TUNNEL PASTEURIZER

Use and maintenance instructions

Marking

TMCI Padovan s.p.a.
via Dal Vera 13 - 31015 Conegliano (TV) - ITALY
tel. 0438-4147 fax. 0438-23682

Serial Nr. : 91200046-0/001
Year of supply : 2000
## INSTRUCTIONS FOR USE AND MAINTENANCE OF TUNNEL PASTEURIZER

<table>
<thead>
<tr>
<th>INDEX</th>
<th>Page</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>TECHNICAL DATA</td>
<td>2</td>
<td>5) CHOICE OF OPERATION CYCLE</td>
</tr>
<tr>
<td>1) GENERAL SAFETY RULES</td>
<td>4</td>
<td>5.1) General principles</td>
</tr>
<tr>
<td>1.1) General information</td>
<td>4</td>
<td>5.2) Variations of pasteurization cycle</td>
</tr>
<tr>
<td>1.2) Equipment of personnel</td>
<td>4</td>
<td>5.3) Variation of heating cycle</td>
</tr>
<tr>
<td>1.3) General mandatory instructions</td>
<td>4+5</td>
<td>-</td>
</tr>
<tr>
<td>2) INSTALLATION RULES</td>
<td>6</td>
<td>6) PLANT OPERATION</td>
</tr>
<tr>
<td>2.1) Unloading from transport means</td>
<td>6</td>
<td>6.1) Starting the plant</td>
</tr>
<tr>
<td>2.2) Control of delivery and assessment of any damage</td>
<td>7</td>
<td>6.2) Standard operation</td>
</tr>
<tr>
<td>2.3) Temporary storage</td>
<td>7</td>
<td>6.3) Stopping the plant</td>
</tr>
<tr>
<td>2.4) Installation of transmission shaft and countershaft</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>2.5) Belt Installation</td>
<td>8</td>
<td>7) ELECTRIC SWITCHBOARD</td>
</tr>
<tr>
<td>2.6) Installation of conveyor belts and head fairing</td>
<td>9</td>
<td>8) SPARE-PARTS LIST</td>
</tr>
<tr>
<td>2.7) Piping and accessories</td>
<td>10</td>
<td>ENCLOSURES:</td>
</tr>
<tr>
<td>3) CONNECTIONS</td>
<td>11</td>
<td>- Dwg.No. 771-133 (Wiring diagram)</td>
</tr>
<tr>
<td>3.1) Electrical connections and controls</td>
<td>11</td>
<td>- Dwg.No. 060-140 Rev.1 (P. &amp; I.)</td>
</tr>
<tr>
<td>3.2) Earthing</td>
<td>11</td>
<td>- Dwg.No. 060-149 Rev.1 (Assembly drawing)</td>
</tr>
<tr>
<td>3.3) Steam connection</td>
<td>11</td>
<td>- Dwg.No. 066-082 (Exchanger drawing)</td>
</tr>
<tr>
<td>3.4) Condensate connection</td>
<td>12</td>
<td>- Use, maintenance and exploded view of appliances composing the plant (pumpes, etc..)</td>
</tr>
<tr>
<td>3.5) Exhaust steam connection</td>
<td>12</td>
<td>- Dwg.No. SP060-149, Dwg.No. 060-134</td>
</tr>
<tr>
<td>3.6) Water connection</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3.7) Water draining</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3.8) Plate-Type exchanger connection (optional)</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>
**TECHNICAL DATA**

### AS A HEATER

- **Bottles treated:** n°/h 8,700
- **Diameter:** mm 62
- **Treatment time:** mins. 36
- **Bottle inlet temperature:** °C 2

### TREATMENT TEMPERATURE

- **Bottle inlet temperature:** °C 2
- **Heating from 2°C to 17°C with water at:** °C 23
- **Heating from 17°C to 32°C with water at:** °C 38
- **Heating from 32°C to 62,5°C with water at:** °C 67,5
- **Holding at 62,5°C with water at:** °C 63
- **Cooling from 62,5°C to 47°C with water at:** °C 36
- **Cooling from 47°C to 32°C with water at:** °C 21
- **Bottle outlet temperature:** °C 32
- **UP:** 28,6

### TREATMENT TIME

- **Heating:** mins. 15’
- **Holding at pasteurizing temperature:** mins. 11’
- **Cooling:** mins. 10’
- **Total cycle time:** mins. 36’

