



## **MEDIGLOVES LIMITED**

### **Recovery and Reuse of Water and Chemicals from Dipping Processes**

#### **SUMMARY OF THE OPTION**

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Medigloves Limited is a Thai producer of more than 70 million pairs of quality surgical and cleanroom latex gloves per year for the domestic and international market.

The company uses nearly 500 m<sup>3</sup> water and discharges more than 420 m<sup>3</sup> to an offsite wastewater treatment plant. The dipping process uses most water. Every day about 42 m<sup>3</sup> hot water of 60 °C is drained from wash tanks in the dipping process for wastewater treatment. Because this water is relatively clean, part of the water is now collected in storage shower tanks for reuse in earlier washing and cleaning steps of the dipping process.

Modifications to connect the wash tank with the storage shower tank cost US\$ 1,250. The company saves US\$ 6,388 per year and the payback period was 2.3 months. Every year, 11,564 kWh electricity, 17,078 liters fuel oil and 4,586 m<sup>3</sup> water are saved. In addition, more than 58 tons of CO<sub>2</sub> emissions are mitigated per year.

A similar option was implemented for the chlorination process (*see separate case study*). Since implementing these options the company is looking into other ways to recover and reuse the remaining drained hot water from the dipping process and wash and chlorination process. If successful, the company could save up to 32,000 m<sup>3</sup> per year and thousands of dollars in the future.

#### **KEY WORDS**

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Chemicals, Thailand, Water Recovery, Water Conservation

#### **OBSERVATIONS**

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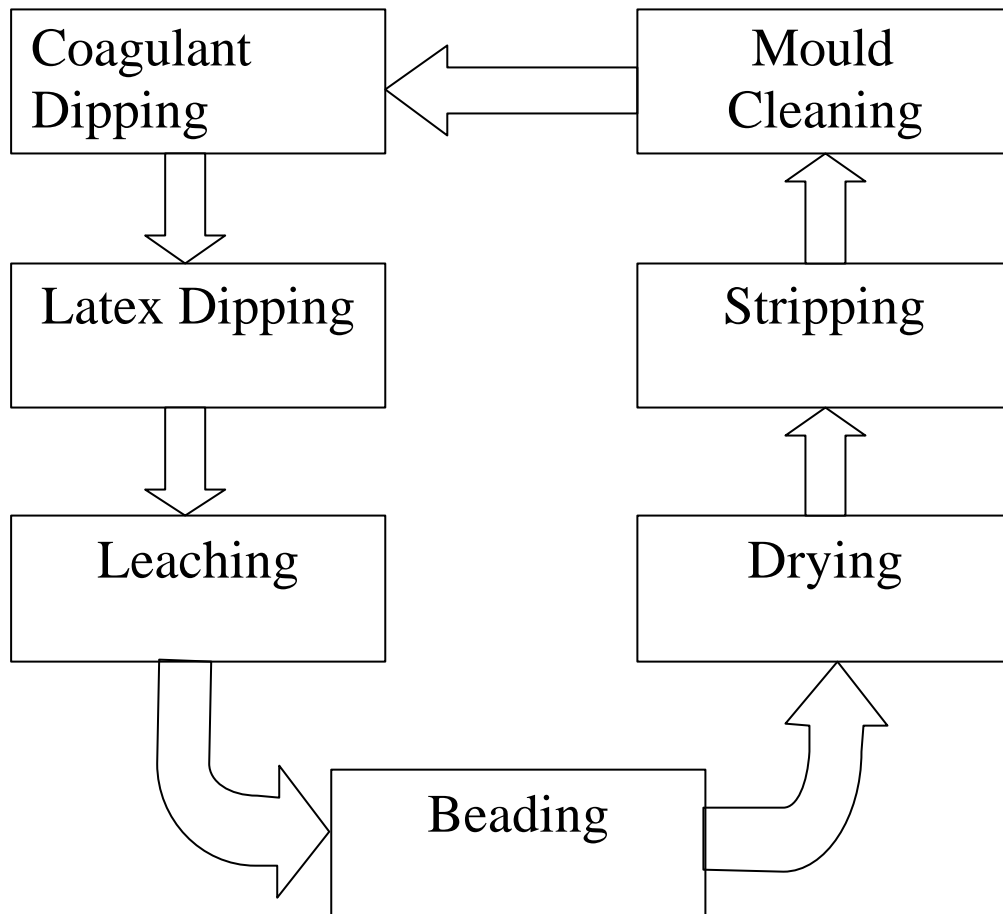
Producing medical gloves requires a lot of water. Medigloves consumes nearly 500 m<sup>3</sup> of water for its daily production processes and the dipping process is the main water consumer.

