

Energy well spent

Although it is impossible to arrive at a single figure, one can safely say that energy is a major input cost for the fruit export industry. It is also the cornerstone of the cold chain. The combination of keeping costs down and production up is reason enough to invest energy into energy efficiency.



The best performing pack houses use around 15kWh of electricity per ton of fruit packed, while others use three times as much.



IN 2008, South Africans were shocked into a new appreciation of electricity. For the first time that we remember, load shedding was a part of our lives. As the national electricity utility struggled to keep the lights on, both households and industry had a taste of life without power.

Although load shedding did not cause significant fruit losses, the export industry wisely decided to heed the warning. Further motivated by substantial electricity tariff increases and global pressure to reduce the industry's carbon footprint, an energy benchmarking project was launched under PHI-1 in 2008.

The aim was to develop and implement a benchmarking system for energy consumption on farms and at pack houses and cold stores to improve electricity and fuel efficiency. Koos Bouwer, industrial engineer and independent engineering consultant, was appointed to oversee and coordinate the project.

"The benchmarking results showed that it was virtually impossible to make generalisations about energy use in the industry," says Mr Bouwer. Not only did the different facilities' energy usage vary widely, they also paid vastly different tariffs – from less than R0,40 per kilowatt hour (kWh) to more than R1,40 per kWh. The best performing pack houses used around 15kWh of electricity per ton of fruit packed, while others used three times as much.

It was also clear that the different methods of cold storage had different energy implications. Storage of apples in a controlled atmosphere was extremely efficient at less than 1kWh per ton of fruit per day, whereas fruit packed in cartons on pallets used almost 8kWh of electricity per ton per day. "The important conclusion drawn from these varying results was that there were many opportunities for energy efficiency improvements," says Mr Bouwer. "If one pack house could be more efficient, there was no reason why others couldn't."

FROM "WHERE ARE WE?" TO "WHAT CAN BE DONE?"

In 2012, the United Nations Industrial Development Organisation (UNIDO) approached the South African government to take part in its Industrial Energy Efficiency (IEE) improvement project. Funded by the Swiss Secretariat for Economic Affairs and the UK Department for International Development, the local IEE project is hosted by the South African National Cleaner Production Centre (NCPC-SA) at the CSIR.

The IEE project focuses on five industry sectors, including agro-processing. Under the project's auspices, the NCPC-SA agreed with PHI-2 to conduct fully subsidised energy audits at interested pack houses and cold stores in the fresh fruit industry. The coordination task was again entrusted to Koos Bouwer.

"The process we followed was more an assessment than an audit," says Mr Bouwer. "Instead of looking at how facilities adhered to standards and specifications, the consultants assessed energy usage and trends." The difference between audit and assessment is also clear from the stated purposes of the project:

- Assist to quantify energy consumption at a facility and identify the significant energy users.
- Identify opportunities for the reduction and more efficient use of energy in the plant as part of an energy management plan.

The energy efficiency audits initiative was rolled out in January 2012, when Mr Bouwer embarked on a campaign to raise awareness in the industry. He arranged several regional workshops where NCPC-SA representatives explained the nature and process of the project and recruited participants. Companies that wanted to participate signed a memorandum of agreement with the NCPC-SA. A total of 29 pack houses and cold stores agreed to take part.

