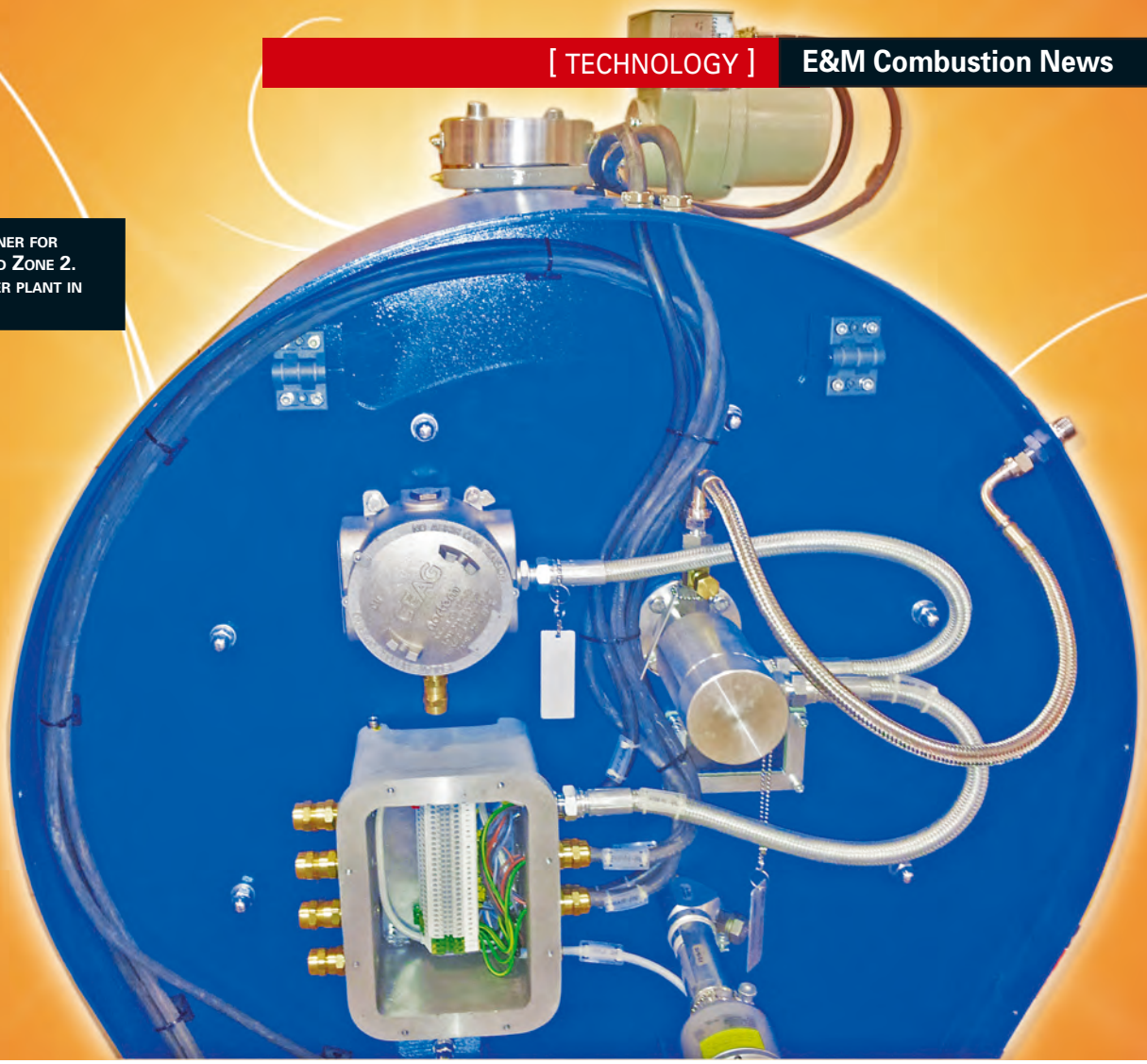

JBD-11,500-G type burner for natural gas ATEX, EExd Zone 2. For combined cycle power plant in Riga – Latvia.

