the scaling up of sector-specific interventions.

Even prior to IPAP and similar initiatives, the potential of the industry and the need for it to remain competitive in order to survive globally were recognised in a partnership between UNIDO and the Automotive Industry Development Centre (AIDC) in the early 2000s.

Known as the Tirisano Cluster Programme, the UNIDO-AIDC partnership aimed to raise operating efficiency at plant level. Focus areas included reducing waste and downtime, improving worker safety and strengthening teamwork among supervisors and shop floor workers.

One of the additional modules added to the Tirisano Cluster programme concerned cleaner production. Cleaner production training is provided by the National Cleaner Production Centre to help companies identify ways to save costs in energy and water, specifically.

The South African government has further corroborated the importance of the sector through a number of policy documents and programmes, including the Motor Industry Development Programme. This was succeeded by the Automotive Production and Development Programme in 2013 to further stimulate local production to 1.2 million vehicles a year by 2020 as well as increasing local content.

Increasing competitiveness

Gauteng, the Eastern Cape and KwaZulu-Natal are home to the bulk of the country's vehicle manufacturing activities with activities taking off in the Western Cape and North West provinces as well. The number of export destinations for vehicles and components is increasing. According to the AIEC, the number of export destinations for values in excess of R1 million has increased from 62 in 1995 to 130 in 2011 and to 152 in 2012.

The green economy has been a subject of discussion for some years and also featured strongly at the 2011 South African Automotive Week, held in East London. Here it was said that "South African automotive manufacturers have to adjust to the green economy if they are to survive."

With role players such as UNIDO and the NCPC, through the Industrial Energy Efficiency Project, and the commitment from vehicle and component manufacturers, some inroads – with significant financial and other savings – have already been made in support of a green economy.

The automotive industry in numbers

(source: Automotive
Export Manual 2013)

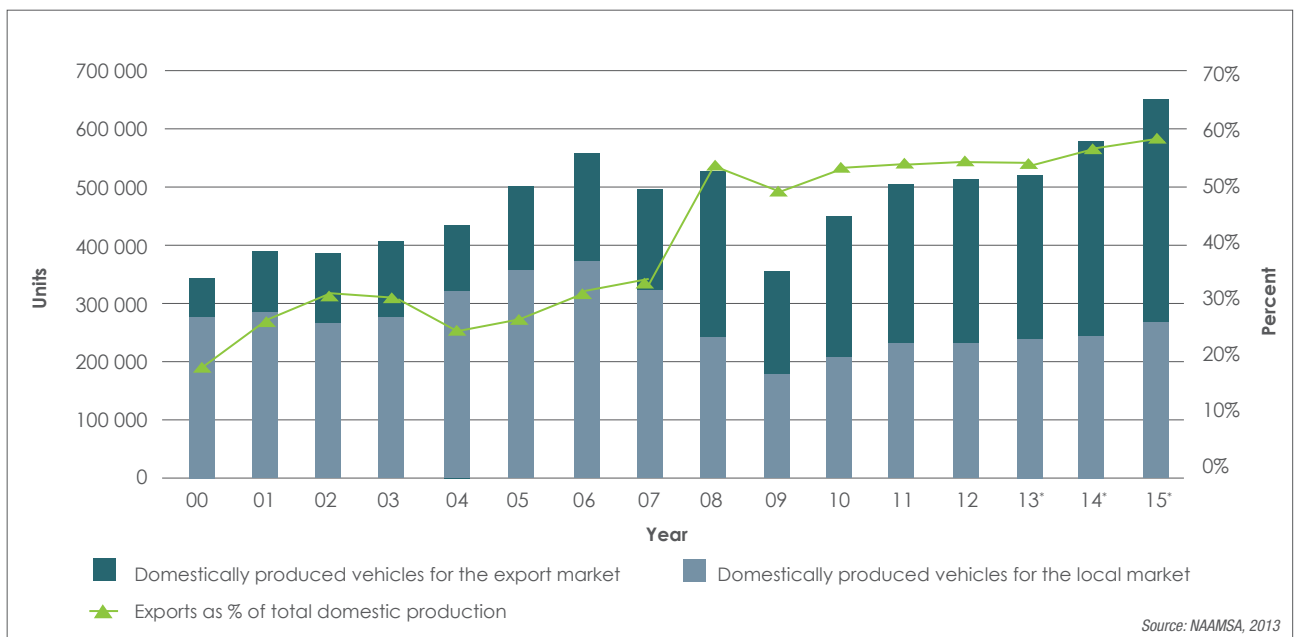
7%
GDP contribution

R48,6 billion
Capital expenditure by OEMs
from 1995 to 2012

25th
South Africa's
ranking in
global vehicle
production

10,61 million
Registered vehicles
at end of December 2012

6,11 million
Registered vehicles in 2012
comprised passenger cars



South African industry trends – vehicle production for domestic and export markets

167
Vehicle
builders

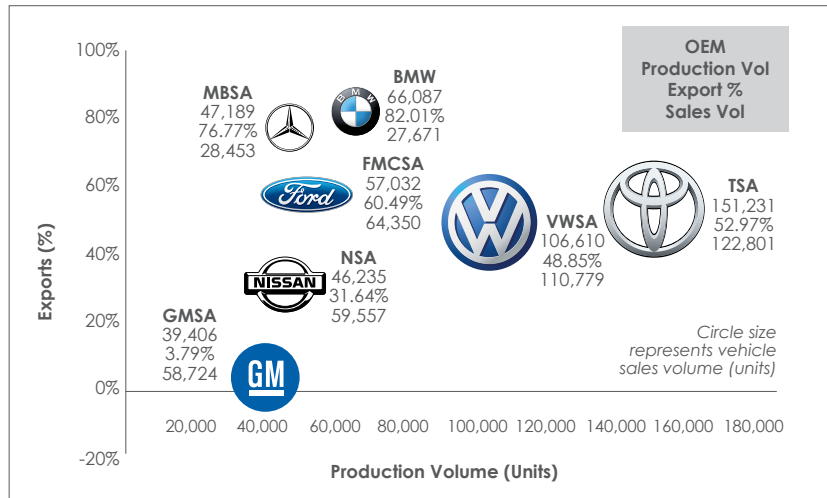
292
Vehicle component
manufacturers

1 374
new car dealerships

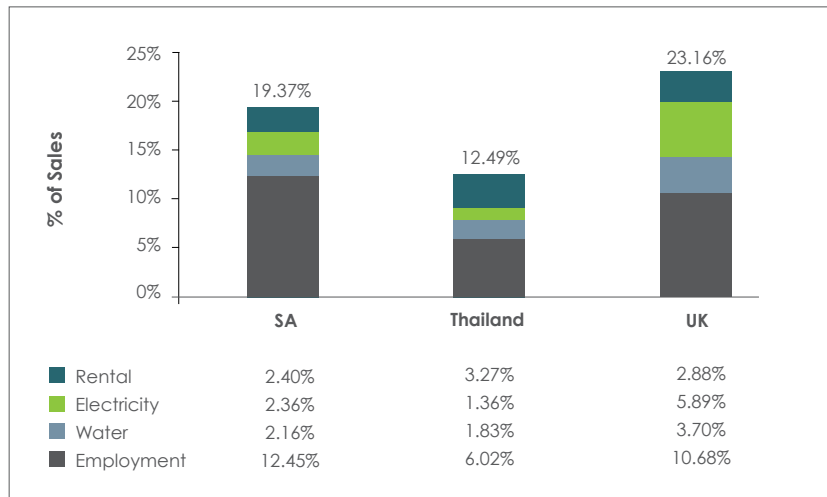
1 898
Specialist repairers

2 907
Parts dealers

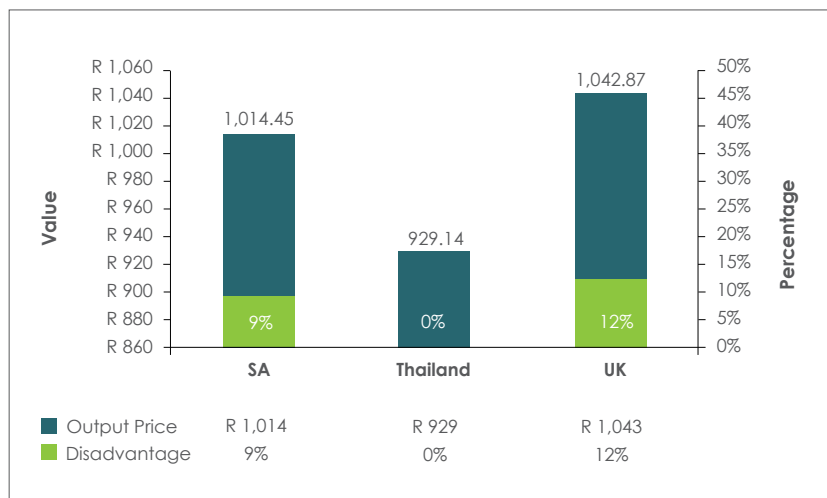
4 600
Garages and fuel
stations (with most
also offering service
workshops)