### CONSUMPTION

- **Steam consumption at start:** kg/h 480
- **Steam consumption in operation:** kg/h 280
- **Air consumption:** Nl/h 1,500
- **Frigorific consumption:** btu/h 300,000 a +5°C

### CONSTRUCTIONS FEATURES

- **Tunnel elements**
  - **Number:** n° 1
  - **Total length:** mm 8,800
  - **Total width:** mm 2,140
- **Total pasteurizing surface:** m² 18,85
- **No. of water circulation pumps:** n° 7
- **No. of conveyor belts:**
  - at inlet: n° 1
  - at outlet: n° 1
PUMPS

Nr. 6 WATER CIRCULATING PUMPS Code 46223611
Type: centrifugal - Model DWO 3006
Material: Stainless steel Aisi 304
Motor: 2 poles type - 2,2 kW

Nr. 1 WATER CIRCULATING PUMP Code 46223613
Type: centrifugal - Model DWO 4006
Material: Stainless steel Aisi 304
Motor: 2 poles type - 3 kW
1) **GENERAL SAFETY RULES**

1.1) **GENERAL INFORMATION**

TMCI Padovan pasteurizers are equipped with some safety devices that meet specific directives and rules. However, the operator is responsible for making sure that the general standards and rules and special safety indications are strictly respected when handling and maintaining the system.

1.2) **EQUIPMENT OF PERSONNEL**

The operators and maintenance personnel must wear a plastic visor on the head, insulated gloves because of high temperature steam piping, protective gloves and boots during cleaning operations.

1.3) **GENERAL MANDATORY INSTRUCTIONS**

- If it is necessary to carry out any operations on the bottle outlet belt, protect face and hands as described above.
- **IMPORTANT!!** - Close the main switch before opening the electric switchboard or carrying out any operations on motors or electrical connections.
- Make sure that the system has been earthed appropriately.
- Close the main switch before performing any operations on any parts in movement (conveyor belts, advancement surfaces, pumps).
- Do not put hands or objects held with hands in areas where there are moving parts.
- Do not sprinkle the electric switchboard, motors or electrical connections with water or other liquids.

- Follow the general safety rules when washing the tunnel periodically with acid or basic detergent solutions. Remember to use protective gloves and glasses.

- When handling caustic soda, remember that it develops a great amount of heat when soda is dissolved in water.

- If operations have to be carried out on parts subject to steam pressure or hot water (piping, regulation valves, tube nest heat exchangers), make sure that the steam or water cutoff valves are closed, that the parts involved have been drained and that they have reached acceptable temperatures.

- If you are operating on components subject to heating, make sure that they have reached a temperature tolerated by the operator. If necessary protect hands with special gloves.

- When handling containers (especially glass bottles) containing pressurized liquids, remember not to open the tunnel’s inspection doors during use. The danger of explosion in this containers grows as the temperature rises because the latter makes the inner pressure increase.

- During the process some containers may break inside the tunnel; the broken glass must be removed periodically from the vats or from the advancement surfaces. The operator must perform these operations carefully and protect hands with appropriate gloves.
2) **INSTALLATION RULES**

2.1) **UNLOADING FROM TRANSPORT MEANS**

Tunnel pasteurizers are generally delivered divided as follows:

- modular elements including metal structure, a part of the distribution piping, pumps, filters;
- accessories such as conveyor belts, electric switchboard, head fairing, etc.

The modular elements must be unloaded and positioned on site using self-propelled or overhead cranes.

Each tunnel has a special fastening frame onto which cables must be fixed to the special fittings.

The frame is only one and must be used to lift one unit at a time. Make sure that the crane and the manoeuvring equipment can bear the weight of each element.

If the elements are packed, pass the cables under the packaging at the indicated points.

Lift the elements according to the above-mentioned instructions to take them out of the packaging.

In order to take the elements out of the container, fasten the cables to the indicated points and pull the element carefully outwards. When the unit protrudes sufficiently, fasten the cables and proceed as above.

**WARNING !!**

Never lift the elements using unappropriate hoisting means, such as fork lift trucks; once the unit has been placed on the ground, never push it around.

When cables are used for hoisting, once they have been pulled tightly make sure that they do not scrape against delicate components.

Lift each element about 50 mm and make sure that it is perfectly balanced. Balancing can be achieved by adjusting the cable on the frame.