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Solutions and Equipment for ATEX zone

(EXplosive ATmosphere)

ATEX Burners

Over recent years, there has been a marked increase in the demand for specially designed burners. E&M Combustión has come up with multiple solutions in the burning of unconventional fuels and in the manufacture of equipment for ATEX (Explosive Atmosphere) zones. We will focus on the latter. However we must first define what is understood as ATEX and does this definition affect a burner.

Definition of ATEX zone

A series of European Directives is known as ATEX which regulate potentially explosive atmospheres. The directives also regulate the measures so as to ensure safety and to avoid triggering an explosion.

For an atmosphere to be explosive several preconditions must exist:

a) Presence of fuel.

b) Existence of an oxidizer (oxygen).

c) An energy source which initiates the reaction.

Mixed Natural Gas-Fuel oil burner model JBD-50,000–GFO with vapour atomization for Zone 1 with equipment with EExd classification for the Repsol – Tarragona refinery.

An explosion produces a rapid combustion, heat, noise and pressure wave due to the expansion of the gases that are produced.

Equipment has a categorised according to the level of protection provided. In general Category 1 equipment (very high protection) are installed in Zone 0; Category 2 (high protection) in Zone 1 and Category 3 (normal protection) in Zone 2.

3 types of zones are defined as potentially explosive atmospheres, for atmospheres wherein the fuel is gas type (G):

- **Zona 0.** The atmosphere is potentially explosive continuously. (Very restrictive)
- **Zona 1.** The atmosphere may be occasionally explosive.
- **Zona 2.** The atmosphere is not normally explosive. If so, it will only exist for a short time. (Less restrictive)

In the cases of atmosphere wherein the combustible is a type of powder (D –dust-), it is designated as Zone 20 (the most restrictive), Zone 21 and Zone 22.

2G/2D equipment is suitable for Zone 1 and for Zone 21.

> E&M provides multiples solutions in the burning of unconventional fuels and equipment for the ATEX zone

As regards, to the type of protection one finds different equipment, focusing on the most common, one has:

- **Intrinsic safety:** are designated as EEx ia/ib. They should prevent any emergence of an accidental flashpoint source. We shall say for example, junction boxes, cables and glands used in the connection of that equipment are blue (RAL 5010, 5012, ...). The installation of galvanic spacers on its electrical connections are necessary.
- **Increased safety,** designated EExe, are equipment that are not up to the standard of the level of protection of explosion proof/flameproof. They should prevent any emergence of an accidental flashpoint source. The packaging of an EEXe equipment should be at least IP54.
- **Explosion proof/Flameproof,** designated EExd, that equipment must withstand an internal explosion without permanent deformation. Must ensure that the explosion

Temp. Code	Max. Temp. on Surface Area (°C)
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

Table 1 – Classification of temperatures

are not conveyed to the surrounding atmosphere. Must be presented on any point of its surface area the exterior temperatures which prevent conversion into auto-ignition sources.

These temperatures are classified as shown in **Table 1**.

T6 is the most restrictive code, the temperature must be lower than 85 °C in order that an explosion to the atmosphere does not take place.