South African industry trends – South African OEM industry profile for 2013



Automotive component producers: Input costs



Cost competitiveness of South African component producers

The IEE Project's automotive journey

The Industrial Energy Efficiency (IEE) Project's journey in the automotive sector started in late 2010 when National Cleaner Production Centre staff and UNIDO engaged with automotive companies to participate in the heavily subsidised IEE Project.



Alf Hartzburg, national IEE Project manager

Alf Hartzburg, national IEE Project manager, remembers, "It was hard in those days because companies were sceptical, did not know anything about the project and were hard-pressed to deliver on their own initiatives."

The first awareness training sessions in Durban, Cape Town and Pretoria targeted senior management as it was clear from the start that for energy efficiency to be taken seriously and accrue the potential benefits, buy-in from management was critical.

It starts at the top

Hartzburg explains, "Management buy-in in action is critical. This translates, for example, in ensuring the energy manager's job description is sufficiently targeted to implement and manage energy plans. This must also be a key performance indicator (KPI) that devotes at least 20 hours a month to the EnMS. Energy KPIs are important for all managers.

"Managers can also demonstrate their commitment by walking the talk and by engaging staff. Switching off lights after meetings is one of the most obvious things to do and while it might not result in a big cost saving, it does have a big impact on effecting behavioural change."

Energy savings reported by participating companies in the automotive sector (as at March 2014)				
Company	kWh Savings	Rand Savings	Tonnes CO ₂ *	Energy Systems
Mercedes Benz	2 800 000	R 1 540 000	2 682	Compressed air system
Toyota SA*	33 300 000	R 18 315 000	31 901	103 projects
Precision Press	334 000	R 183 700	320	Compressed air and idle machines
Tenneco Emission Control	600 000	R 330 000	575	Lighting
Tenneco Ride Control	2 360 000	R 1 298 000	2 261	Oven, knives, induction geyser, VSD
Willard Batteries	5 600 000	R 3 080 000	5 365	Curing time, wet scrubbers, charges
Techniplate	840 000	R 462 000	805	Time switches and temp sensors to plating tanks
BMW	17 700 000	R 9 735 000	16 957	Paintshop ovens, driers
Feltex	2 600 000	R 1 430 000	2 491	Cooling comp, lights, idle machines
Johnson Matthey	9 400 000	R 5 170 000	9 005	Compressors, chillers, idle machines, ovens
Total	75 534 000	R 41 543 700	72 362	

*Toyota SA has reported on updated savings (June 2014) in the article on page 13



Potential Savings identified through energy audits in SMEs				
Sector	Rands/Annum	% (R/a)	kWh/Annum	% kWh/a
Agro-processing	50 394 755	0.45	48 106 764	0.44
Automotive	13 928 814	0.12	11 052 155	0.10
Chemicals, Plastics & Pharmaceuticals	13 727 194	0.12	14 906 851	0.14
Metal Allied & Engineering	21 887 111	0.20	27 276 480	0.25
Manufacturing	3 877 385	0.03	875 581	0.01
Pulp & Paper	292 799	0.00	139 181	0.00
Clothing & Textile	3 135 224	0.03	1 626 031	0.01
Other	4 354 973	0.04	4 847 573	0.04
TOTAL	111 598 255		108 830 617	

Hartzenburg adds, "The EnMS allows one to systematically chip away at the targets, monitor and keep track of new opportunities for energy saving projects and performance of existing projects."

Taking the lead

"Toyota embarked on its energy efficiency journey a year earlier and it had to navigate many difficult discussions to convince its global parent company about the merits of reviewing current energy management plans," Hartzenburg explains (read article on page 13).

"Arden Wessels, who with his colleague Sheldon Bode attended the first training sessions in 2010, was appointed as energy manager at Toyota in 2009. He started by monitoring and logging the energy electricity consumption per unit, per region and per assembly. He developed a database which helped to identify opportunities for improvement and through a project-based approach started to tackle each issue.

"His battle – and we've seen this to be relevant to other companies as well – was not only on the shop floor with operations and plant management but also with other departments such as procurement

and shop front. Slowly their efforts started to show savings. As his credibility grew, he was allowed to establish an energy team of four young graduate engineers to drive energy consumption down.

"This was a burning platform in Toyota because that specific plant was the most inefficient plant in the world from an energy perspective. The Toyota story is a very positive success story because by continuing with their initial projects as well as developing and implementing an EnMS through the IEE Project,

The IEE Project offers three main services to industry:

- Energy audits (mostly for SMEs) to identify and advise on potential savings in a plant
- EnMS and ESO intervention support – this also includes support in efforts to attain SANS/ISO 50001 certification.
- Training in EnMS and ESO to capacitate industry to implement energy efficiency in the long terms.

In all of these areas, the automotive sector has been an enthusiastic participant, making the results and impact a good news story.

The IEE Project's

automotive journey (continued)



Arden and his team took the plant from being the worst to being one of the three top energy efficient plants in the world!"

"Toyota showed what can be achieved and it wasn't very long that the news spread and the grapevine extended into the Eastern Cape."

Hartzenburg says that Wessels soon had his hands full with enquiries from Eastern Cape companies that wanted to know more. As a direct result, Tenneco (see pages 17-19) came on board.

Dialogue improved within the industry and through the IEE Project's facilitation, companies engaged each other that would not normally do so. They discovered that energy was not a confidential issue but a universal language."

Tenneco's journey again illustrates the importance of management buy-in. "Justin Botha, Tenneco MD, took a strong lead. In fact, he wanted to implement the then non-existing EnMS in six months – something that has never been done before! In that same meeting Tenneco's existing environmental policy was amended to include energy, signed off there and then and work started immediately," relates Hartzenburg, applauding Botha's 'can-do' attitude.

Tenneco was also the first company on the IEE Project to call for support to train its procurement people and maintenance engineers. From the savings accrued through its EnMS, Tenneco was able to procure a state-of-the-art compressor.



Growing interest



Volkswagen enquired about the IEE Project early on. Hartsenburg visited the Uitenhage plant twice and was then asked to do a gap analysis between Volkswagen's existing energy efficiency programme and the IEE Project. Deficiencies were pointed out and in November 2013 about 35 representatives in mainly the engineering and environmental sustainability areas of Volkswagen attended a training session. Another two workshops followed and this, together with increased pressure from Germany to be ISO certified by November 2014, added impetus to the establishment and implementation of the EnMS. Hartsenburg's team is now helping Volkswagen prepare for certification.

DAIMLERBENZ **Daimler Benz** has also shown its commitment by sending a team of four to attend the training in 2012. It signed up as a host company for the IEE Project's compressed air system training. "We are helping the company to prepare for certification. The urgency is such that it twinned with a plant in Germany that has already received its ISO 50001 certification to speed up the process," says Hartsenburg.

The company has achieved a saving of 2 800 000 kWh and R 1 540 000 through changes to its compressed air system alone.



Willard Batteries' energy saving initiatives are doing well and its highly dedicated team is, aligned with the larger global group, pursuing a target to reduce energy by 5% per annum. Internal communication and awareness raising of its efforts have added to its success and include activities such as daily energy usage costs fixed on each office door as well as reminders on basic ways to

cut down electricity usage. Energy awareness training is ongoing.

