Comments

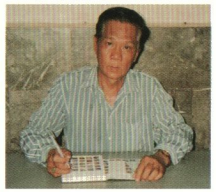
Mr. Vo Thanh Dai

Assistant Manager, Saigon Plastic Factory

We were convinced about the benefits from insulation by the demonstration of insulation in a machine of our factory. We have now planned to insulate all the remaining molding machines.

Mr. Phung Phu Lap

Manager, Vinh Tien Plastic



We were absolutely convinced about the benefits from insulating by the demonstration of the insulation in the extrusion molding machine in our factory. After this demonstration, I have applied this option to all our molding machines. Our workers now feel more comfortable.

Mr. Nguyen Thanh Dung

Engineer, Tan Dai Hung Plastic

Previously, we were worried about the effect of insulation on our product. However, after conducting tests on one molding machine, we have decided to put insulation on all barrels of the machines in our factory. The surrounding temperature has also reduced remarkably.

Contact

For more information, please contact:

- Department of Science, Technology and the Environment (DOSTE) of Ho Chi Minh City
  244 Dien Bien Phu street, Dist. 3
  Ho Chi Minh City, Vietnam
  Tel: (84-8) 8242709 / 9320122
  Fax: (84-8) 8242711;
  Email: pqlmt@hcm.vnn.vn

Technical support was provided by:

- Energy Conservation, Research and Development Center (ENERTEAM)
  273 Dien Bien Phu street, Dist. 3
  Ho Chi Minh City, Vietnam
  Tel: (84-8) 9 302 393 / 9 307 350
  Fax : (84-8) 9 307 350
  Email: enerteam@fmail.vnn.vn

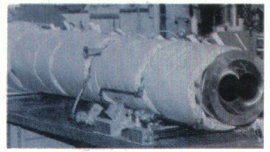
- Institute of Environment and Resource-National University-Ho Chi Minh City (CEFINEA)
  142 To Hien Thanh Street, District 10
  Ho Chi Minh City, Vietnam
  Tel: (84-8) 8 651 132
  Fax: (84-8) 8 655 670
  Email: dan-np@hcm.vnn.vn

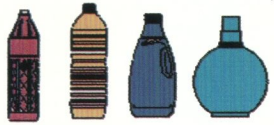
ABOUT THE PROJECT

- The Cleaner Production project in HCMC funded by the French Agency for the Environment and Energy Management (ADEME) was aimed at
  - reducing energy consumption and pollution in industrial sectors and
  - enhancing local technical and managerial capacity to deal with the energy-environment issues faced by the industries.
- The Department of Science, Technology and the Environment (DOSTE) of Ho Chi Minh City implemented the project with technical support from ENERTEAM and CEFINEA, and with guidance from experts of the Asian Institute of Technology (AIT). The plastic and the seafood industries were targeted. The project was initiated in September 2001.
- The methodology adopted to carry out the project was as follows:
  - Project initiation workshop
  - Preliminary survey to identify the current status of the industries.
  - Discussion with factories, and carrying out audits in selected factories to identify options.
  - Implementation of suggested options.
  - Preparation of fact sheets of viable options and detailed reports.
  - Final workshop (August 2002) to highlight and disseminate the findings.
- It is believed that the results of the project can be used as references for similar improvements in other factories.

TFS - 001 - August 2002 / 500 copies

Insulation of Heating Barrels in Plastic Molding Machines





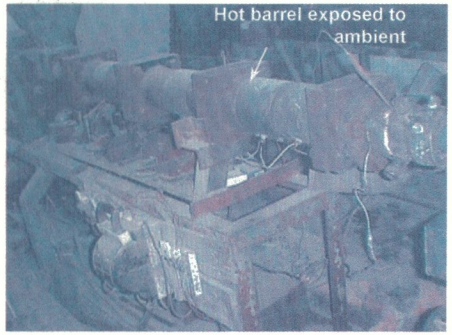
DEVELOPMENT PARTNERS

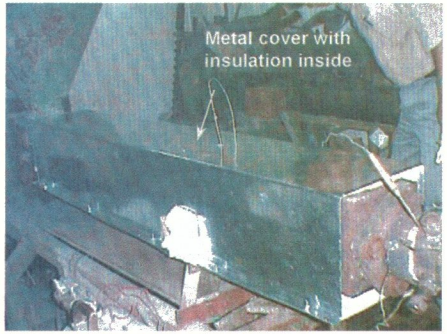
Users: Saigon Plastic, 50A Ben Phu Dinh, Ward 16, District 8, Ho Chi Minh City, Vietnam