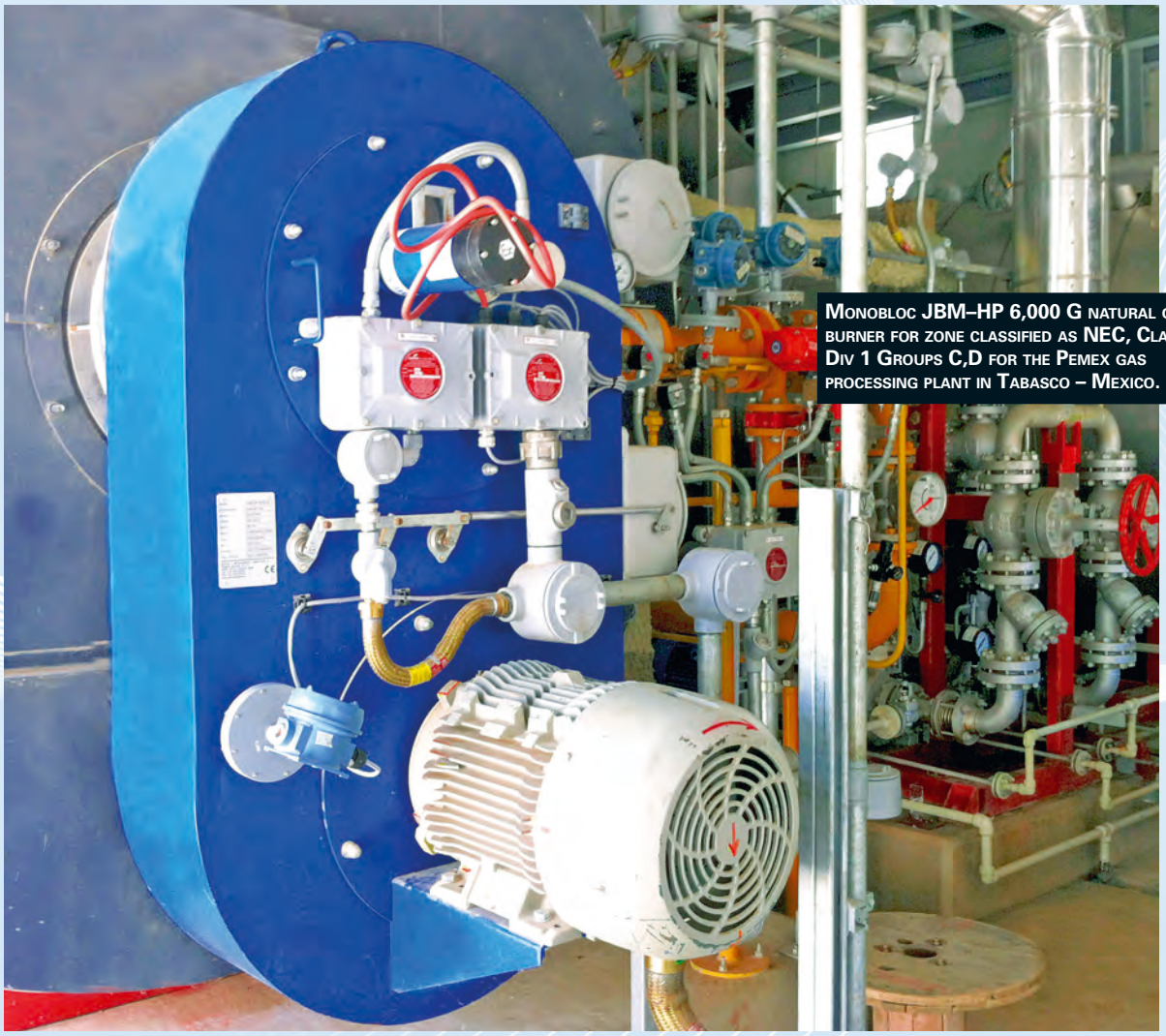
Lastly, we shall specify that the designation also of the level of protection for equipment for different groups of gases. Group I gases refer to Methane (only for equipment used in mining); Group IIA are made up by propane gas type (this is the less restrictive group); Group IIB are ethylene type gases and Group IIC refer to hydrogen gases

Special features of ATEX burners

Once the customer has defined the ATEX zone type and its characteristics, the burner shall be manufactured in a manner that the equipment that make up same are suitable.

The definition of the zone affects several components of the burner and in particular:

- Junction boxes and glands.
- Photocells.
- Servomotors.



Monobloc JBM–HP 6,000 G natural gas burner for zone classified as NEC, Class I Div 1 Groups C,D for the Pemex gas processing plant in Tabasco – Mexico.