Completed actions include altering the charging profiles of batteries to reduce Ah input into batteries; automatic switch off of chillers, conveyors and extractors during production stoppages; air leak survey and repair; a lighting upgrade which saw all lights on the premises replaced with low energy lighting – this intervention effected a rebate from Eskom and a 393 078 kWh saving per annum.

Ablution geyser elements were replaced by heat pumps, for which the company received an Eskom rebate of 50% and a saving of 59 545 kWh per annum. Changing to a gas stove in the canteen effected a saving of 44 912 kWh per annum.

Curing time for plate making was reduced with savings amounting to 1 306 800 kWh and a payback of 2.5 years. Bag filters were replaced with wet scrubber, effecting 817 344 kWh savings with a two-year payback period; and savings by replacing 10 A chargers in the Charge Room amounted to 693 505 kWh with a payback of 3.9 years.

Yunus Moola from Willard Batteries' parent company, Powertech Batteries, says, "Our work is not done yet and the team is committed to reaching its energy saving targets. Internal audits are planned for early 2015 with ISO 50001 certification following in 2016."

The IEE Project will continue to enable companies to reap energy efficiency rewards. Energy efficiency has been proven to save industrial firms money, increase the reliability of operations, improve security of supply and offer attractive financial and economic returns, while promoting job creation and reducing carbon dioxide emissions.

Equipping industry for energy efficiency

IEE Project (UNIDO) Training

The availability of specialised skills is critical to the sustainability of energy efficiency initiatives in industry. Courses have therefore been developed by the IEE Project, under the leadership of UNIDO, to train professionals in EnMS and ESO in a variety of industrial systems in use in manufacturing, mining and other industries.

TRAINING IS PRESENTED AT TWO LEVELS:

- A technical user (advanced) level offered in a two-day workshop format, and
- Expert level training, which is completed over a period of months and includes theoretical and in-plant training, and an actual workplace implementation component.

TRAINING PROGRAMMES ARE PRESENTED IN THE FOLLOWING ENERGY SYSTEMS:

- Fan Systems Optimisation (ESO Fans)
- Motor Systems Optimisation (ESO Motors)
- Compressed Air Systems Optimisation (ESO Comp Air)
- Pump Systems Optimisation (ESO Pumps)
- Steam Systems Optimisation (ESO Steam)

More details of course content, the training event dates and online registration are available on www.iee-sa.co.za

To date, the IEE Project has **trained over 2,200** individuals at advanced level and around **80 IEE experts**



Selected expert level graduates recently qualified as trainers to take over from international UNIDO-appointed facilitators. During the last quarter of 2013, the first South African professionals also qualified to lead audit teams to certify companies as ISO 50001 compliant.

TOYOTA

Leading the way

In a nation where the electricity supply reserve margin is low and energy costs rapidly increasing, it is not only good corporate citizenry to reduce energy consumption but it also makes good business-sense.

INITIAL STEPS

Toyota South Africa understands this and in 2008, Toyota SA (Durban) identified energy saving as one of its priority focus areas. A representative from each of the 14 Toyota SA plants was called to be part of a working group tasked with identifying areas for possible energy consumption reduction.

Toyota's company policy is to consider all energy initiatives that show a payback period of less than two years. For added momentum to existing projects, Toyota SA signed up as a host plant for the Industrial Energy Efficiency (IEE) Project in August 2010.

(A host plant 'hosts' IEE Project expert level training at its plant, which automatically allows it two delegates at the expert training.)

All relevant Toyota personnel enrolled for the user-level (2 day) Energy Management Systems (EnMS) and Energy Systems Optimisation (ESO) training programme offered by the IEE Project, with two candidates successfully completing the first expert-level EnMS training course (2010/11) and one graduating from the Pump Systems expert-level course in 2012.

An EnMS was introduced, along with a number of ESO and energy efficiency projects across various operational areas. In line with the ISO 50001 approach, Toyota SA set up a Plan-Do-Check-Act (see page 17) process to ensure effective implementation of the EnMS, including regular and accurate monitoring. As part of the implementation

of an EnMS, energy audits were conducted at all 14 of its plants to identify significant energy users.

A total of 55 projects were implemented, realising savings of 8.15 GWh (R4.8 million) in the first year.

A case study for this first year of the EnMS is available on the IEE project website, www.iee-sa.co.za

Early successes – Toyota energy improvements 2010 – 2011

Total No. of Projects	55
Gross Monetary Savings	R4,847,000
Energy Savings	GWh 8.15
Total Investment	R3,350,000
Overall Payback Period (in years)	1.09
GHG Emissions Reduction	ton CO ₂ 7,8043

DEDICATED RESOURCES

In April 2012 the company set up a dedicated Energy Management Department consisting of a senior manager and four engineers, each dedicated to a particular cluster of plants within Toyota Durban. These comprised:

- Paint and utilities plants;
- Vehicle and component assembly plants, and assembly parts warehouses;
- Welding plants; and
- Non-production areas (administrative areas).

Arden Wessels, Toyota Senior Manager: Environmental Engineering & Compliance, attributes the success of the EnMS and ESO initiatives at Toyota SA to "the support of both top management and the managers of the plants concerned".

TOYOTA *Leading the way* (continued)



Arden Wessels, Toyota Senior Manager: Environmental Engineering & Compliance, one of SA's first UNIDO-certified EnMS experts and champion of energy efficiency efforts at Toyota SA.

He says that, "Plant personnel in all targeted areas have to be engaged throughout the planning and implementation stages to ensure the necessary support and to overcome the perception that energy reduction steps would impact negatively on safety, quality or production cycle times."

PLAN, DO, CHECK AND ACT

Toyota is the largest vehicle manufacturer in South Africa and a full

affiliate of the Toyota Motor Corporation. "Globally, the company is driven by aggressive environmental targets to reduce energy and water usage, vehicle emissions and waste," Wessels says. "We are fully committed to cost reduction initiatives through more efficient use of energy and water and constantly create awareness with employees and suppliers on the benefits of energy management. After four years of consistent returns on energy management efforts, we are preparing for ISO 50001 certification to drive sustainable improvements."

In following the ISO-aligned EnMS Plan-Do-Check-Act process, Wessels emphasises that senior management continues to play a leading role. In fact, each general manager of each plant has energy and water as a key performance indicator and set targets have to be met.

In the planning phase, Toyota established its Energy Policy and identified and prioritised significant energy users. An energy baseline was established, energy performance indicators identified and measured in kg CO₂ per vehicle. Finally, energy objectives and action plans were put in place to reach targets.

In the following phase, action plans were implemented and training and awareness programmes carried out and communicated across the company. Energy improvement was also considered in new or renovated facilities.

Energy is monitored, measured and analysed weekly and monthly, and in the final phase (Act), top management reviews the EnMS and energy performance on a quarterly basis.

PROGRESS

"We have completed 103 projects since April 2010 and have identified 11 more for this financial year, ending March 2015. Fifty of the 103 projects required no additional financial investment," Wessels adds.

Projects varied and had both financial and energy savings. Three projects are highlighted below.

One of the 103 projects, gas supply conversion, had many additional benefits. Wessels recounts, "We converted from liquid petroleum gas to compressed natural gas. Apart from financial savings, we are also reaping safety benefits. The tank can be filled while the driver is on the vehicle, filling time is quicker, and CO₂ emissions are lower."

But the real success story, Wessels says, is that Toyota SA has shown a year-on-year decrease in energy consumption while also achieving a year-on-year increase in building vehicles.



Arden Wessels (left) receives the South African Energy Efficiency (SAEE) energy company of the year award in November 2013 at the annual SAAEC in Gauteng. SAEE bestowed this award in recognition of Toyota SA's "ambitious environmental commitments and the aggressive approach taken to reduce energy usage, vehicle emissions and waste."

