

held by
Mr. Cannon
16.6.06



PURIFICATION PLANT IN URBAN ROAD TUNNELS

Madrid, 8th July 2005

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1.1. INTRODUCTION

The aim of this document is to establish the conditions and milestones to be provided to the most important manufacturers worldwide for the elaboration of a technical-economical proposal for the scope of works hereinafter related (design, supervision, construction, testing and commissioning and maintenance) to 4 purification plants in Madrid City with a capacity each of 680 m³/s. The stations are to be built along the tunnel called: ***“By-pass sur de la M30, conexion del Paseo de Santa María de la Cabeza- NIII”***

These preliminary studies should be sent to the Town Hall of Madrid and associated companies, in order to compare and analyze all the offers and take a decision about what technology and manufacturer selected to develop the related works.

Finally, the aim of this document is to provide the guidelines to be fulfilled to ensure that all the proposals are homogeneous to facilitate their analysis.

1.2. DESCRIPTION OF THE STATION

All tenderers shall submit a proposal describing their technologies in this field of activity, according to their know-how and experience in similar projects.

As a general guide, the subsystems to be included and efficiency rates shall be as follows:

- Electrostatic precipitator system to remove small particles. Minimum Collection efficiency of 80% for particles less than 1 micro, and 90% for particles bigger than 1 micro.
- Washing system of the electrostatic precipitator.
- Water treatment system or cleaning systems offered.
- Denitrification system with NO₂ 80%, NO 30%, HC 90% efficiency.
- Electrical equipment and systems electrical requirements.
- Control system and measurement of the concentrations of hazardous substances to ensure the efficiency of the system.
- The building where the equipments are going to be installed is nowadays under construction according to the information already provided.

500 Pa of total max. Pressure loss in the station. In the case to be higher it should be necessary to specify the increase in power of the already designed fans and the extra cost involved.

1.3. SCOPE OF THE WORKS

The works to be included in the proposal shall be as follows:

- 1) Design and engineering of the 4 purification stations, with a capacity each of 680 m³/s. Each station must be splitted in 4 substations of 170 m³/s each. The required dimensions

and a full technical and mechanical description of the main equipments and other ancillary equipments must be submitted.

- 2) Full support between the Construction Company and the Executive Director in order to perform all the necessary changes in architectural and structural drawings in order to integrate the purification plant into the existing building, including necessary space for access and maintenance work.
- 3) Percentage of foreign and national equipment manufacture. The Executive Director shall have the possibility of visiting the factory during the construction. The pieces used in the manufacturing will be under normalization rules, so that all the spare parts could be easily found in Madrid.
- 4) Installation and connexion of all the equipments into the purification plant.
- 5) Supervision of the installation of the equipments. A minimum of two persons will be required: one technical person in design and one supervisor person in the site.
- 6) Testing and Commissioning.
- 7) Measurement station of the contaminating air and in purified air (input – output) in order to evaluate the offered system performances.
- 8) Elaboration of "as-built documentation"
- 9) Full Maintenance of the purification station during two years including people and materials.
- 10) Training course for people appointed by the local authority.

1.4. PROPOSAL

The proposal shall include the following documentation, in the order herein established:

- Document 1: Report with a technological system description.
- Document 2: Preliminary specification.
- Document 3: Efficiency ratios of the different parts of the purification station.
- Document 4: Planning of the works to be carried out according to the following data:
 - a) Local and outside manufacture.
 - b) Task force to be provided in the different stages.
- Document 5: Full data for maintenance works (people involved and qualifications).
- Document 6: Full description of the measurement station and available data.
- Document 7: Curriculum of the company.
- Document 8: References of tunnels where the system is in operation.
- Document 9: Regulations and Normative that is going to be applied in the project.
- Document 10: Planning of the works. The final end must be in February of 2007.
- Document 11: Preliminary drawings with geometrical layout.
- Document 12: Economical proposal of every purification station indicating the cost of the following items separately:
 - A) Design and Engineering.
 - B) Manufacturing, transport and installation of the equipments into every station, indicating the cost of every equipment separately:
 - Electrostatic precipitator system
 - Washing system of the electrostatic precipitator.

- Water treatment system or cleaning systems offered.
 - Denitrification system
 - Electrical equipment and systems electrical requirements.
 - Control system and measurement
- C) Supervision of the installation of the equipments.
- D) Testing and Commissioning, including measurement station.
- E) Elaboration of "as-built documentation"
- F) Full Maintenance of the purification station during two years including materials.
- G) Training course for the people that is going to operate the purification station in Madrid.

