



ASSOCIATED MOTORWAYS LIMITED

Insulation of Steam Pipelines and tyre moulds of Vulcanization/Curing Process in Rubber Products Division

SUMMARY OF THE OPTION

Associated Motorways Limited is one of the leading rubber products factories in Sri Lanka, producing tyres and tubes and retreading tyres. The company comprises several subsidiary companies, including the Rubber Production Department (RPD). This division produces 2,700 tyres for three wheelers and 3,400 tyres for motor cycles on average per month.

A detailed Cleaner Production / Energy Efficiency assessment identified many energy losses and waste streams. A cause analysis was conducted to identify what caused these losses and to identify options to reduce losses. Based on the results, the company insulated steam pipelines and tyre moulds of the vulcanization/curing process. Investment costs were US\$ 1,480, annual furnace oil savings are 6,000 liters or US\$ 1,380, and the payback period was # months. GHG emissions are reduced by 18 tCO₂ per year.

The company has since commenced with establishing a system to recover condensate, which is currently released into the atmosphere, and is repairing insulation and leaks on a continuous basis.

KEY WORDS

Chemicals, Sri Lanka, Steam Distribution and Utilization, Rubber, Tyres, Vulcanization Process, Curing Process

OBSERVATIONS

A comprehensive Cleaner Production/ Energy Efficiency assessment of the RPD by the Team identified several waste streams:

- Un-insulated steam pipelines. The Team measured the length and surface temperature to estimate losses
- Un-insulated tyre moulds. The high temperature near the tyre moulds made the Team decide to investigate this area further. The following work was done:
 - Steam supplied to the moulds was measured through measuring the quantity of condensate collected
 - Causes for the variation in the cycle time were analyzed and was mainly attributed to heat losses from the moulds, which was caused by un-insulated mould surfaces
 - Heat losses from the mould were estimated
 - The Team also analyzed other aspects of influence on the heat loss at the mould, such as the vulcanizing process, the steam temperature, and compressed air supply to the mould
- Condensate losses: A noticeable loss was the flash steam due to condensate that is going down the drain in the factory because condensate is not recovered.

A detailed brainstorm session was conducted to find the causes for these and other waste streams identified. The results of this cause analysis are given in the table below.

Table 1: Sample cause analysis and options generated

Process	Waste stream	Cause	Option
Pressing	Energy loss	Steam leaks	Repair steam leaks & insulate
		Poor efficiency of pressing machines	Improve preventive maintenance
		Ineffective production planning	Prepare effective production plan to use the machines & operators
		Overheating the machines	Control and stabilize required steam supply
		Uncovered moulds	Cover the pressing moulds
		Un-insulated steam pipe lines	Insulate steam supply lines
		Power failures	Improve the Generator Relay Switch
	Worn out Air Bags	Damaging the air bags	Training of operators on handling the air bags
		Less durability	Increase durability by using good quality air bags
	Waste Bladder	Damaging the bladder	Training to the operators on handling the bladder
		Less durability	Increase durability by using good quality bladder
	Damaged Tyre	Poor housekeeping	Improve the internal housekeeping system
		Heat variation	Provide stable steam supply
		Poor maintenance	Improve preventive maintenance
		Poor training & awareness	Organize training programs
		Power failures	Improve the Generator Relay Switch
		Damaged moulds	Use right moulds and inspect before use
	Waste water	Water leaks in the pipelines	Repair the water pipelines
		Release of wastewater to the drain	Install a wastewater treatment plant

OPTIONS

The following options were implemented:

- Insulating steam pipelines with glass wool insulation material and covering the glass wool with reflective paper to minimize radiation losses
- Insulation of the two parts of the moulds used for vulcanization or curing of the tyres with glass wool and covering the glass wool with aluminium sheets to minimize radiation losses

The company also commenced with the identification and repair of steam leaks. In addition, the company is now evaluating the option of condensate recovery using a suitable pump and insulation of approximately 200 meters of condensate return pipe lines (equals the distance to the boiler).



Figure 1: Un-insulated moulds at RPD at AMW

RESULTS

Financial benefits

Insulation of steam pipelines and tyre moulds:

- Investment: US\$ 1,480, including:
 - Insulation material (glass wool) and aluminium refractory covers for steam lines: US\$ 700
 - Insulation material (glass wool) and aluminium cover for moulds: US\$ 600
 - Labour costs to install insulation: US\$ 180
- Operating costs: not determined
- Annual cost savings: US\$ 1,380 (6,000 liter fuel oil X US\$ 0.23/liter)
- Payback period: 1 year

Expected financial details for the condensate recovery option:

- Investment: US\$ 3,200, including:
 - Materials and pump: US\$ 3,000
 - Labour US\$ 200
- Annual operating costs: US\$ 1,200 (estimated)
- Annual cost savings: US\$ 15,456 (67,200 liters of furnace oil X US\$ 0.23/liter)
- Payback period: 4 months

Company management is motivated by the result of these options and in order to monitor and further reduce steam consumption, the company is in the process of installing a steam flow meter at the cost of approximately US\$ 2,000.

Environmental benefits

Insulation of steam pipelines and tyre moulds:

- Annual furnace oil savings: 6,000 liters (500 liters/month X 12 months), based on a rule of thumb that for every 6°C increase in boiler feed water temperature, the boiler efficiency will increase by 1% and fuel consumption will reduce by 1%)
- Annual GHG emission reduction: 18 tCO₂/yr (6000 liters X 3.08 tCO₂/1000 liters)
- SO_x emission reduction: not quantified

Expected environmental benefits for the condensate recovery option:

- Annual furnace oil savings: 67,200 liters (5,600 liters/month X 12 months), based on a rule of thumb that for every 6°C increase in boiler feed water temperature, the boiler efficiency will increase by 1% and fuel consumption will reduce by 1%)
- Annual GHG emission reduction: 207 tCO₂ (67,200 liters X 3.08 tCO₂/1000 liters)

Other benefits

- The employees are experiencing more comfortable working conditions inside the factory, due to reduced heat loss from steam pipelines and moulds
- Reduction of cycle time because heat loss of moulds was reduced, and therefore production was increased
- Because the RPD was able to reduce the cost of steam to AMW, this department was charged less for steam by AMW
- RPD reduced the cycle time by conserving heat in moulds and increase production

FOR MORE INFORMATION

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