PROJECT HIGHLIGHTS

Project: Pump optimisation
Process: Cooling Water
Objective: 3 to 2 pumps and maintain 487m³/h flow rate
Completed: 2010

Cost	R	38 000
Energy saving	kWh/y	322 500
Cost saving	R/y	167 700
Payback	months	3

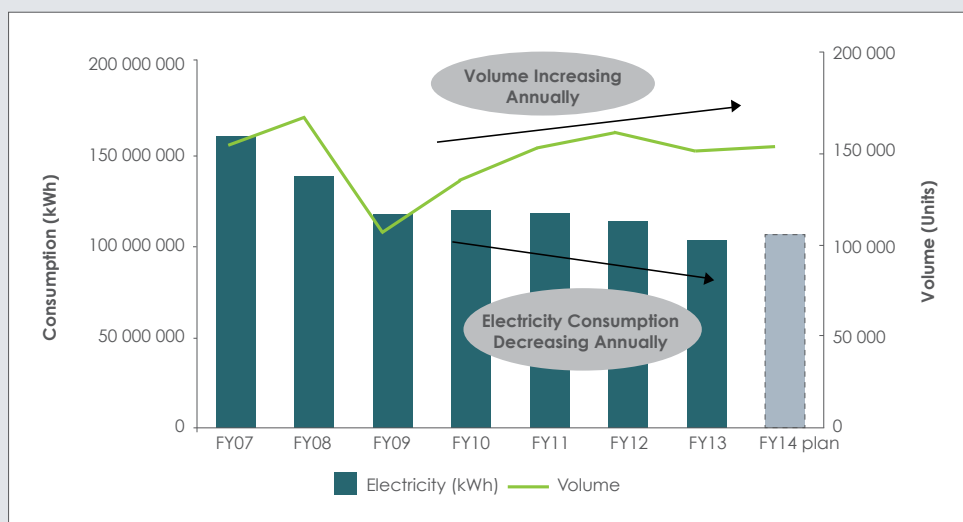
Project: Compressor Optimisation
Process: Compressors
Objective: Set compressors to run only when required – react to demand
Completed: Phase 1 – 2010
 Phase 2 – 2011, Phase 3 – 2012,
 Phase 4 – 2013

Cost	R	0
Energy saving	kWh/y	2 442 000
Cost saving	R/y	1 693 690
Payback	months	0

Project: Chiller 8 Operating Pattern
Process: Paint Plant Water Chiller
Objective: Program smaller Chiller 8 to run on weekends only
Completed: 2013

Cost	R	32 500
Energy saving	kWh/y	563 100
Cost saving	R/y	444 850
ROI	months	1

Note: This kaizen (a term originally from Japan referring to 'good change' or continuous improvement) won a Toyota Global ECO award in 2013



The true test of energy efficiency: Increasing annual volume while decreasing annual electricity consumption

Energy efficiency boost with international standard certification (ISO 50001)

According to the International Organisation for Standardisation, ISO 50001 is based on the management system model of continual improvement also used for other well-known standards such as ISO 9001 or ISO 14001. "This makes it easier for organisations to integrate energy management into their overall efforts to improve quality and environmental management," the organisation says.

ISO 50001 was adopted by the South African Bureau of Standards in 2011 as the national standard for establishing, implementing, maintaining and improving an energy management system. The Industrial Energy Efficiency (IEE) Project is supporting a number of local companies in working towards joining the approximately 1 800 companies worldwide who have attained ISO 50001 certification at around 3 000 sites, most of which are in Europe.

The IEE Project's Hemant Grover explains the significance of being ISO 50001 certified, "In a nutshell, ISO allows any organisation to manage energy in a sustainable way. Previously, companies that wanted to manage energy did so by implementing ad hoc interventions with little sustained rewards or impact. The NCPC-SA uses it for sustainability and continuity."

Any company wanting to be ISO certified must be compliant and must pass a recertification audit every two or three years. That implies that record keeping is very important as records show what is sustainable.

"Energy has now been elevated to feature in the business culture instead of being a nice-to-have," Grover adds. "More than a decade ago in South Africa, energy was cheap. That changed with the energy crisis and a big boom in industry. Consultants

SANS / ISO 50001:

- Enables organisations to establish systems and processes necessary **to improve energy performance**;
- Is applicable to all organisations; and
- **Does not** prescribe specific performance criteria with respect to energy

ISO 50001 is the only standard that impacts directly on the company's bottom line, as it aims to reduce overall operating costs by driving down energy spending.

ISO 50001 ensures that energy savings are sustained over time: to remain certified, a company must have systems in place to ensure that the energy efficiency is sustainable in the long term.

started to advocate ways to change energy consumption but without a proper management system in place, these initiatives are difficult to sustain. Europe then developed a national energy standard, in which UNIDO played a key role, and this led to the establishment of ISO 50001."

ISO certification first for Tenneco

Business Reporter

TENNECO in Nelson Mandela Bay has become the first automotive supplier in South Africa to achieve an international certification for its energy management systems.

The ISO 50001 certification was achieved for the implementation of the energy management systems at Tenneco Ride Performance, which manufactures original equipment and aftermarket shock absorbers, and Tenneco Clean Air, which manufactures catalytic converters and exhaust assemblies.

Tenneco's energy representative for the plants, Justin Botha, said the international certification cemented Tenneco South Africa's drive towards energy efficiency and green practices.

"This achievement demonstrates our commitment to global leadership and innovation in the environment. It will encourage other Tenneco facilities and suppliers alike to undertake similar initiatives in order to sustain and develop the efficiency of the industry," Botha said.

Tenneco achieved the certification for the development of a world-class energy management system with the assistance of the Automotive Industry Development Centre Eastern Cape (AIDC EC) and the National Cleaner Production Centre (NCPC). Tenneco joined the programme with the aim of reducing its energy bill in the face of rising power prices.

AIDC EC supplier development manager Lance Schultz said the AIDC was proud of the results of the programme, which demonstrated what many individual organisations could do to reduce costs and relieve the grid.



TENACIOUS TENNECO: Tenneco Ride Control plant manager Casey Beary, Tenneco energy representative Justin Botha, AIDC EC supplier development manager Lance Schultz and Tenneco emission control manager Gary Keen celebrate the company's ISO 50001 certification

The programme started in mid-2011 and both Tenneco manufacturing plants in Nelson Mandela Bay were included in the agreement.

The NCPC provided training

to various organisations over an 18-month period to assist with the implementation of an energy management system.

This training allowed Tenneco to adapt the content for

ISO 50001 standards prior to achieving certification.

Energy audits were conducted to identify opportunities to improve energy efficiency.

AIDC EC programme manager

Kushen Naidoo said that from the first lighting project, Tenneco saw the immediate benefit of saving energy and had continued the journey for energy efficiency within its plants.

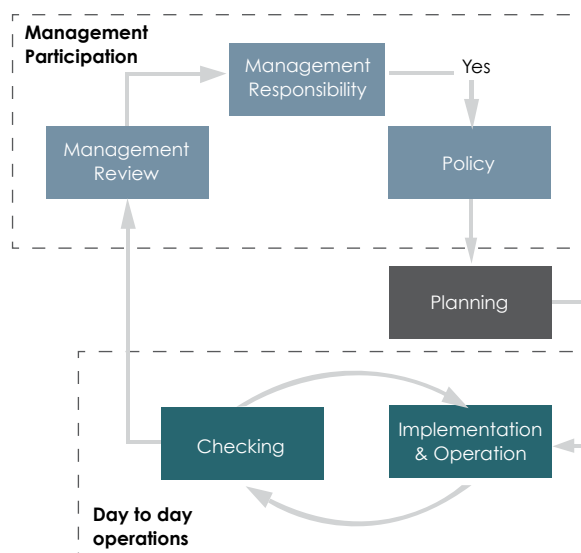
Tenneco in Nelson Mandela Bay was in the news in May 2014 for becoming the first automotive supplier in South Africa to achieve an international certification for its energy management systems.

Based on the successes achieved in the Nelson Mandela Bay plant, the certification is now being rolled out to all production facilities worldwide (some 90).

The ISO 50001 certification was achieved for the implementation of the energy management systems at two of its plants – Tenneco Ride Performance, which manufactures original equipment and aftermarket shock absorbers, and Tenneco Clean Air, which manufactures catalytic converters and exhaust assemblies.