Do not cause abrupt movements of the equipment.

During these operations be careful that the equipment does not knock abruptly on the floor.

Use the same attention when unloading and moving the accessories so that no parts are deformed or damaged.
2.2) CONTROL OF DELIVERY AND ASSESSMENT OF ANY DAMAGE

Control all the goods upon arrival and make sure that all the components listed in the delivery note or packing list are in perfect conditions.

If some parts are missing, if the crates or packaging have been tampered with or goods are damaged, it is necessary to write out a report, have it signed by the forwarding agent and notify the insurance company immediately.

Notify the insurance company even in case of damage occurred during unloading, displacement and positioning.

If the insurance is at TMCI PADOVAN’s own expenses, advise the company immediately by telex or fax and wait for instructions.

Any rights to damage indemnification are forfeited if TMCI PADOVAN is not notified immediately.

Do not remove protections or locking devices until installation, unless there are clear signs of damage.

Put covers back into position if the goods are going to be stored for some time.

Crates which have been opened for inspection must be handled with care to prevent damaging contents; pack the parts again and store in a safe place until it is time for assembly.

Please refer to STORAGE for information concerning how to handle these units.

2.3) TEMPORARY STORAGE

If the tunnel is not placed immediately in the final installation position, store it in dry and well-aired premises at a minimum temperature of +10°C.

Cover all surfaces subject to oxidation and corrosion with a suitable protection.

Control frequently any signs of oxidation, especially on machined or uncoated surfaces (shafts, bearings, etc.). Remove the oxidation or any signs of corrosion immediately and apply an appropriate anticorrosion protection over the damaged surfaces.

Rubber parts must be protected against very low temperature and should never be stored outdoor even for very short periods. Keep rubber parts well-aired if the environment is warm.

In case of prolonged storage or inactivity after a first startup or a considerable delay in starting up the system after delivery, it may occur that some gaskets or seal rings harden causing leakages or seizures.
The greases or lubricants used to install the bearings, shafts, etc. may also harden.

Therefore in these cases (inactivity lasting over 6 months), it is necessary to control the entire machine, replace all the gaskets or parts that may deteriorate during storage or inactivity.

These operations require qualified and authorized personnel to prevent that badly performed operations or incorrect reassembly may damage the appliance when operation begins again.

**IMPORTANT!!** Make sure that:

- there is no water in the vats, in the tanks and in the pumps; leave the drains or taps open;
- there are no iron objects in contact with stainless steel components;
- there is no dripping from iron structures;
- there is no possibility of damaging components caused by equipment in transit, goods or people close to the plant.

2.4) **INSTALLATION OF TRANSMISSION SHAFT AND COUNTERSHAFT**

Once the units have been positioned, install the transmission shaft (to which the motor-driving unit has been installed) and the countershaft.

They are both fitted on appropriate supports that must be fixed to the end of the tunnel.

It is important to make sure that the central support of the transmission shaft (only on large pasteurizers) is installed correctly.

2.5) **BELT INSTALLATION**

Arrange the roll/s in front of the tunnel (bottle inlet side) with the ends of the tube, that passes through the middle of the roll, on special supports.

Make some ropes pass under the transversal bars supporting the belt and above the rollers supporting the belt return.
Tie the ropes to an iron rod and then tie the latter with several wires to the belt’s first bar.

Pull the ropes slowly from the end of the bottle outlet and push the belt inside the tunnel.

When the belt reaches the transmission shaft, roll up its end around the gears and reverse the ropes right up to the bottle inlet head.

It is now possible to make the transmission shaft turn with the belt end connected by means of the gearmotor. At this stage it is necessary to keep the end of the belt stretched with the ropes, stop the gearmotor when the end of the belt comes out of the tunnel. Detach the ropes and whatever else from the belt and join the two pieces keeping the belt well tensioned. Insert the connecting bar and fix the end nut.

After this operation it is advisable to start the belt at full speed and make it turn for 4-8 hours to control operation and stability.

Control that the return of the belt is supported appropriately and does not scrape over any surfaces of the lower vats, but is supported by the lower rollers.

2.6) INSTALLATION OF CONVEYOR BELTS AND HEAD FAIRING

The inlet and outlet belts can be delivered already assembled to their fairing or be supplied separately.

