VERY LARGE VARIABLE PITCH AXIAL FANS
FOR ROAD TUNNEL VENTILATION

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ABSTRACT

The paper presents a short technical description, useful information, drawings and photographs of (according to our knowledge) physically the largest variable pitch axial tunnel ventilation fans in the world.

1. INTRODUCTION

The new Motorway Tarsus – Adana – Gaziantep (TAG) in the republic of Turkey includes four tunnels. The largest tunnel P 3 with a length of 2860 m consists of two separate tunnel tubes with 3 lanes each for unidirectional traffic. Both tubes have a combined ventilation system with jet fans and large axial fans located in a ventilation station for each tube. The ventilation station for the south tunnel tube (ST) is situated on top of the tunnel. The ventilation station for the north tunnel tube (NT) is situated sidewise of the tunnel on the mountain.

2. VENTILATION STATIONS

Each ventilation station for the North and the South tube is a separate building and has basically the following aerodynamic equipment: One fan motor unit (VMU) for fresh air supply, one fan motor unit (VMU) for exhaust air, each unit is equipped with an intake transition peace, a diffuser and a large damper to close the air duct. Each fan is equipped with a motor cooling fan and a hydraulic unit for blade pitch control.

The electrical equipment, transformers and control cabinets are also located near the VMU’s in the same building.

3. VENTILATOR MOTOR UNIT (VMU)

The VMU consists of a steel welded housing with the drive motor mounted in the fan hub. The three-phase asynchronous motor has 2 rotational speeds. The impeller is directly mounted on the motor shaft and has hydraulically adjustable blades.

The VMU’s for exhaust air are designed to withstand an emergency ventilation case at a temperature of 250°C for one hour and for a further hour at 100 °C. An other precaution for high temperature operation at large fans against blade rubbing at the fan housing due to different thermal expansion coefficients for aluminum and steel are wearing tips at the impeller blade tips.
4. TECHNICAL DATA

The main data are summarized in the following table.

<table>
<thead>
<tr>
<th>Ventilator</th>
<th>NT1</th>
<th>NT2</th>
<th>ST1</th>
<th>ST2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>Exhaust</td>
<td>Supply</td>
<td>Exhaust</td>
<td>Supply</td>
</tr>
<tr>
<td>Impeller Diameter [mm]</td>
<td>5300</td>
<td>5300</td>
<td>6300</td>
<td>6300</td>
</tr>
<tr>
<td>Max. Volume Flow [m³/s]</td>
<td>590</td>
<td>590</td>
<td>870</td>
<td>1050</td>
</tr>
<tr>
<td>Fan speed [RPM]</td>
<td>295/147</td>
<td>295/147</td>
<td>295/147</td>
<td>295/147</td>
</tr>
<tr>
<td>Motor Power [KW]</td>
<td>200</td>
<td>200</td>
<td>370</td>
<td>660</td>
</tr>
</tbody>
</table>

5. ATTACHMENTS

Fig. 1 Drawing of the VMU ST1
Fig. 2 NT2 Supply fan
Fig. 3 NT2 Supply fan during aerodynamic measurements
Fig. 4 NT Building supply air intake
Fig. 5 ST2 Supply fan
Fig. 6 ST2 Fan after erection
Fig. 7 ST1 Exhaust fan during commissioning
Fig. 8 ST2 Damper
Fig. 9 ST Building

Fig. 1 Drawing of the VMU ST1
Fig. 2  NT2  Supply fan

Fig. 3  NT2  Supply fan during acceptance tests
Fig. 4  NT Building supply air intake

Fig. 5  ST2 Supply fan
Fig. 6  ST2 Fan after erection

Fig. 7  ST2  Exhaust fan during commissioning
Fig. 8 Damper for ST2 fan

Fig. 9 ST Building