Tan Dai Hung Plastic, 373C Nguyen Son Street, Ward 18, Tan Binh District, Ho Chi Minh City, Vietnam

Vinh Tien Plastic, 122/12E Ta Uyen, Ward 4, District 11, Ho Chi Minh City, Vietnam

Promoter: Department of Science, Technology and the Environment (DOSTE), 244 Dien Bien Phu, Ho Chi Minh City, Vietnam.





An Extrusion molding machine before and after adding insulation

Summary

Insulating the heating barrel of the plastic molding machine helps to reduce energy loss to the surrounding. This will reduce the power consumption and provide a better working environment.

Injection and extrusion machines were insulated following a Cleaner Production audit. The total energy saving ranged from 7 to 25% of the molding machine energy consumption. The payback period was less than 15 days.

A Cleaner Production activity sponsored by the French Agency for the Environment and Energy Management (ADEME) and assisted by the Asian Institute of Technology (AIT)

The problem

The heat required for melting raw material in plastic molding machines is provided by the friction between the screw and plastic material and by external heating bands wound around the heating barrel.

Normally, a metal sheet covers the barrel to protect workers from accidentally coming into contact with the barrel and to reduce heat losses. However, in practice, many machines do not have this cover. Even with this metal cover, heat loss to the surrounding environment is still high. Temperature measured on the metal cover is in the range of about 110-160°C while the temperature of heating barrels can be as high as 260°C.

The heat loss from the machine contributes to an increase in the surrounding ambient temperature. Therefore, ventilation fans are used to improve the workers comfort. This results in further increase of electricity consumption.

The answer

Insulating the heating barrel will reduce the energy needed for melting the raw material, thus minimizing energy consumption and related costs. Other benefits include:

- Shorter start-up: insulation helps to reduce the time required to start the production;
- Reducing temperature fluctuations: constant temperature fluctuations on heating bands and other heating elements will greatly shorten the heater's service life. With proper insulation, heaters maintain a more consistent temperature, thus increasing the service life of heater bands;
- Consistency in processing: The heated equipment maintains a more even heat profile, ensuring a more consistent process, and reducing scrap and defective products; and
- Employee's safety should also be considered when operating heated equipment. Insulating layer brings the surface temperature to a level that is safe.

Audits carried out in three factories in Ho Chi Minh City indicated that placing insulation around heating barrels is an excellent Cleaner Production option.

PLASTIC INDUSTRY IN HCMC

- Plastic is considered as one of the key sectors of industrial development in Ho Chi Minh City. In 2000, about 900 enterprises were involved in making plastic products. The plastic sector has grown by 25-30% annually in recent years and is expected to maintain this growth in the coming years.
- However, lack of knowledge on resource conservation along with the increase in production has led to energy inefficiency and environment deterioration. Some options to improve the present situation are:
  - Housekeeping: measuring and recording production data and energy use; regular checking and maintenance of equipment
  - Improved working condition: insulating heating sources, reducing noise, etc.
  - Energy saving options: insulation to reduce heat loss, replacement of inefficient VS coupling mechanism by VSD; designing suitable distribution systems for the compressed air and cooling water system.

Energy conservation

a) Saigon Plastic

Heating bands accounting for over 50% of energy consumption in the injection molding machines are covered by only a simple metal sheet. Figure 1 shows the change in the power consumption before and after placing the insulation layer around it.

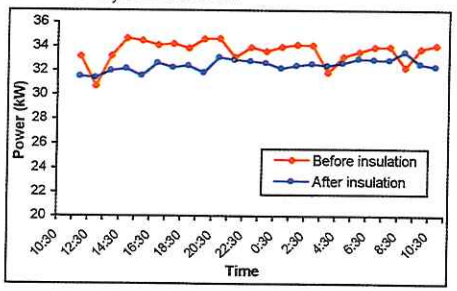


Figure 1. Power consumption before and after placing insulation in a plastic forming machine.