If they are separate, it is necessary to fix them to each fairing with the front screws and motor; then fix the fairings and belts to each end of the tunnel with the perimeter screws, insert the upper tie rods supporting and regulating the belt height and then insert the lateral screws to fix the belts to the heads.
2.7) **PIPING AND ACCESSORIES**

Once the tunnel has been installed, fit the pump connection piping to each area, the steam inlet pipes in the heat exchangers with the regulation valves, the condensation and manifold drain pipes.

We recommend to carry out these operations according to the plant's technological diagram.
3) CONNECTIONS

3.1) ELECTRICAL CONNECTIONS AND CONTROLS

- The tunnel is supplied with electrical connections between the switchboard and the motors and control instruments. It is sufficient to connect the cable terminals on the switchboard according to the diagrams included and connect the electric switchboard to the mains.

- Control that the connection terminals on the motors are tightened firmly (the vibrations during transport may unloose the terminals or even disconnect the cables).

- Control that the power supply and the electrical features of the machine are equivalent.

- Connect the electric switchboard with a four-pole cable (three phases + earth) and plug to a socket with switch and fuses.

- Control that the diameter of the feed line is sufficient for the working and starting load.

- Control that the direction of rotation of the motors is equivalent to the data plate figures installed on the motors.
  Control the pumps only for a few seconds to avoid damaging the rotary seals.

3.2) EARTHING

- Connect the earth plate on the tunnel to the earth line with an appropriate size cable.

3.3) STEAM CONNECTION

Connect the flanged fitting to the steam feed piping. The piping must have a suitable diameter to ensure that pressure and output are suitable for the plant’s requirements.

If the pressure is greater, it must be reduced by fitting a pressure reduction unit. The feed steam must not contain any condensate; the feed piping must be insulated and equipped with a steam trap, if necessary.
3.4) **CONDENSATE CONNECTION**

When heating is achieved by steam condensation in tube nest heat exchangers, the manifold fitting must be connected to the piping for the return to the boiler. The return to the boiler can be made directly, if the distance and different boiler level allow it, or using a pump.

3.5) **EXHAUST STEAM CONNECTION**

Fittings dia. 200 mm can be available on the tunnel covers near each end. If these fittings exist, they can be connected to the outside of the building using stainless steel or stiff plastic tubes.

3.6) **WATER CONNECTION**

Connect the fitting to the water supply piping coming from the water mains. This pipe must have a suitable diameter to ensure a proper water output and pressure as shown in the technical chart.

3.7) **WATER DRAINING**

The vats are equipped with an overflow drain that eliminates any excess of water during use. At the end of the process, drain the vats and wash them with jets of water. The drain water must be collected in a drain channel made in the floor.
3.8) PLATE-TYPE EXCHANGER CONNECTION (OPTIONAL)

In some case, to reduce water consumption in the cooling section, a plate type exchanger is applied: such device allows to lower water temperature in the final section by means of glycol solution. The connection piping diameter must be suitable for the foreseen fittings.
4) **REGULATION**

4.1) **THERMOREGULATION DEVICE**

The temperature of water in the pasteurizer sections can be adjusted in one of the following three ways:

I) Using special tube in tube heat exchangers placed on the water circuit, that keep the set operating temperature in the plant’s different sections by means of a pneumatic valve controlled by a special thermoregulator.

II) By means of steam injectors inside some vats or on the delivery side of some pumps. In this case the water temperature is controlled by thermostats that control the steam cutoff solenoid valves.

III) By means of a plate-type exchanger, with coolant, for the cooling phase.

4.2) **INLET AND OUTLET CONVEYOR BELTS**

4.2.1) **BELT LUBRICATION**

The tunnel’s inlet and outlet belts need to be lubricated continuously so that the containers slide over them without tipping. Spray on each belt special liquid lubricants that are available on the market or, if they cannot be found, using a soapy solution.

Spray the solution over the surface of each belt in the area not involved by the movement of the containers.

The centralized system of the bottling line can be used for lubrication or an independent unit provided with a tank and dosage pump.

If the belts are provided with an inner lubrication vat, make sure that the level is always sufficient for the belts to be dipped in the lubricant.

4.2.2) **REGULATION OF BELT SPEED**

The inlet and outlet belts are two or more; they all have a speed that allows a capacity of approximately 10% more than the tunnel’s own capacity and they can be driven by a gearmotor with fixed reduction ratio or by a ratiomotor.
A limit or proximity switch is installed at the end of the outlet belt.