1.5. TIME SCHEDULE

The above requested information must be in submitted the 26th of July as a limit date.

The proposal must be sent by electronic e-mail to TYPASA and to CEMIM, further a hard copy (paper) should be sent to CEMIM (resubmitted to the Town Hall authority).



Ignacio del Rey Llorente

Centro de Modelado en Ingeniería Mecánica (CEMIM) de la
Fundación para el Fomento de la Innovación Industrial (F2I2)

C/ Jose Gutierrez Abascal, 2
28006 MADRID

Tfno: +34 913 365 346
Tfno/Fax: +34 913 365 345

e-Mail: idelrey@etsii.upm.es

URL: <http://www.ffii.nova.es/f2i2/inicio.htm>



Eva Montero

Industrial Engineer

Técnica y Proyectos S.A. (TYPASA)
c/ Gomera 9
28700 San Sebastián de los Reyes
MADRID

Tel: +34 91 7227300 (Ext. 7503)

Fax: 34 91 722 73 94

e-mail: emontero@typsa.es

Town Hall of Madrid
(forwarded by CEMIM)

Oslo, July 25th 2005

Bid for the “By-pass de la M30, connexion del Paseo de Santa María de la Cabeza- NIII”.

Referring to the received bid documents for the “By-pass de la M30 dust cleaning plant”, our bid will be as follows:

Total price as requested in your document 1 – 11 and document 12 A – G.

€ 16.051.500, - excl. taxes, vat, toll fees etc.

Additional cost for 4 denitrification systems will be:

€ 20.600.000, - excl. taxes, vat, toll fees etc.

The bid is based on the received documents, and on the price level of August 1st 2005.
The price will be adjusted according to price escalation formulae later to be agreed upon by the client and the contractor.

Enclosed you will find appendices giving details of our proposal.

We are looking forward to give you our best service and support for the project.

Best regards

CTA Europe GmbH

Hans Anderl

Appendix 1, document 1-12, 6 pages

Appendix 2, supplementary info/general requirements, 1 page

Appendix 3, test results, xx pages

Appendix 4, certificate of completed contract/final acceptance, xx pages

1. Technological description

CTA, s electrostatic precipitation system is based on a prefilter to remove the larger particles in the polluted tunnel air. The prefilter is a mechanical filter.

When the air has passed through the prefilter, I will enter the electrostatic filter which removes the finer particles in the air.

Before the air enters the gas cleaning system, there sometimes may be necessary to install another mechanical filter. Such a filter is not included in this proposal.

The filters will be washed automatically according to a preset washing procedure.

The washing system is a fixed system including pumps for clean water, wastewater and detergent.

The waste water will be pumped into a wastewater tank/system where the particles are separated and the water recycled.

The electric system is based on transformers to produce the high voltage needed for the filter cells to obtain the required efficiency.

A plc is monitoring the systems, giving status, alarms etc. The plc is usually connected to a central monitoring system.

2. Preliminary specification

Front Filter

Item	Specification
Capacity to be treatedx4	680 m ³ /s
Air velocity through Front Filter	3 m/s
Capacity of Unit Cell	1,4 m ³ /s
.Wight 1 cell 3 kpx3072	Totally wait 9216 kp
Dimension of Unit Cell	600 x 600 x 50 mm
Collecting Efficiency	90% in particle size 3μ - 300μ
Material of Cell	Inside knit aluminum treads ø 0,25 mm
Material of Frame	Stainless steel
Wight 1 Frame 80 kp	Totally wait 1280 kpx4
Cell Quantity	3072 units
Pressure Loss	100 Pa when clean, 150 Pa when ready for wash

Electrostatic Precipitator

Item	Specification
Capacity to be treated x4	680 m ³ /s
Air velocity through EP	7-10 m/s
Capacity of Unit Cell	3,7 – 5,3 m ³ /s
Dimension of Unit Cell	854mm x 610 mm x 580 mm
Wight off cell unit	82 kg
Wight clean 82 kp	82x72x4 (82x72) =5904 (170m ³ /s) x4 STA.1+4. 5084 kpx4 SRA 2+3
Applied Voltage for Ionizer/Collector	6-9 kV collecting voltage 12-20 kV ionizing voltage
PLC based control cabinet incorporated in main control cabinet	
CTA Power pack transformers Wight 16 kpx96	Total number: 96 Total Wight 1536 kp
High voltage cables	Pirelli production, total 6000 meters
Collecting Efficiency	85 - 96%, 0,3 - 10 μ
Material of Collector/Ionizer	Collector plate: Aluminum Laser cut Ionizer: Stainless Steel
Material of Frame	Stainless Steel 170m ³ /s 1400 kp
Number of EP-Cell	72 units.station, 1+4, 62 inn 2+3 = 1072 cell units
Pressure Loss	Maximum 60 Pa
Power Consumption of each Cell Unit	75 W