- Pressure switches.
- Pneumatic positioners.
- Fan motors and impellers (for monobloc burners)

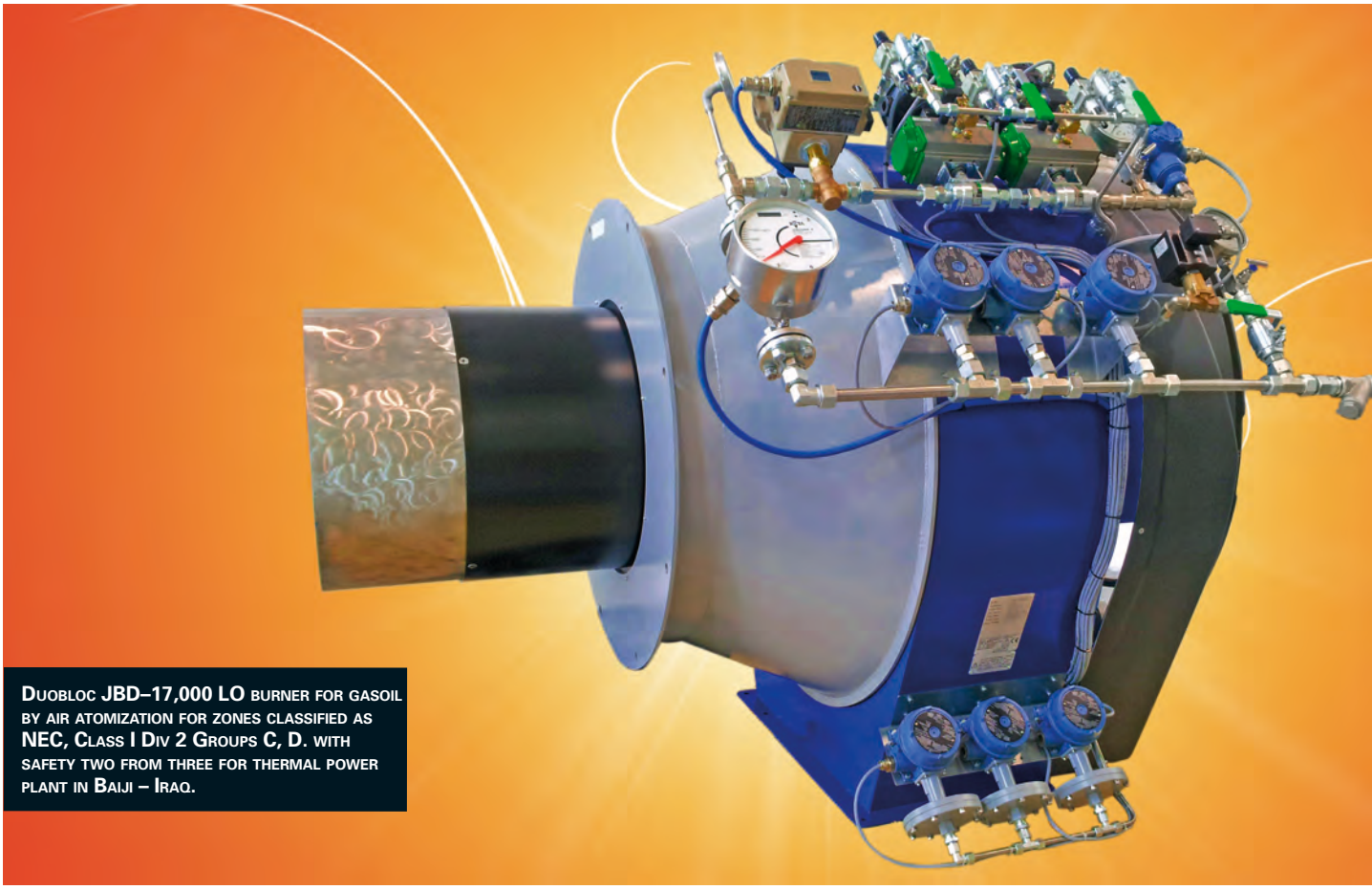
It is important to note that the ignition of the ATEX burners is produced by pilot burners, in which the spark that produces the ignition is located on the inside of the burner, practically at the end of the flame tube. The igniter is protected by a metal tube and the back box in which the electrical connections are made is valid for the classified zone. Of course the ignition transformer is installed on a box certified for the area in question.