When the movement of containers after the tunnel is interrupted, the containers fill the outlet belt completely.

The pressure of the containers makes the limit switch operate and it stops the advancement of tunnel surface.

4.3) REGULATION OF SAFETY LIMIT SWITCH

A safety limit switch is installed on the belt movement unit near the torsion bar of the transmission shaft. It is extremely important for the integrity of the tunnel belt.

This safety device blocks the belt in case of belt overloading or clogging, caused by broken containers inside the tunnel.

The belt can be started again only from the electric switchboard and once the cause of the overload has been eliminated.

4.3.1) LIMIT SWITCH CONTROL BEFORE STARTING

Before starting the plant for the first time or after long periods of inactivity, we recommend to carry out the following operations:

- Unloose the lock screws on the torsion bar of the transmission belt’s ratiomotor.
- Start slowly. The limit switch will operate and stop movement because the screws have been unloosed.
- Tighten the screws a little and repeat the operation until movement is continuous.
- Place the containers. If the belt should stop, tighten the screws again until the belt with all the containers move safely and constantly.
5) **CHOICE OF OPERATION CYCLE**

5.1) **GENERAL PRINCIPLES**

The kind of treatment cycle is established when designing the tunnel according to:

- length and number of stages for heating phase,
- holding time and temperature for pasteurization phase,
- time and number of stages for cooling phase.

The number and time of heating and cooling phases are established according to:

- type, volume and resistance to heat shocks of containers,
- energy recovery.

The pasteurization time and temperature are established according to:

- container temperature resistance,
- number of pasteurization units required.

A PU pasteurization unit is the pasteurization result achieved by holding a product at 60°C for one minute.

The enclosed table (1) provides a list of the different PU according to the treatment temperature.

The total pasteurization effect of a cycle is calculated by multiplying the PU of the pasteurization temperature by the holding time and adding the pasteurization effect achieved in the heating and cooling phases.

5.2) **VARIATIONS OF PASTEURIZATION CYCLE**

The length of each area in which the tunnel is divided for heating, holding and cooling is fixed, and so are the ratios between the travelling time of the containers in each area.

The following values can be changed:

- Total treatment time: Adjust the speed variator of the belt advancement unit manually.
- Pasteurization temperature: Operating on thermoregulators set-points of heating, pasteurizing and cooling vats.
### TABLE 1