Of the water used, more than 420 m<sup>3</sup> is discharged to the wastewater treatment plant every day. More than 100 m<sup>3</sup> per day is drained water from the dipping process and the wash and chlorination process, and is relatively clean water.

The dipping process was further investigated because of the high quantities of water consumed and discharged. A schematic diagram of the dipping process is shown in figure 1.

The last step of the dipping process is the cleaning of moulds. After moulds are cleaned with a chemical solution (55-65 °C), they are moved into a wash tank with hot water (70-75°C) to remove remaining chemicals. To ensure that the chemical concentration remains below a certain level, each time the moulds are dipped into the wash tank, hot water is drained from the wash tank and fresh hot makeup water is added to the tank.

Figure 1. Schematic diagram of the dipping process



Upon investigation the Team found that more than 2 m<sup>3</sup> (60 °C average) of hot water is drained from wash tank for each 8-hour shift for each of the seven dipping line, resulting in 42 m<sup>3</sup> wastewater each day (2 m<sup>3</sup> X 3 shifts X 7 dipping lines). Because this water is clean and hot, it is very suitable for reuse. In addition, since this water is sent to the wastewater treatment plant, this causes significant losses of treatment chemicals and electricity, costing the company thousands of dollars each year.

## OPTIONS

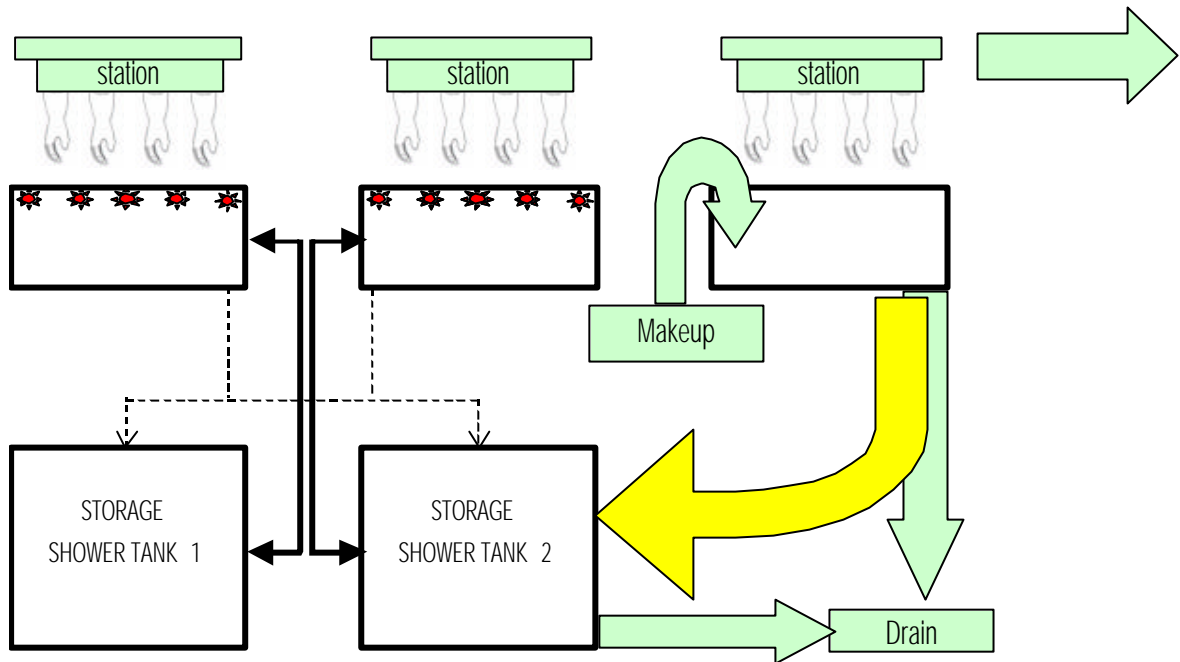
The Team proposed to collect hot water drained from the wash tanks in storage shower tanks (see figure 2). The storage shower tanks reuse this water for showers to wash or clean gloves in earlier steps of the dipping process. The technical feasibility analysis of this option found the following:

- Laboratory tests confirmed that this water is not contaminated with other chemicals and is therefore suitable for reuse in the dipping process.
- The limited area between the different tanks and equipment made it difficult to attach drainages guards/pipes to all water tanks



- The capacity of storage shower tanks is 0.7 m<sup>3</sup> and therefore only a maximum of almost 15 m<sup>3</sup> water (0.7 m<sup>3</sup> X 3 shifts X 7 dipping lines) could be recovered each day, while the remainder would still need to be sent to the wastewater treatment plant

**Figure 2. Recovery of drained water from wash tanks in the dipping line**



Since the implementation of this option the company is looking into other ways to recover and reuse the remaining drained hot water from the dipping process and wash and chlorination process. If successful, the company could save up to 32,000 m<sup>3</sup> per year and thousands of dollars in the future.

## **RESULTS**

### **Financial benefits**

- Investment: US\$ 1,250 for pipelines between the wash tanks and the storage shower tanks
- Annual cost savings: US\$ 6,388, calculated as follows:
  - Annual electricity cost savings: US\$ 665 (= 11,564 kWh X 0.0575 US\$/kWh)
  - Annual water & chemical cost savings: US\$ 1,880 {= 4,586 m<sup>3</sup> water savings X (0.26 US\$/m<sup>3</sup> water + 0.15 US\$ for chemicals per m<sup>3</sup> wastewater treated)}
  - Annual fuel oil cost savings: US\$ 3,843 (= 17,078 liters fuel oil X 0.225 US\$/l)
- Payback period: 2.3 months (= US\$ 1,250/US\$ 6,388 X 12 months)

### **Environmental benefits**

- Annual water savings: 4,586 m<sup>3</sup> from seven production lines (13.65 m<sup>3</sup>/day X 336 operating days)
- Annual electricity savings: 11,564 kWh, calculated as follows:
  - Electricity used for water 2.519 per m<sup>3</sup> water (= 0.759 kWh/ m<sup>3</sup> to lift water from the well + 1.76 kWh/ m<sup>3</sup> to treat wastewater)

- 2.519 kWh X 4,586 m<sup>3</sup> water saved = 11,564 kWh per year
- Annual fuel oil consumption reduction: 17,078 liters, calculated as follows:
  - Average temperature of hot drainage: 60°C
  - Average temperature of ambient water: 30°C
  - Average specific heat of water between 30-60 °C at constant pressure: 1.0029 kCal/kgC
  - Heat recovery from hot drainages: 410,693 kCal/day {= (14 x 1000) X 1.0029 X (60-30)}
  - Steam consumption reduction via recovery of hot drainage: 233.94 ton steam per year (= 410,693 kCal per day / 589,855 kCal per ton X 336 operating days)
  - 233.94 ton steam X 73 liters to produce one ton steam = 17,078 liters
- Annual GHG emission reduction: 58.4 tons CO<sub>2</sub>/year, calculated as follows:
  - GHG reduction from electricity: 7.2 tons CO<sub>2</sub>/year (11,564 kWh X 0.000618 tonCO<sub>2</sub>/kWh)
  - GHG reduction from fuel oil: 51.2 tons CO<sub>2</sub>/year (17,078 liters X 3 tons CO<sub>2</sub>/1,000 liters fuel oil)}

## **FOR MORE INFORMATION**

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