This insulation helped to save 2.2kW (about 7% of the total power consumption of the machine). The sudden decreases observed in the power consumption (figure 1) are due to stoppages in production.

b) Tan Dai Hung Plastic

An insulating layer was applied on an extrusion molding machine for both the heating barrel and the die. A reduction of 7.31kW of power (equivalent to 12.8% of the total power consumption) was observed.

Before insulation, the average power demand of this machine was 57.28kW. After installing the insulation, the demand reduced to 49.97kW (see Figure 2).

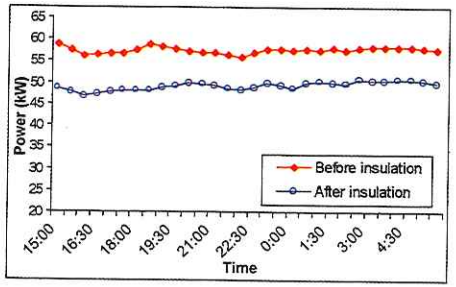
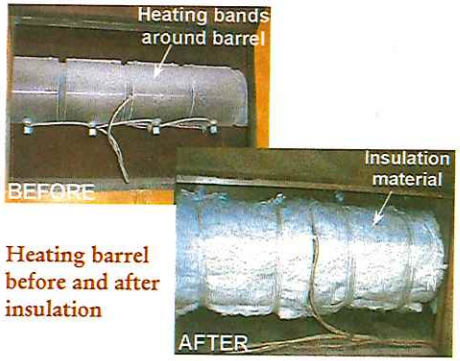


Figure 2. Power consumption before and after insulating in a molding machine of Tan Dai Hung Plastic Factory

The insulation also helped to reduce the nearby ambient temperature remarkably, (at a location 1m away from the cylinder) from around 45°C to 40.5°C. This temperature will be further reduced if all the machines are insulated.



Heating barrel before and after insulation

c) Vinh Tien Plastic

An insulation and cover were placed on the PVC-pipe making machine.

Measurements were conducted before and after insulating to evaluate the effect of the insulation layer. Figure 3 shows the change in power consumption before and after putting insulation.

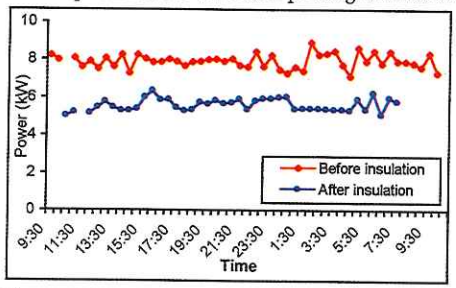
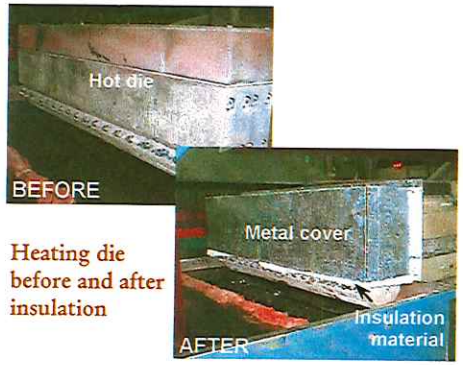


Figure 3. Power consumption before and after placing insulation in Vinh Tien Plastic Factory



Heating die before and after insulation

Cost-benefit

Investment includes insulation material, metal cover and accessories. The saving is evaluated based on the actual electricity saving and taking into account the present working condition (number of working hours per year). Table 1 summarizes the saving from insulation for the three machines at the three factories.

Table 1. Cost-benefit of the insulation option in the factories

Machine	Investment (Mil. VND)	kW saving	% energy saving of machine	Saving (Mil. VND/month)	Payback period
Saigon Plastic	0.52	2.20	6.5	1.10	14 days
Tan Dai Hung Plastic	0.63	7.31	12.8	3.65	5 days
Vinh Tien Plastic	0.33	2.29	32	1.10	10 days

Note: 1USD = 15,300 VND (August 2002)