Washing System

a) Water consumption/tank volumes

Item	Specification
Clean water tank	40 m ³ x 4
Waste water tank	20 m ³ x 4
Number of fixed type, brass nozzles per Unit EP Cell	48
Number of fixed type, brass nozzles per unit Front Filter	24

Flow rate	When washing	800 liter/min (8 bar)
	When rinsing	1200 liter/min (12 bar)

b) Pumps for washing system

Item	Specification/Capacity
High pressure clean water pump, suppressible	Caprari E10R35/5+MC850, 1200 lit/min, 12 bar, 50 Hz 400 V 37 kW 74 A
Low pressure clean water pump, submersible	Caprari E6S64/10+Mc625, 800 lit/min, 8 bar, 50 Hz 400 V 18,5 kW 42,4 A
Pressure Tank	D 800 16 bar. SB/L1
Slurry pump	Tsurumi 50UA2.4, 3x400V/50Hz input 0,59 kW output 0,40 kW normal current 1,1A start current 5,5A
Detergent Pump	Ebara 3LS 4-160/4, 3x400V/50 Hz
Detergent Tank	Stainless steel or chemically resistant plastic tank

Water treatment system:

4 units, each with a capacity of 2 m³/h, power consumption 64 kW.

Recycling of spent washing water from cleaning of electrostatic air filters

Scope: Electrostatic Precipitation units applied as tunnel air filters is cleaned at regular intervals by means of water containing small concentration of a special formulated detergent. Spent water contains impurities (mainly carbon particles), which is to be removed to allow re-use as E.P. Washing medium.

Proposed process layout:

Primary cleaning cycle:

Spent washing medium is collected in buffer reservoir, hereafter termed Dirty Water Tank. Spent water is pumped from Dirty Water tank at design capacity (2 m³/h) to a special formulated Dual Medium Filter, in which 99.5% of all impurities (particles) is retained. Filtered water is collected in Clean Water Tank. This water is fit for re-use as cleaning agent.

Secondary Cleaning cycle:

Water from primary cleaning cycle still contains soluble detergents, which may cause storage problems due to bacterial activity.

To avoid this, a secondary cleaning process is employed.

Water stored in Clean Water Tank is pumped through a patented electrolysis unit, where DC current produces highly reactive oxidants, which kills bacteria, destroys unwanted organics, and supplies oxygen to the water.

3. Efficiency ratios

The efficiency of the front filter will be minimum 90 % for the particle range 3 - 300 μ .

The efficiency of the EP will be 85 – 96 % for the particle range 0, 3 – 10 μ .

Enclosed you will find the results of previous test of efficiency carried out in different tunnels supplied with CIA's EP systems.

4. Planning of the works

The detailed design and engineering will be carried out by CTA, and will start immediately if the contract is awarded to CTA.

We intend to buy or manufacture the following items in Spain:

- pumps, tanks and piping for the washing system
- frames for the EP filters
- We intend to use local manpower for most of the installation of the front filters, EP-frame, EP filter cells and part of the cabling. Also for the handling of electrical panels and various odd jobs.
- For maintenance work we plan to train local people to perform most of the supervision during the 2 year period.

5. Description of maintenance work

Maintenance of the filtration system will mainly consist of the following:

- cleaning of the front filter(every 6 months)
- cleaning of the EP (every 6 months)
- replenishing of the detergent for the washing process (when necessarily)
- checking the nozzles in the washing pipes (every 6 months)
- monitoring the electric and monitoring systems, checking for alarms, and taking appropriate actions (every month)

CTA intend to train local people to supervise this. If necessary, CTA will available on the site in less than 48 hours.

6. Measurement stations

For each of the 4 stations we have included 2 units of particle counters to monitor the efficiency of the dust cleaning stations.

We would advise that all the stations should be prepared for such monitoring instrument, and that the 8 units is reduced to 2 which can then be switched between the filter stations.

The efficiency of the 4 systems will be close to equal under the same conditions. Our bid can then be reduced by € 140.000.