The installation of pneumatic actuators may be an interesting alternative to the use of servomotors in regulating the flow of the fuel and air, since in this case the classification only affects the positioner which moves the actuator, rather than the entire equipment.

The increase of the size of the equipment must be considered. The sizes of a burner are specified by its power, to the same power of an ATEX burner, which occupies more space due to the size of the equipment which are installed in it. Price is another issue to be taken into account given that, in particular the equipment valid for Zone 1 may be considerably more expensive than equipment without the ATEX classification. Despite this drawback, it is certainly the most suitable alternative for certain facilities, taking into account that one always has above all to assess any cost regarding the safety of persons. For that reason, it is the most suitable manufacturing and required in certain industrial sectors such as refinery, petrochemical, power plants etc.

NEC Regulation

The American equivalent to the European ATEX standard is the NEC (National Electric Code) Regulation, one can say that both are equivalent regulations with its own, but the philosophy is similar, as is shown as follows.



Duobloc JBD–17,000 LO burner for gasoil by air atomization for zones classified as NEC, Class I Div 2 Groups C, D. with safety two from three for thermal power plant in Baiji – Iraq.

The NFPA (National Fire Protection Association) 70 Regulation, NEC, and CEC define three categories of hazardous materials that are designated as Class I, Class II or Class III. The classes specify the type of explosive or flammable substances present in the atmosphere, such as

- **Class I** are those zones wherein

the vapours and flammable gases may be present.

- **Class II** are those zones wherein combustible dust may be found.
- **Class III** are those zones which are hazardous due to the presence of easily ignitable fibres or particles.

Each of the three classes is divided in turn into two divisions:

- **Division 1**: The risk of concentration of flammable substances existing under normal conditions and maintenance and/or repair works must be made, given than breakdowns in the equipment occur frequently.
- **Division 2**: There is a risk of concentration of flammable substances. They are processed or used, but normally are found in closed containers or systems of which can only escape through accidental breakage or rupture of such containers or systems.

The division defines the probability that the hazardous material that may be present in an flammable concentration. The explosive properties of the mixtures of air and gases, vapours or dusts vary with the specific involved material.

The materials are classified in groups according to its ignition temperatures and explosion pressures.

The definition of the group subdivides the hazardous materials. The groups define substances by classification of its flammable nature in relation with other known substances. The combustible and flammable gases and vapours are divided into four groups.

A - Acetylene. (More restrictive)

B - Hydrogen.

C - Ethylene.

D - Propane.

The temperature classes are used to designate the maximum operating temperatures on the surface area of the equipment which must not exceed the ignition temperature of the surrounding atmosphere. The ignition temperature is the required minimum temperature, of the normal atmospheric pressure in the absence of a spark or flame to ignite or cause spontaneous combustion independently of the element subjected to that temperature.

Allowable Surface Temperature of the Electrical Equipment		Temperature Class
450°C	842°F	T1
300°C	572°F	T2
280°C	536°F	T2A
260°C	500°F	T2B
230°C	446°F	T2C
215°C	419°F	T2D
200°C	392°F	T3
180°C	356°F	T3A
165°C	329°F	T3B
160°C	320°F	T3C
135°C	275°F	T4
120°C	248°F	T4A
100°C	212°F	T5
85°C	185°F	T6

As is the case for ATEX equipment depending on the type of protection one finds equipment with "Explosion-Proof" (flameproof) packaging, of intrinsic security, etc. Whose definitions are the same as those specified for ATEX equipment.

Notwithstanding, that the fabrication of ATEX or NEC equipment is becoming increasingly more widespread, and it should be noted that few companies are capable of manufacturing custom burners according to specific customer requirements with respect to the definition of the zones with risk of explosion. E&M Combustión is, without question a leader company and truly competitive in this regard and we are capable of manufacturing in a relatively short space of time custom equipment taking into account the different options offered by the ATEX and NEC regulations at attractive prices for the customer.