Grover emphasises that the first step in the process for becoming ISO certified is commitment to energy management from the top leadership of the organisation. The organisation identifies the scope and the boundaries (what and where) of the energy management required, and sets up a team to drive the process. The team constitutes top management representatives as well as representatives from business units. The energy manager takes the lead.

"Collectively, the team oversees management and detailed planning. They need to know exactly how much energy is being used (also looking back); what, if anything, was done to reduce consumption; how successful these interventions were; what are the big energy users; and then based on this information, objectives, targets and action plans are compiled. This is followed by implementation, monitoring and evaluation and supplying leadership with feedback.



The ISO 50001-aligned Energy Management System process is based on the concept of plan, do, check, and act.

TENNECO RIDE PERFORMANCE (PTY) LTD AND TENNECO CLEAN AIR (PTY) LTD

Overall plant efficiency improvements

THE ISSUE AND MAIN FINDINGS

Tenneco Automotive is an international automotive supplier with more than 90 production facilities worldwide. Two of these are located close to the automotive hub in Nelson Mandela Bay.

Tenneco – Ride Performance (Pty) Ltd produces shock absorbers and Tenneco – Clean Air (Pty) Ltd produces catalytic converters and exhaust assemblies for both the local and international markets. Tenneco has a combined total of 780 employees who all contribute to the energy consumption. Annual production of each plant is around 2.2 million units per annum.

Tenneco South Africa became aware of the IEE project at a two-day Energy Management Systems (EnMS) training session. Following a decision to join

the full EnMS expert course, Tenneco was selected as the host company to showcase the implementation of ISO 50001 with support from the IEE project.

ENERGY CONSERVATION OPPORTUNITIES IDENTIFIED

Tenneco has set its sights on ISO 50001 from the day it was released. Progress towards ISO 50001 was a great learning experience since no other organisation has implemented the standard before.

The EnMS training allowed the Tenneco team to develop an energy management system aligned with Tenneco's needs. This was a challenging task, as while assistance was available to implement an energy management system, adapting the EnMS to ISO 50001 proved more difficult.



IMPLEMENTED SAVINGS MEASURES

The following table shows energy saving interventions implemented with commensurate costs and savings.

Intervention (All project groups have been combined)	Capital Cost ZAR	Savings ZAR	Payback Yrs	Energy saving
Compressed air systems Compressed air optimisation	R 1 023 265.30	R 425 595	2.4	766 305 kWh
Lighting initiatives Factory, Offices, Sensors, Daylight Harvesting	R 1 076 695.40	R 780 131.49	1.38	926 064 kWh
Paint shop burner submersion tube	R 35 000	R 16 284	2.14	15 366 kWh
Automatic metering. Electricity, LPG, Shielding gas weight	R 149 011	–	–	Better energy management
New Chrome Planting oven	R 750 000	R 634 508	1.18	829 444 kWh
Power Factor correction at Tenneco – Emission Control. To be done at Tenneco – Ride Control	R 69 079	R 142 776	0.48	127 kVA
Procedures – Shutdown, SEU training	–	–	–	Better energy management
TOTAL	R 3 103 050.70	R 1 999 294.49		2 537 179 kWh

Highlights of operational/ESO interventions

CONCLUSION

Future work will include power factor correction (PFC) as this was left until later in the programme to reduce the required size and cost of the required PFC equipment. Paint shop modifications will only be made to coincide with the new paint shop design that is planned for 2015.

The company believes the implementation of the EnMS would have been easier to understand if the ISO 50001 standard was considered from the start. To ensure sustainability of the system, all new equipment will comply with the internal energy efficiency regulations. Tenneco has found that the company culture has benefited from the IEE project in that more team members are aware of and actively engaged in energy savings initiatives.



KEY FINDINGS: The two plants completed more than 15 projects of varying sizes over three years. **R3 100 000 was invested** with a payback period of 1.55 years. Monetary **savings amounted to R2 million**, energy savings amounted to **2 540 000 kWh**, and **GHG emission were reduced by 2 428.08 tonnes of CO₂**.

JOHNSON MATTHEY SOUTH AFRICA

Automotive component suppliers

BACKGROUND

Johnson Matthey, a British company established in 1817, is a global manufacturer of automotive components, specifically autocatalysts. The South African operation began in 1953 and since 1992 Johnson Matthey South Africa (JMSA) has been manufacturing catalysts at its Germiston (Gauteng) plant, supplying several local “canners” who fit the catalyst into the catalytic converter system for export to the motor vehicle assemblers.

In response to the increase in energy costs, JMSA Germiston signed up with the IEE Project in 2012 as a candidate plant for the implementation of an ISO 50001-based energy management system. The plant holds management system certification for ISO 9001/TS16949, ISO 14001 and OHSAS 18001 and adopted the ISO 50001 approach as an integration and extension.

IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

An IEE Project energy consultant facilitated a systems review and conducted an ISO 50001 initial audit. The expert then assisted JMSA to develop and implement an energy management system (EnMS) and energy efficiency measures were systematically implemented in both production and utilities.

Existing structures, such as policies, procedures and sustainability reporting, were expanded to include energy specific requirements.

An energy team was appointed, under the chairmanship of the Engineering (Energy) Manager which met weekly to identify, co-ordinate and implement energy performance improvements. Two members of the energy team attended the IEE Project's advanced EnMS training and further training is planned for additional energy team members and energy management system auditors.

HIGHLIGHTS OF INTERVENTIONS

Four main projects were identified as potentially large energy savers. Three of these, namely the air compressors, chillers and mixing vessels, could be implemented immediately with nominal or no investment required.

The fourth project was the optimisation of the ovens, which was implemented as phase two, during the December shut-down period.

These four projects resulted in approximately R4.5 million of the R7.7 million in savings. The balance was realised through behaviour changes and a process of continuous improvement (Kaizen projects). A summary of the interventions and savings realised is outlined in the table opposite.

Key findings	
Total number of projects	Four large and various small Kaizen projects
Monetary savings	
Total savings	R7,728,569
Four main projects	R4,540,098
Balance	R3,188,470
Energy savings	
Total savings	9,425,084 kWh
Large projects	5,469,998 kWh
Balance	3,888,379 kWh
Total investment made	R620,000
Payback time period	1 month
GHG emission reduction	9,020 tonnes of CO₂

SUMMARY OF ALL INTERVENTIONS

System	Intervention	Capital Cost ZAR	Energy saving	Savings ZAR (Average of R0.82/kWh)
Compressors	Reduce waste – repaired leaks, increased awareness and optimal usage of the equipment	Zero	1,072,163 kWh	R879,174
Chillers		R20,000	933,973 kWh	R765,858
Production mixing vessels	Identified areas of waste – vessels left running when production lines were stopped. Introduced a lockout system.	Zero	2,180,862 kWh	R1,788,307
Oven Optimisation	<ul style="list-style-type: none"> • Shutdown 3 De-humidifier units by re-routing the air • Re-circulation ratio increased to ~50%-60% • All fan cowlings were cooled and insulation was replaced 	R600,000	1,283,000 kWh year on year despite a 9.73% increase in running time	R1,065,000
Other projects and factors	Behaviour changes e.g. switching equipment off when not in use) Focus on production efficiencies Kaizen projects	Zero	3,888,379 kWh	3,188,470

CHALLENGES AND LESSONS LEARNED

- **Behavioural changes** – various communication and suggestion campaigns were run and the energy awareness increased. It is critical to ensure that energy influencers understand the energy impacts of their work and actions.
- **Measurement/metering** – it is important to have sufficient metering, and to ensure sub meters on significant energy users to allow for accurate measurement and better inform future implementation.
- **Selection of correct energy team members** – selecting the correct individuals and representation of all the relevant sections of the plant is critical to drive and EnMS. It is advisable to be willing to make changes where necessary and to ensure significant involvement by production personnel.
- **Knowledge and awareness** – this process showed the critical nature of becoming aware of the potential for energy savings and how to realise them effectively.
- **Attitude is of paramount importance.**



The Johnson Matthey energy team outside the Germiston plant following the handover of their ISO 50001 certificate by a UNIDO and SABS delegation in April 2014

FELTEX AUTOMOTIVE TRIM – DURBAN

Vehicle Component Supplier

BACKGROUND

Feltex Automotive Trim Ltd is a leading supplier of a wide range of quality automotive acoustic and trim components, including carpets, various compartment insulators, parcel shelves and wheel arch insulators. One of their plants is located in Jacobs, Durban South, KwaZulu Natal.

