

CALCULATION REPORT

OF REFRIGERATION LOAD

**Food Industry**

**Tunnel for fish**

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# Project data

## Project identification

• Project title: Food Industry

• Date:

• Designer:

• Client:

• Comments:

## Location

• Country: Argentina

• City: Córdoba

• Outdoor temperature (ºC): 33,1

• Outdoor R.H (%): 36

• Soil temperature (ºC): 24,05

• Altitude (m): 489

# Room data

## Type of room: Tunnel blast freezer

• Room name: Tunnel for fish

## Type of product

• Product: Fish / Fish, oily

• Room temperature (ºC): -30

• Room R.H (%): 88

• Product inlet temperature (ºC): 15

• Final product temperature (ºC): -10

• Product shape: Oval

• Oval length (mm): 599,95

• Oval width (mm): 199,9

• Oval thickness (mm): 199,9

• Estimated piece weight (kg): 13,58

• Minimum freezing time (min): 647

## Room dimensions

• Room length (m): 5

• Room width (m): 4

• Room height (m): 3

• Room volume (m³): 59,95

• Room capacity (kg): 1599

• Freezing time (min): 647

• Tunnel capacity (kg/h): 148

• Packaging load enlargement (%): 15

• Daily infiltration air changes: 2

## Position and orientation

• Position: Walls at different temperatures

• Entrance hall temperature (ºC): 5

• Entrance hall R.H (%): 80

• Wall temperatura 1 (ºC): 5

• Wall temperatura 2 (ºC): 5

• Wall temperatura 3 (ºC): 5

• Wall temperature 4 (ºC): 5

• Ceiling temperature (ºC): 5

## Walls

• Wall 1

◦ Material: Polyurethane, expanded (board)

◦ Thickness (mm): 120

• Wall 2

◦ Material: Polyurethane, expanded (board)

◦ Thickness (mm): 120

• Wall 3

◦ Material: Polyurethane, expanded (board)

◦ Thickness (mm): 120

• Wall 4

◦ Material: Polyurethane, expanded (board)

◦ Thickness (mm): 120

• Ceiling

◦ Material: Polyurethane, expanded (board)

◦ Thickness (mm): 120

• Doors

◦ Material: Polyurethane, expanded (board)

◦ Thickness (mm): 120

◦ Surface (m²): 3

• Floor

◦ Slab

▪ Material: Reinforced concrete slab

▪ Thickness (mm): 150

◦ Insulation

▪ Material: Polystyrene, expanded

▪ Thickness (mm): 250

◦ Air chamber: Yes

## Evaporator

• Type of evaporator: Ventilated

• Calculation method: Fan power known (W)

• Fan power (W): 4339

• Operating time (h/day): 22

**Defrost heating power**

• Calculation method: Defrost power known (W)

• Defrost power (W): 26.481

• Operating time (h/day): 2

## Other thermal loads

• Calculation method: Power known (W)

• Other loads power (W): 0

• Operating time (h/day): 0

## Enlargement factors

• Installation operating time (h/day): 22

• Safety factor (%): 10

# Results

|  |  |  |  |
| --- | --- | --- | --- |
| **Calculation results** | **Sensible** | **Latent** | **% of total** |
| A. Transmission thermal load (W) | 698 | 0 | 3 |
| B. Infiltration thermal load (W) | 67 | 21 | 0 |
| C. Ventilation thermal load (W) | 0 | 0 | 0 |
| D. Product thermal load (W) | 15.020 | 0 | 68 |
| E. Product respiration thermal load (W) | 0 | 0 | 0 |
| F. Occupancy thermal load (W) | 0 | 0 | 0 |
| G. Ligthing thermal load (W) | 0 | 0 | 0 |
| H. Evaporator fan thermal load (W) | 3977 | 0 | 18 |
| I. Evaporator defrost thermal load (W) | 2207 | 0 | 10 |
| J. Other thermal loads (W) | 0 | 0 | 0 |
| Total sensible thermal load (W) | 21.969 | 0 | 100 |
| Total latent thermal load (W) | 0 | 21 | 0 |
| **Total thermal load (W)** | **21.990** | | **100** |

* Installation operating time (h/day): 22
* Safety factor (%): 10

**Room refrigeration load (W): 26.388**

Sensible (W): 26.363

Latent (W): 25

Load / Room volume ratio (W/m³): 440

**Freezing time (min): 647**

**Design recommendations**

* Room temperature (ºC): -30
* Room R.H (%): 88
* ΔT ventilated evaporator (K): 5