**RELATIONSHIP BETWEEN TEMPERATURE AND LETHALITY POTENTIAL AND PASTEURIZATION UNIT BY MINUTES OF TREATMENT**

<table>
<thead>
<tr>
<th>TEMPERATURE (°C)</th>
<th>LETHALITY POTENTIAL AND UP</th>
<th>TEMPERATURE (°C)</th>
<th>LETHALITY POTENTIAL AND UP</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>0.01</td>
<td>63.5</td>
<td>3.2</td>
</tr>
<tr>
<td>46.5</td>
<td>0.012</td>
<td>64</td>
<td>3.7</td>
</tr>
<tr>
<td>47</td>
<td>0.014</td>
<td>64.5</td>
<td>4.5</td>
</tr>
<tr>
<td>47.5</td>
<td>0.016</td>
<td>65</td>
<td>5.2</td>
</tr>
<tr>
<td>48</td>
<td>0.019</td>
<td>65.5</td>
<td>6.2</td>
</tr>
<tr>
<td>48.5</td>
<td>0.023</td>
<td>66</td>
<td>7.2</td>
</tr>
<tr>
<td>49</td>
<td>0.027</td>
<td>66.5</td>
<td>8.6</td>
</tr>
<tr>
<td>49.5</td>
<td>0.032</td>
<td>67</td>
<td>10</td>
</tr>
<tr>
<td>50</td>
<td>0.037</td>
<td>67.5</td>
<td>12</td>
</tr>
<tr>
<td>50.5</td>
<td>0.045</td>
<td>68</td>
<td>14</td>
</tr>
<tr>
<td>51</td>
<td>0.052</td>
<td>68.5</td>
<td>16.5</td>
</tr>
<tr>
<td>51.5</td>
<td>0.062</td>
<td>69</td>
<td>19</td>
</tr>
<tr>
<td>52</td>
<td>0.072</td>
<td>69.5</td>
<td>23</td>
</tr>
<tr>
<td>52.5</td>
<td>0.086</td>
<td>70</td>
<td>27</td>
</tr>
<tr>
<td>53</td>
<td>0.1</td>
<td>70.5</td>
<td>32</td>
</tr>
<tr>
<td>53.5</td>
<td>0.12</td>
<td>71</td>
<td>37</td>
</tr>
<tr>
<td>54</td>
<td>0.14</td>
<td>71.5</td>
<td>45</td>
</tr>
<tr>
<td>54.5</td>
<td>0.16</td>
<td>72</td>
<td>52</td>
</tr>
<tr>
<td>55</td>
<td>0.19</td>
<td>72.5</td>
<td>62</td>
</tr>
<tr>
<td>55.5</td>
<td>0.23</td>
<td>73</td>
<td>72</td>
</tr>
<tr>
<td>56</td>
<td>0.27</td>
<td>73.5</td>
<td>86</td>
</tr>
<tr>
<td>56.5</td>
<td>0.32</td>
<td>74</td>
<td>100</td>
</tr>
<tr>
<td>57</td>
<td>0.37</td>
<td>74.5</td>
<td>119</td>
</tr>
<tr>
<td>57.5</td>
<td>0.45</td>
<td>75</td>
<td>139</td>
</tr>
<tr>
<td>58</td>
<td>0.52</td>
<td>75.5</td>
<td>166</td>
</tr>
<tr>
<td>58.5</td>
<td>0.62</td>
<td>76</td>
<td>196</td>
</tr>
<tr>
<td>59</td>
<td>0.72</td>
<td>76.5</td>
<td>231</td>
</tr>
<tr>
<td>59.5</td>
<td>0.86</td>
<td>77</td>
<td>268</td>
</tr>
<tr>
<td>60</td>
<td>1.0</td>
<td>77.5</td>
<td>320</td>
</tr>
<tr>
<td>60.5</td>
<td>1.2</td>
<td>78</td>
<td>373</td>
</tr>
<tr>
<td>61</td>
<td>1.4</td>
<td>78.5</td>
<td>445</td>
</tr>
<tr>
<td>61.5</td>
<td>1.65</td>
<td>79</td>
<td>519</td>
</tr>
<tr>
<td>62</td>
<td>1.9</td>
<td>79.5</td>
<td>620</td>
</tr>
<tr>
<td>62.5</td>
<td>2.3</td>
<td>80</td>
<td>720</td>
</tr>
<tr>
<td>63</td>
<td>2.7</td>
<td>80.5</td>
<td>860</td>
</tr>
</tbody>
</table>

### 5.3) VARIATIONS OF HEATING CYCLE

In this case, the different stages of the tunnel pasteurizer operate as a single stage, so as to reach the thermostats set-point temperature.

Even in this case it will be possible to adjust the treatment time for the bottles by adjusting the speed variator of the belt advancement unit.
6) **PLANT OPERATION**

6.1) **STARTING THE PLANT**

- Turn on the electric switchboard by turning the main switch.
- Open the water supply piping. The water level in the vats is adjusted by special probes. When the vats are full start the water circulation pumps.
- Open the compressed air valve feeding the pneumatic device. Make sure that the max. pressure is 6 bar.
- Drain any condensate by opening the cap on the lower part of the filter-reducer unit.
- Set the desired water temperature in the different treatment areas by adjusting the thermoregulators set-points.
- Open the steam feed valves slowly. The temperature of the water in the vats will increase until the set-point has been reached.
- Once the set-points of water temperature are reached, start the advancement of the mobile surface.
- Start the tunnel inlet belts. The containers will fill the tunnel progressively and pass through the different zones at different temperatures.

**NOTE:**

In each area water will circulate in a closed circuit between vat-pump and spray nozzles. The level probes will maintain a constant water level in the vats.

- Start the tunnel emptying belts.
- During the containers advancement phase, control the variables set on the thermoregulators and, if necessary, correct them until constant operating conditions have been achieved.
6.2) **STANDARD OPERATION**

- Control that the operating conditions are equivalent to set conditions every now and then. A non-stop recorder (optional) records some of the pasteurizing parameters.

- If a travelling thermoregulator is available, control the actual pasteurization cycle in the container every now and then.

- Control the filters on the suction side of circulations pumps and clean them periodically.

6.3) **STOPPING THE PLANT**

- Wait until all the containers have come out of the tunnel.