Heat is used in various stages within the manufacturing process, including heating and forming of fibre sheets under pressure, and pre-heating of materials used in floor carpet manufacture before layering and pressing via banks of heating elements. Press mouldings are water cooled via a centralised chiller system, and fumes produced in the process are extracted via hood and extractor fan systems. Certain products are trimmed using high pressure water-jet cutting units. Compressed air is supplied via a centralised compressor, and lighting is provided by fluorescent tubes.

Feltex Durban underwent an energy audit in February 2012 as part of the National Cleaner Production Centre of South Africa (NCPC-SA)'s Resource Efficiency and Cleaner Production Programme. The purpose of this was to help Feltex to characterise energy usage, determine Significant Energy Users (SEU's), and to identify opportunities for energy consumption reduction within the plant. The audit identified the need to address energy management systems within the plant, and a recommendation was made to strengthen the energy management capabilities of the plant.

This prompted Feltex to adopt an Energy Management System (EnMS) through the Industrial Energy Efficiency (IEE) Project, as implemented by the NCPC-SA in conjunction with UNIDO. Feltex's company engineer attended the IEE Expert Level training from November 2012 and successfully completed it in November 2013. This prompted the development of an energy policy in the early stages of the EnMS programme.

The endorsement of and commitment to the programme by Feltex's top management was a key contributor to success.

IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

An energy policy was drafted and adopted, and an energy team was established. Each member of the team was assigned specific responsibilities and given clear mandates regarding utility efficiency and energy management. A decision was taken to implement mandatory targeted training for all energy end-users. To this end a needs analysis and skills assessment were done to determine the content of the training, and content specific to different functions was developed.

IMPLEMENTATION CHALLENGES

The determination of a key driver as the primary influence on the level of energy usage and against which performance could be measured, proved challenging as the development of a realistic

Key findings / savings table

Implementation Period	2013 to 2014
Number of projects	6
Energy savings in KWh	1,070,000 kWh per annum
Payback period in years	<12 months
GHG Emission Reduction (ton CO _{2e})	1,024 tonnes CO ₂

baseline was difficult. A more rigorous meter reading procedure, combined with a specific weekly production monitoring initiative, meant

that the relationship between production and energy usage could be modelled using regression analysis techniques.

SUMMARY OF INTERVENTIONS

System	Intervention	Energy saving per year
Taca moulding section presses	Thermal insulation of the press housings to minimise unnecessary heat wastage to atmosphere	140,000kWh
Autoline press and chiller systems (two projects)	Insulation of the heating plate to minimise unnecessary heat loss to atmosphere	
Insulation of suction-side pipework on the Autoline chiller system	18,500kWh	
Lighting retrofit	Replacement of dated fittings with modern equivalents; more appropriate switching arrangements; making optimal use of daylight.	732,000kWh
Compressed air programme	Optimising compressed air usage through employee awareness; reduction of consumption at point of use; optimisation of system including leakage reduction; replacement of compressors.	44,100kWh
Unused equipment	Switching off unused equipment	135,400kWh

LESSONS LEARNED

- **Leadership support** at all levels of the programme is a prerequisite.
- **Composition of energy team** should involve people from a wide range of backgrounds and skill-sets.
- **Analysis of key data** (production and energy data) is vital in the identification of opportunities.
- **Many opportunities** exist for energy saving with little or no implementation cost.
- **Linking of data** is vital to link the business case to key business drivers and to highlight any additional benefits that the company may derive through the uptake of energy management best practice.

FELTEX AUTOMOTIVE TRIM – ROSSLYN

Vehicle Component Supplier

BACKGROUND

Feltex Automotive, headquartered in Durban, consists of seven business units that supply products directly and indirectly to South African Original Equipment Manufacturers (OEMs).

The Feltex Automotive Trim plant, located in Rosslyn Pretoria, is a leading supplier of textile-based automotive acoustic and trim components. It produces technical felts in needled and airlay constructions and non-woven carpets (both structured and conventional) in a broad range of weights, widths and specifications, for mouldable applications. From its factories direct to customers, Feltex Trim supplies main floor carpets, passenger compartment insulation, trunk packages, engine compartment insulation, parcel shelves and exterior wheel arch liners.

Most of the processes require the following activities:

- Heating of material. The heating is mainly supplied by electricity.
- Most of the equipment requires compressed air for operation. Although two compressors are installed, one compressor is off-line due to various improvements to the reticulation and requirements for compressed air. Compressed air is currently supplied through one 75 kW compressor.

THE ISSUE AND MAIN FINDINGS

In order to transform operational processes, reduce energy consumption and costs, and ensure long-term environmental sustainability, Feltex Trim joined the IEE Project in 2012 and the Feltex Trim Rosslyn maintenance manager signed up for EnMS expert level training.



KEY FINDINGS: (2012-13) No capital investment and just an in-house cost estimated at R 30 000 in less than one year realised an **annual saving of R 287 451**. **Energy savings of 309 087 kWh** with a concomitant GHG reduction of 295 796 tonnes CO₂.

(2013-14) After an investment of R 197 600, a **saving of R 99 519** with a payback of 1.98 years has been realised. A **215 611 kWh** and **213 tonnes CO₂ reduction per year** were achieved as well as **additional energy conservation opportunities identified**.



ENERGY CONSERVATION OPPORTUNITIES IDENTIFIED 2012-14

In 2012, two main projects were identified as ESO interventions:

- **Platten Heater:** The process of shaping carpets under heat requires both heat and pressure. It was found that equipment was not optimally utilised, with roughly 50% of the heating surface out of contact with the product. Moulds were re-cast to get closer to the 100% target. As a consequence, production was almost doubled without applying additional heat. The resulting spatial target achievement also halved production time, reducing electricity consumption by 50%.
- **Electricity to heat products:** waste heat was rerouted to pre-heat products before reaching the oven, thereby reducing the 75°C oven time from 90 to 45 seconds. A canopy was constructed to capture the lost air when doors were opened and use it for pre-heating products. This intervention halved oven time and consequently electricity consumption by about 45%.

In addition, the following steps were taken in 2012/13:

- Staff energy awareness interventions: erecting posters displaying drying oven energy consumption.
- Equipment and software was installed to monitor drying tunnel energy consumption.
- Permanent tracks were installed in the drying ovens to ensure no trolley movement allowing hot air to escape. The installation also resulted in a reduction of drying time, from 24 hours to around 19 hours.
- Flaps were also installed to restrict air flow through the pans of fruit being dried, avoiding the loss of hot air in unutilised areas.
- Staff behavioural changes: to ensure that the drying tunnels were being optimised, staff was trained to add the maximum amounts of pans per session, reducing kWh usage per pan and optimising production.

FELTEX AUTOMOTIVE TRIM – ROSSLYN

Vehicle Component Supplier (continued)

- The total amount of energy consumed by the ovens was reduced by about 20%.
- Automating the four cold store doors and retrofitting remote controls to forklifts ensured less wasteful temperature loss due to doors left open indiscriminately during packing over produce for transport to end-user.

During 2013/14, the following opportunities were identified:

The requirement for compressed air throughout the plant over weekends was assessed. It was found that at the foaming plant compressed air was needed to circulate the foam in the storage tank. A 2.2 kW compressor supplying air at 3 Bar was installed. This made the operation of the main 75 kW compressor at 6 Bar over weekends redundant.

Carpets are heated before they are pressed in the required shape. The traditional way of heating the carpets was to use 36 resistive heater elements rated at 2 kW each. These heaters take a long time to heat up and consequently are not switched off between carpets. They were replaced with 48 infrared heaters rated at 1.5 kW which heat up instantaneously. Controllers of the process were reprogrammed so that the heaters only switch on when there is a carpet in the machine. The time required in the oven also reduced from 80 seconds to 45 seconds.

