

# AWA 250 – CASE OF STUDY

## 1. INTRODUCTION

In December 2017 SEAS installed an AWA 250 HWAC machine (usually called AWA 250 in the current document for shortness) in a worker village (named Labour village 2 in the following two pictures) placed not very far from Dubai. The scope was to carry out a working test of the machine, in order to determine its Pay Back Time for the worker village owners.



Fig. 1. Worker Village geographic position





Fig. 2. Worker Village

## 2. DUBAI CLIMATE

Taking into account statistical weather data, coming from a weather station placed in the Dubai airport, it was possible to determine the following table.

| Data base *        | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Avg Day Temp °C    | 20,6 | 21,7 | 24,4 | 28,5 | 32,8 | 34,2 | 37   | 36,8 | 34,4 | 31,2 | 26,5 | 22,3 |
| Avg Day Humidity % | 59,7 | 56,5 | 53,2 | 46,6 | 39,5 | 48,8 | 44,5 | 44,6 | 51,5 | 54,4 | 53,7 | 57,4 |

Considering the previous table, Dubai has an almost dry and hot climate. The AWA machine average water production, in such a climate is about 1650 litres/day.

## 3. WORKER VILLAGE EXISTING PLANT DESCRIPTION

The worker village has several buildings. The actual heating plant, for each building, is composed by 24 electrical boilers of 1.5 kW, which works 12 hours/day. Such an energy amount can heat about 12,000 litres/day of domestic water (temperature difference provided: 30°C)

Moreover there is a building, which houses all the kitchens, which serve workers. This building has a LPG boiler, that has an estimated efficiency of 70% and averagely heats about 20,000 litres day of domestic water (temperature difference provided: 30°C). Furthermore, such a building has an air conditioning system, which has also a duct system equipped with fans (fan motors energy consumption: 144 kWh/day)

#### 4. WATER AND ENERGY COST

On the basis of data collected from worker village managers, it was possible to determine the following table of costs

| description                 | Measure unit | cost |
|-----------------------------|--------------|------|
| Electrical energy           | AED/kWh      | 0.44 |
| LPG                         | AED/litre    | 1.9  |
| High quality drinking water | AED/litre    | 0.5  |

N.B.

AED is the Dubai currency, its value, in comparison to US dollar, is 0.2724 (11/04/2017)

#### 5. AWA 250 INSTALLATION SCHEME AND TEST SHORT DESCRIPTION

The AWA 250 machine was installed on concrete basement, in external environment, nearby village kitchens, where the test has been performed.

The fresh and dry air, coming from the AWA machine, was directly delivered into kitchen environment. A pipeline linked the existing domestic water tank to the AWA 250 condensation plate coils. Moreover, the drinking water was collected in tank.

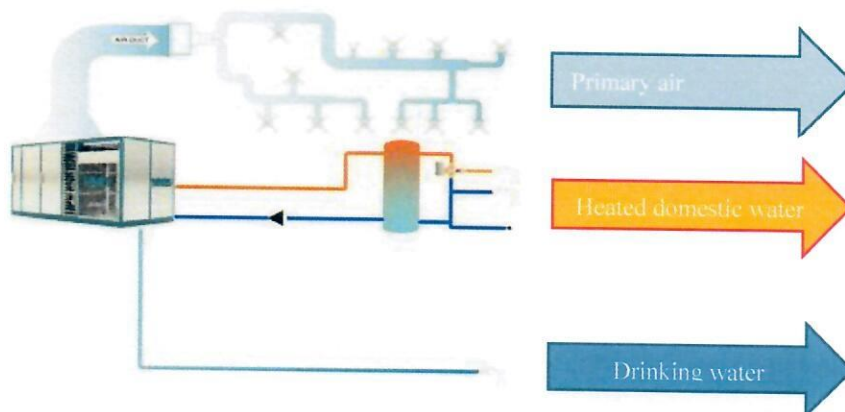


Fig. 3. AWA installation scheme





Fig. 4. The AWA 250 on site



Fig. 5. Pipeline construction

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Fig. 6. Pipeline connection to the tank and LPG boiler



Fig. 7. Example of kitchen environment. Air coming from AWA



The test has been carried out for about 3 months, and, during them, several data were collected, such as:

- Temperature and relative humidity
- Produced water
- energy consumption
- heated domestic water flux and achieved temperature

Worker village people monitored the test on site, while SEAS made controls, on remote, by means of AWA satellite device.

## 6. RESULTS

On the basis of data coming from the test it was possible to define the followings results:

- AWA 250 heating capacity: enough to serve five buildings of the worker village and save: 2160 kWh of electrical power due to boilers, which means 950 AED /day  
Moreover, there is enough thermal energy left to serve the kitchen boiler and save 154 litres of LPG/day, which means 293 AED/day
- AWA 250 average water production: 1646 litres/day of high quality drinking water, which means 829 AED/day
- AWA 250 cooling power: enough to replace existing air conditioning and fan motors to achieve daily electrical energy saving of: 480 kWh, which means 211 AED/day

While the AWA 250 average electrical energy consumption is 800 kWh/day, which means a cost of 352 AED/day

Moreover the AWA 250 daily cost for maintenance and consumables is: 139.3 AED/day.

The following table shows the previous results

| description                 | Measure unit | results | AED/day  |  |
|-----------------------------|--------------|---------|----------|--|
| Electrical energy saving    | kWh/day      | 2640    | 1161.6   |  |
| LPG saving                  | litre/day    | 154     | 293      |  |
| Water saving                | litre/day    | 1646    | 823      |  |
| AWA costs                   |              |         |          |  |
| Electrical consumption      | kWh/day      | 800     | 352      |  |
| Consumables and maintenance |              |         | 139.3    |  |
| Final result                |              |         |          |  |
| Net daily saving            |              |         | 1,785.88 |  |
| Net yearly saving           |              |         | 651,846  |  |

## 7. PAY BACK TIME EVALUATION

On the basis of the previous described results, it was possible to calculate the PBT of the machine, taking into account the following prices:

| Description          | Costs AED |
|----------------------|-----------|
| AWA 250 HWAC machine | 1,180,480 |
| Installation         | 57,500    |
| Total cost           | 1,237,980 |

Thus the PBT is less than 2 years (about 1 year and 11 months)