- Close the steam, water and air supply valves.

- Stop the circulation pumps.

- Stop the tunnel inlet and outlet belts and the transport surface inside the tunnel itself.

- Turn off the appliance by turning off the main switch on the electric switchboard.

- Unload the water vats; clean and wash them.

- Clean the pump suction filters.

- If any nozzles are clogged, remove the nozzle holder, take off the nozzle caps using a screwdriver and blow compressed air against the holes to clean them.
### TABLE 2  
**LUBRICATION**

<table>
<thead>
<tr>
<th>TYPE OF LUBRICANT</th>
<th>FREQUENCY</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Mellana Oil 220 BP Energol GRXP 220 SHELL Oma Oil 220 MOBIL Mobilgear 630</td>
<td>Control level every 3 months</td>
<td>Gearmotors and ratiomotors.</td>
</tr>
<tr>
<td>LOW VISCOSITY FINE OIL</td>
<td>Oil every week (1-2 drops)</td>
<td>Limit switches.</td>
</tr>
</tbody>
</table>
7) **ELECTRIC SWITCHBOARD**  
Ref. wiring diagram No. 771-133

- Before turning on the switchboard, it is advisable to control that all electrical connections are correct and according to the wiring diagram.
- Tighten the cable screws that may have become loose during transport.
- Control that overheating protections in the automatic switches are set at the data plate figures of the motor they protect.
- Turn main switch **QS0** to turn on the switchboard.

When the switchboard has been turned on the following temperature displays will light up:

- **ST 2** = **FIRST COOLING** - Temperature of first cooling stage. One alarm is set for maximum temperature.
- **ST 4** = **SECOND COOLING** - Temperature of second cooling stage. One alarm is set for maximum temperature.
- **ST 5** = **FIRST HEATING** - Temperature of first heating stage. One alarm is set for minimum temperature.
- **ST 6** = **SECOND HEATING** - Temperature of second heating stage. One alarm is set for minimum temperature.
- **TIC 1** = **PASTEURIZING** - Temperature of pasteurization stage. Two alarms are set on this temperature indicator: the 1st for min. temperature and 2nd for max. temp.
- **TIC 3** = **PRE-PASTEURIZING** - Temperature of pre-pasteurizing stage. Two alarms are set on this temperature indicator: the 1st for min. temperature and 2nd for max. temp.
**TIC 7 = COOLING WATER**
- Temperature of water cooling stage. This temperature indicator has a temperature set that adjusts the glycol valve (MV3).

**DESCRIPTION OF CONTROLS**

**Q50  MAIN SWITCH**
This switch turns on the electric switchboard.
- On position 0 the electric switchboard does not receive power supply.
- On position 1 the electric switchboard receives power supply.

**SA1  SECOND COOLING PUMP**
This switch is used to start or stop the water pump in the 2nd cooling stage (MS1).
- On position 0 the pump is not operating.
- On position 1 the pump is operating and the warning light is lit.

**SA2  FIRST COOLING PUMP**
This switch is used to start or stop the water pump in the 1st cooling stage (MS2).
- On position 0 the pump is not operating.
- On position 1 the pump is operating and the warning light is lit.

**SA3  PRE-PASTEURIZING PUMP**
This switch allows to start or stop the water pump in the pre-pasteurizing stage (MS3).
- On position 0 the pump is not operating.
- On position 1 the pump is operating and the warning light is lit.
SA4 PASTEURIZING PUMP
This switch is used to start or stop the water pump in the pasteurizing stage (M54).
On position 0 the pump is not operating.
On position 1 the pump is operating and the warning light is lit.

SA5 SECOND HEATING PUMP
This switch allows to start or stop the water pump in the heating stage (M55).
On position 0 the pump is not operating.
On position 1 the pump is operating and the warning light is lit.

SA6 FIRST HEATING PUMP
This switch allows to start or stop the water pump in the heating stage (M56).
On position 0 the pump is not operating.
On position 1 the pump is operating and the warning light is lit.

SA7 INLET BELT
This switch is used to start or stop the motor (M57) of the inlet belt.
On position 0 the belt is not operating.
On position 1 the belt is operating and the warning light is lit.

SA8 TUNNEL BELT
Unstable selector for conveyor belt control (M58). When conveyor belt is running the warning light is lit.