Heated air is used to pre-heat carpets before they are glued and pressed. Air is heated through 36 elements rated at 1 kW each. Previously, the carpets were conveyed into the oven on a grid conveyor and the hot air by-passed the carpet and followed the path of least resistance. Consequently the carpets took longer to pre-heat to the required temperature. Buffer plates were installed to control air flow so that heat is efficiently applied where it is required; on the carpet. The result is that carpets are now pre-heated within 45 seconds compared to 90 seconds.

In a section of the plant, the corrugated roof plates were replaced with translucent roof plates to make use of natural light instead of artificial light during the day-shift. This resulting in 50 high bay lamps rated at 125 W being switched off between 18:00 and 6:00 where they were previously operational 24-hours.

LESSONS LEARNED

Feltex Trim Rosslyn demonstrated that substantial energy savings could be achieved without major capital investment or retrofitting. By just challenging the status quo of operations and pro-active action towards optimal operation, a substantial impact was achieved on both production throughput and electricity consumption.

HIGHLIGHTS OF ESO INTERVENTIONS

System	Intervention	Investment ZAR	Savings ZAR	Payback Period	Energy saving (kWh)	GHG Emission Reduction (Kg CO ₂ /year)
Platten Heater	Optimal usage of heated areas in the equipment	15,000	287,451	< 1 yr	309,087	295,796
Heating Oven	Waste heat recovery to preheat products	15,000				
Compressor	Installation of small air compressor to supply weekend load	10 000	36 700	0.27 yrs	101 192	100 000
Heater coils	Replace resistive heater coils with infrared lamps	57 600	33 770	1.7 yrs	61 401	60 000
Buffer plates	Buffer plates at line 2 manufactured in-house to match carpet sizes	0	19 356	0	35 193	34 800
Lighting	Use of natural light	130 000	9 693	13	17 625	17 000

TOYOTA BOSHOKU SA (PTY) LTD

Automotive Industry Parts Manufacturer

BACKGROUND

Toyota Boshoku SA (Pty) Ltd (TBSA) is a subsidiary of Toyota Boshoku, based in Japan. TBSA is based in Umbogintwini, KwaZulu Natal, South Africa and manufactures door panels and car seats for Toyota South Africa Motors. The facility is housed in one large building.

TBSA is an ISO14001 accredited company and therefore has to show continued improvement with regard to environmental challenges as required by the plant and as set out in the Toyota Boshoku Global Objectives and Targets. TBSA also strives to achieve the national environmental targets as well as requirements of their customer (Toyota South Africa Motors).

OVERVIEW OF IMPLEMENTATION

TBSA's Section Manager – General Affairs attended a Durban Automotive Cluster workshop, which introduced the programme to Toyota Boshoku. An IEE Project assessment was conducted at the plant. The interventions dealt primarily with the replacement of existing lighting technologies with new, energy efficient technologies as recommended in the assessment report.



KEY FINDINGS: One project was undertaken, resulting in a **saving of 190,645 kWh** and **R 165,203 per year** for an **investment of R 451,840** (payback period of 1.85 years). A **reduction in GHG emissions of 188,738 kg CO₂** was achieved.

HIGHLIGHTS OF ESO INTERVENTIONS

A total of 874 old technology lamps with conventional ballasts were replaced with energy efficient lamps with electronic ballasts, resulting in an average monthly energy consumption saving of 15,86kWh. Timers were installed to switch off selected internal light fittings during daylight hours. Replacements were made as follows:

- Replacement of linear lamp T8 light fittings with linear lamp T5 fittings;
- Replacement of HID floodlight fittings with CFL light fittings; and
- Replacement of Halogen lamps with LED lamps.

Existing Technology	Quantity	New Technology	Energy saving (kwh)	GHG Emission Reduction (Kg CO ₂ /year)
Double lamp T8 fluorescent light fittings	846	Replaced with new double lamp 28W fluorescent light fittings	153,408	151,873
50W Halogen down light lamps	5	Replaced with new 5W LED lamps	819	811
400W HID floodlight fittings	21	Replaced with new 105W CFL floodlight fittings	34780	34,432
250W HID Streetlight fittings	2	Replaced with new 105W CFL streetlight fittings	1638	1,622

The above was in addition to the replacement of and control of the HID Highbay lighting which was completed before the energy assessment.

IMPLEMENTATION CHALLENGES

Labour strikes and holiday shutdowns prolonged the implementation of the programme. Further delays were caused by problems with the supply of products needed to complete the project.

LESSONS LEARNED

- Energy savings are possible without major capital investment.
- The Toyota Boshoku Group already had policies in place to improve and reduce environmental impact. The IEE Project fitted well into the existing culture.
- Toyota Boshoku was impressed with the conduct and efficiency of IEE Project staff and consultants.



The IEE Project

and small, medium and micro enterprises

One of the services offered by the IEE Project is free energy audits for small and medium enterprises (SMEs).

In the automotive sector, this process was assisted greatly by the strategic partnership between the National Cleaner Production Centre of South Africa (NCPC-SA) and the Automotive Industry Development Centre (AIDC).

With the support of the AIDC, the IEE Project was able to engage SMEs in the automotive and related sectors and offer technical reports and recommendations on energy efficiency interventions.

However, the IEE Project is keenly aware of the real challenges faced by SMEs wishing to implement EnMS or even ESO interventions, despite rising energy costs.

"It is often difficult for SMEs to see the long-term value of implementing an energy management system. By its very nature, an SME's owner might also be the marketer and fulfil other responsibilities, making it difficult to take more time from a busy schedule to focus on energy matters.

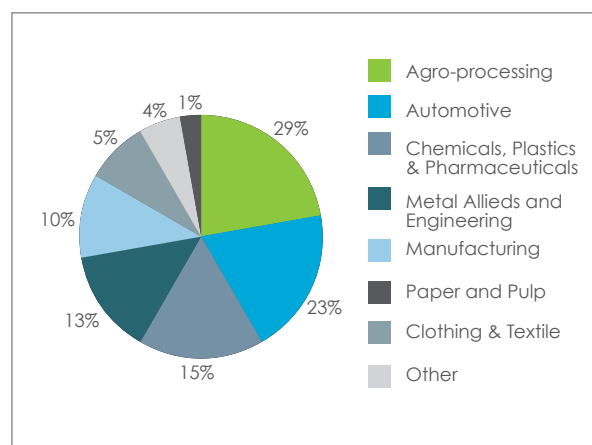
"The rule of thumb for appointing a dedicated energy manager is when the company's energy costs reach or exceed R100 million per year," explains the IEE Project's Alf Hartzenburg.

But energy savings are possible, even for SMEs with limited internal capacity.

Benteler Automotive in Uitenhage, Eastern Cape, took up the challenge and is still part of the IEE Project with leadership not only appreciating the need to improve energy efficiency but also taking a strong lead in ensuring the company remains committed.

The Techniplate and Precision Press case studies on the following pages outline the efforts of two SMEs in the automotive and related sectors.

"Many companies are surprised to hear that they do not have to spend money to save energy. It is not necessary to invest in technology upgrades to effect energy savings. In fact, some companies use the money they save through their energy management system to fund technology upgrades," says Hartzenburg.



Percentage of assessments within each sector

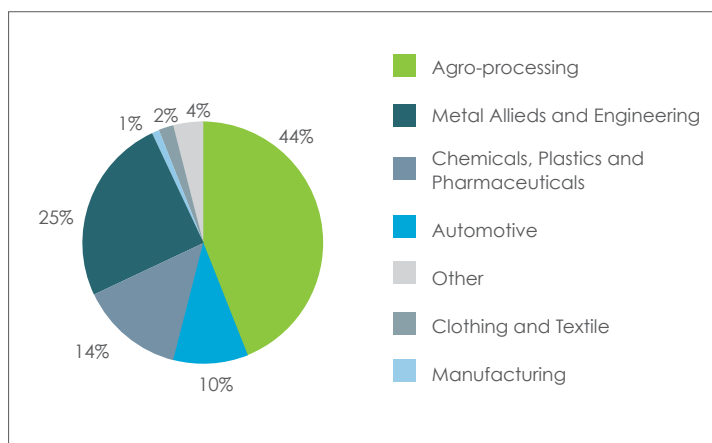
IEE PROJECT – SME ENERGY EFFICIENCY AUDITS

Since 2011, the IEE Project has conducted 227 energy audits. 51 of these (23%) were in the automotive sector.