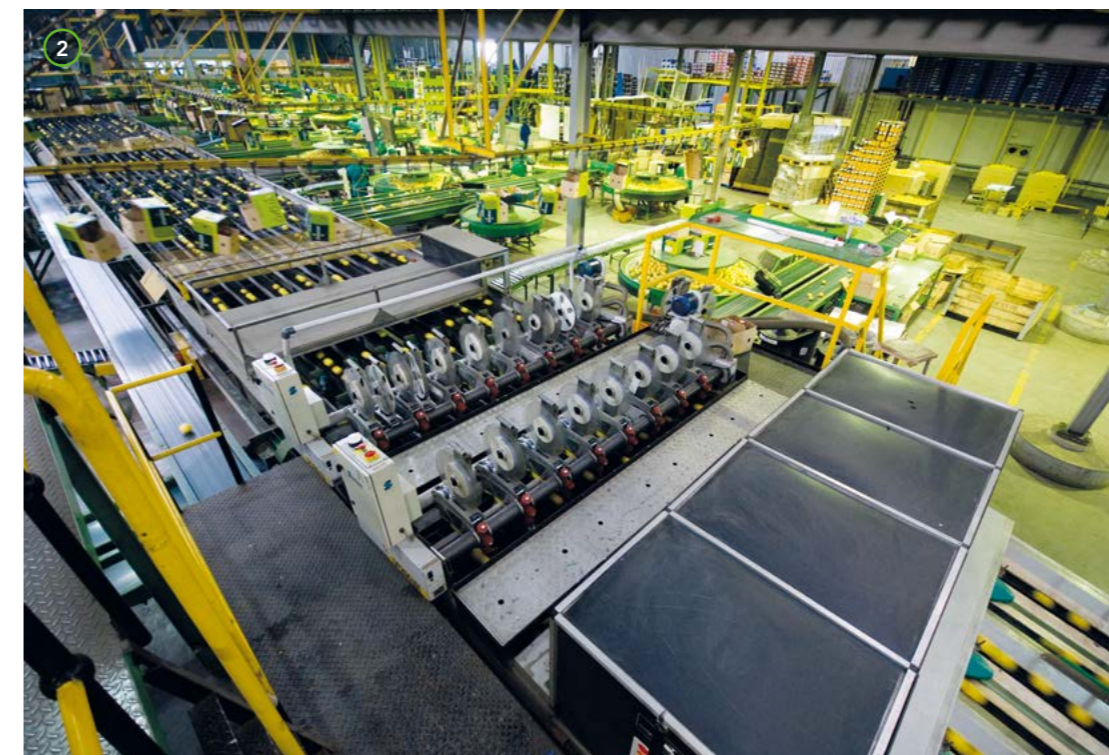
The NCPC-SA assigned trained energy consultants to spend three to four days at each of the participating

facilities. The audit was fully subsidised by the NCPC-SA. All the participants had to contribute, was their cooperation.

Once the audits were completed, the energy consultants discussed their detailed reports with the owners of each individual pack house and cold store. The reports highlighted, among others, savings options, results on feasibility, quantification of behavioural changes and the expected payback periods for energy saving investments.

THE FINDINGS

The 29 participating facilities had a combined energy usage of 101,1 megawatt hours (MWh) of electricity at a cost of R77 million for the year 2011. The energy audits revealed that they could save a combined 27MWh per year, putting R20,7 million back into their collective pocket. This 26,8% saving would require an investment of R26 million that will, on average, pay for itself in only 1,26 years. The potential electricity saving equals a reduction in CO₂ emissions of 27 000 tons per year



- 1 Koos Bouwer.
- 2 The best performing pack houses use around 15kWh of electricity per ton of fruit packed, while others use three times as much. The only way to improve facilities' energy efficiency is to use individual energy audits or assessments.



The energy audits were not a PHI research project. Instead the Programme helped pack houses and cold stores to access free energy audits that were offered by the Council for Scientific and Industrial Research's National Cleaner Production Centre (NCPC). Koos Bouwer worked with the NCPC to execute the initiative on behalf of PHI.



The energy audits revealed that the 29 participating facilities could save a combined 27MWh per year, putting R20,7 million back into their collective pocket. The potential electricity saving equals a reduction in CO₂ emissions of 27 000 tons per year.



Some of the areas in which considerable efficiencies can be gained are energy efficient lighting, variable speed drives and energy management systems. The single biggest opportunity, however, is to improve the efficiency of cooling equipment.

THE WAY FORWARD

Mr Bouwer points out that it is important to understand that the facilities are all unique and that the same change will have different impacts at different facilities. "It is literally impossible to generalise because one size does not fit all. The only way to improve facilities' energy efficiency is to use individual energy audits or assessments as the starting point."

A number of the facilities that took part in the audits are doing just that. Using their site-specific recommendations, they have started to implement the

THE IEE IN ACTION

The objectives of the Industrial Energy Efficiency (IEE) improvement project are to:

- Contribute to the sustainable transformation of industrial energy usage practices in South Africa.
- Reduce carbon dioxide emissions.
- Demonstrate how energy efficient practices can increase profitability.

suggested energy efficiency measures and are reaping the benefits.

"The project seems to have acted as a catalyst," says Mr Bouwer. "It made the saving opportunities visible and facility owners are acting on it." 🍏



1 Different methods of cold storage have different energy implications. Storage of apples in a controlled atmosphere is extremely efficient at less than 1kWh per ton of fruit per day, whereas fruit packed in cartons on pallets use almost 8kWh of electricity per ton per day.

ANALYSIS OF COST CHAIN FOR APPLES

Selling price of R175,00 for 12,5kg

Source: Prof. Malcolm Dodd