SA9 P9 PUMP
This switch is used to start or stop the pump (M59).
On position 0 the pump is not operating.
On position 1 the pump is operating and the warning light is lit.
SA10  TUNNEL BELT SELECTION

Key selector for the AUTOMATIC or MANUAL control of conveyor belt.
- In position 0 the belt is not running.
- In position MAN the belt starts running by means of SA8.
- In position AUT the belt starts running by means of SA8 according to temperature levels.

SA11  PASTEURIZING TEMPERATURE

It selects the working temperature during cycle, allowing for changeover to the lower set in case of prolonged interruptions of machine operation.
- In position 1 (set 1) the selected temperature is low (pause temperature).
- In position 0 (automatic) the working temperature is normally selected (set 2).
- In case of a prolonged interruption of machine operation (belt stop due to clogging at outlet, for example) exceeding the time set on timer KT1, the machine automatically changes over to the low temperature (set 1).
- When the cause for the interruption is eliminated, the machine restarts at working temperature (set 2), and cycle is then restarted.

SB0  EMERGENCY STOP

This mushroom push button is pressed to cut power supply to the entire control circuit, therefore all the pumps and motors are stopped and warning lights turn off. The temperature indicators still receive power. Turn the emergency push button (SB0) until it is released to supply power again and then press start push button (SH0).

SB2  SIREN STOP

This push button, when pressed, stops the siren.

SH0  CONTROL STARTING

Start luminous push button to energize the auxiliary control circuits.
- When this push button is pressed it turns off.
DESCRIPTION OF SIGNALS

HL10  COLD WATER INLET TANK 1  The water level in container 1 is below the minimum level, with consequent opening of the solenoid valve (YE1) to restore the set water level. Once the set level has been restored the warning light (HL10) will turn off automatically.

HL11  COLD WATER INLET TANK 2  The water level in the container 2 is below the minimum level, with consequent opening of the solenoid valve (YE2) to restore the set water level. Once the set level has been restored the warning light (HL11) will turn off automatically.

HL12  COLD WATER INLET TANK 3  The water level in the container 3 is below the minimum level, with consequent opening of the solenoid valve (YE3) to restore the set water level. Once the set level has been restored the warning light (HL12) will turn off automatically.

HL13  COLD WATER INLET TANK 4  The water level in the container 4 is below the minimum level, with consequent opening of the solenoid valve (YE4) to restore the set water level. Once the set level has been restored the warning light (HL13) will turn off automatically.
<table>
<thead>
<tr>
<th>Alarm Code</th>
<th>Alarm Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL14</td>
<td>MIN. TEMPERATURE ALARM</td>
<td>Pasteurizing, pre-pasteurizing and 2nd cooling temperatures below minimum level set on thermostat set 1 (TIC3, TIC4, TIC6).</td>
</tr>
<tr>
<td>HL15</td>
<td>MAX. TEMPERATURE ALARM</td>
<td>Pasteurizing and pre-pasteurizing temperatures above maximum level set on thermostat set 2 (TIC3, TIC4).</td>
</tr>
<tr>
<td>HL16</td>
<td>OVERLOAD OUTLET BELT</td>
<td>Operation of outlet indicator (SQ9A, SQ9B).</td>
</tr>
<tr>
<td>HL17</td>
<td>MOTOR OVERLOAD</td>
<td>One or more automatic cut-outs to protect the motors. Remove the cause of overload. Rearm the overload cut-out inside the electric panel.</td>
</tr>
<tr>
<td>HS1</td>
<td>BLINKING LIGHT</td>
<td>This warning light is activated by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- minimum temperature of 1st heating stage, 2nd heating stage, pre-pasteurizing and pasteurizing;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- maximum temperature of pre-pasteurizing, pasteurizing, 1st cooling and 2nd cooling;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- tunnel belt overload;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- motors overload.</td>
</tr>
<tr>
<td>HS2</td>
<td>SIREN</td>
<td>This acoustic alarm is activated by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- minimum temperature of 1st heating stage, 2nd heating stage, pre-pasteurizing and pasteurizing;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- maximum temperature of pre-pasteurizing, pasteurizing, 1st cooling and 2nd cooling;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- tunnel belt overload;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- motors overload.</td>
</tr>
</tbody>
</table>
SH2 TUNNEL BELT OVERLOAD
(RESET)

OVERLOAD alarm reset of the TUNNEL BELT.
Remove the cause of overload to the sensor (SQ 8).