Through these audits, potential energy savings of 108 GWh were identified, valued at some R 101.5 million.

Of these, 10% of the energy savings identified (11 GWh) were in automotive sector SMEs, with over 12% of the monetary value of the energy savings being within this sector. *(The discrepancy is due to the different energy sources used and the relative cost of these energy sources.)*

Potential savings identified through energy audits in SMEs				
Sector	Rands/Annum	% (R/a)	kWh/Annum	% kWh/a
Agro-processing	50 394 755	45%	48 106 764	44%
Automotive	13 928 814	12.4%	11 052 155	10%
Chemicals, Plastics & Pharmaceuticals	13 727 194	12%	14 906 851	14%
Metal Allied & Engineering	21 887 111	19.6%	27 276 480	25%
Manufacturing	3 877 385	3%	875 581	1%
Pulp & Paper	292 799	–	139 181	–
Clothing & Textile (CTFL)	3 135 224	3%	1 626 031	1%
Other	4 354 973	4%	4 847 573	4%
TOTAL	111 598 255		108 830 617	



Percentage of potential energy savings identified in each sector



TECHNIPLATE

Plating Tank Temperature Control

THE ISSUE AND MAIN FINDINGS

Techniplate Electroplaters is located in Silverton Pretoria and offers a range of plating products and services, including electro-polishing, embossing, etching and colouring. In the delivery of these services, the company makes use of plating tanks which operate at extremely high temperatures, resulting in high energy (specifically electricity) consumption.

Consumption statistics showed that the total amount of energy used by the site was equal to 2,186,708 kWh per annum, at a cost of R735 202.

control is deactivated. The difference in the average (mean) energy consumption is 1.9 kWh.

Both the mean and the median of temperature are higher when there is no auto control. The difference of the means shows that without auto control the tanks are running **4.7 °C hotter**. Temperature variability as indicated by the standard deviation is 6.5 more without auto control. This high variability might have quality consequences on the product.

KEY FINDINGS: After an investment of R 46,200, a **saving of R 172,751 (23.5% saving)** with a payback of 4 months has been realised. **Energy savings of 421 344 kWh (19.3% saving)** achieved.

Parameter	Energy Consumption		Temperature Control	
	Auto Control	Manual Control	Auto	Manual
Mean	5.3 kWh	7.2 kWh	50.4 °C	55.1 °C
Median	5.2 kWh	7.0 kWh	50.5 °C	56.2 °C
Min	4.2 kWh	5 kWh	49.8 °C	49.6 °C
Max	7.2 kWh	9.4 kWh	51 °C	57.2 °C
Range	3 kWh	4.4 kWh	1.2 °C	7.6 °C
St Deviation	0.76	1.88	0.44	2.85

Summary Statistics of the Measurement Data

ENERGY CONSERVATION OPPORTUNITIES IDENTIFIED

An IEE Project energy audit identified that Techniplate's plating tanks' temperature was being manually controlled, thereby resulting in high degree of temperature variations, excessive temperatures and excess energy use.

Recommendation: *Plating Tanks Auto Temperature Control (ECO1)*

IMPLEMENTED SAVINGS MEASURES

Measurement and data analysis

Data measurements clearly showed that when auto temperature control is on, energy consumption was significantly lower than when auto temperature



The temperature controller used for this case study. Both this item and the energy meter also used in the case study cost R 1100.

The temperature profile of the plating tanks is also far more stable with auto control than without it. When operating on auto control, the variance is as low as 1.2 ° C while without auto control the temperature has a wide range of 7.6 ° C.

The plating tank energy consumption profile for both auto and manual control also shows that without

auto temperature control energy consumption is higher.

A temperature controller and an energy meter (shown left) were installed at each plating tank at a cost of R1,100 each – a total cost of R42,600.

DETERMINATION OF SAVINGS AND PAYBACK PERIOD

Below is the calculation of the energy cost savings and payback period.

Energy and Cost Saving	
Cost per kWh	R 0.41 per kWh
No of plating tanks	42
Total energy used per year	2186708 kWh
Cost of energy consumed per year	R 735 202
Energy saving (determined from difference of means from table 4)	1.9 kWh
Working hours per year (24 x 4 + 14) x 48	5 280 hrs
Total energy to be saved per year (5 280 hrs x 1.9 kWh x 42 tanks)	421 344 kWh
Percentage of energy saved	19.3 %
Cost of energy saved per year (421 344 kWh x 0.41)	R 172 751
Percentage of costs saved	23.5 %

Payback Period:

- Total cost of installation for 42 tanks = **R46,200**
- Payback period (46,200/17,251) = **4 months**

CONCLUSION

This simple energy-saving measure resulted in a saving of 19.3% of energy and 23.5% of the energy costs of this SME. In addition, the investment was paid back in the relatively short timeframe of only four months.

Another benefit of the measures is better process control, which may result in better products.

PRECISION PRESS

Energy systems optimisation in an SME

THE ISSUE AND MAIN FINDINGS

Precision Press is a medium-sized metal pressing automotive parts manufacturer which manufactures a wide range of automotive parts and components. It has 163 employees and is based in Cape Town.

Due to the nature of the machines and processes used to manufacture the parts, technological solutions were very expensive, and focus had to be placed on systems and procedures to reduce the electricity usage and bring the maximum demand energy usage down.



KEY FINDINGS: By repairing compressed air leaks, at no cost to the company, and rolling out an awareness campaign at a cost of only R793, **energy savings of 117 100 KWH** with a value of **R 66,265 p/year** were realised. The overall payback period was 0.14 months.

ENERGY CONSERVATION OPPORTUNITIES IDENTIFIED

A programme of energy efficiency (and other resource efficiency considerations) was initiated in order to:

1. Create sustainable energy efficiency awareness amongst all employees.
2. Reduce the company's electricity bill by 20%.

Based on the results of a SWOT analysis and an IEE Project assessment, opportunities for intervention were identified as follows:

Objective Description	Implementation timeframe
Subproject 2: Switching off – hydro-boils, lights & motors (presses) when not in use	1 months
Subproject 3: Compressed air – leak tagging, awareness & sustainable system	1 months

IMPLEMENTED SAVINGS MEASURES

	Capital Cost ZAR	Savings per annum ZAR	Payback Months	Environmental benefit per annum
Switching-off electrical equipment	793.20	37,699	0.25	55,000 kWh
Repairing Compressed air leaks	0	28,566	-	62 100 kWh
Total	793.20	R66,265	0.14	117 100 kWh

SWITCH-OFF CAMPAIGN

During weekends a base load was measured of around 30kW. This was due to lights and electrical machinery being left on during non-production hours. Automatic timers were installed on the hydro-boils to switch them off. For items that could not be automated due to flexible operating hours, employees such as team leaders and supervisors were given the responsibility of ensuring manual switch-off. Awareness posters were placed near or on all switches and machines. The switching off project has reduced the electricity usage by an estimated 55,000 kWh, which amounts to a cost saving of R37,699.

COMPRESSED AIR

Air leaks frequently occur due the heavy vibration of the machinery during the production process. In this sub-project, all air leaks were tagged and a policy set up to ensure that air leaks are fixed every month. Compressed air was also being used to blow finished parts from the machine into the finished goods bins. This was done for convenience and the operators were unaware of the high costs involved in compressed air usage. Alternative mechanical solutions were implemented and the operators' awareness established. This has produced a saving of 62 100 kWh, which amounts to a cost saving of R28 566.



The inappropriate use of compressed air as it was used to blow parts out of the press. This cost the company an estimated R5000.00 annually

CONCLUSION

A successful and sustainable energy efficiency campaign requires all employees to be involved and aware of the cost implications on operational expenses. The level of commitment and support from the management at Precision Press made the task easier. Precision Press has improved its energy awareness and it can be seen everywhere in the factory. This adds value to the client and improves the competitiveness of Precision Press.







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