

# COMSPAIN

COMPañIA DE MANUTENCIONES ESPECIALES ESPAÑA, S.A.



## INDUSTRIAL EQUIPMENT

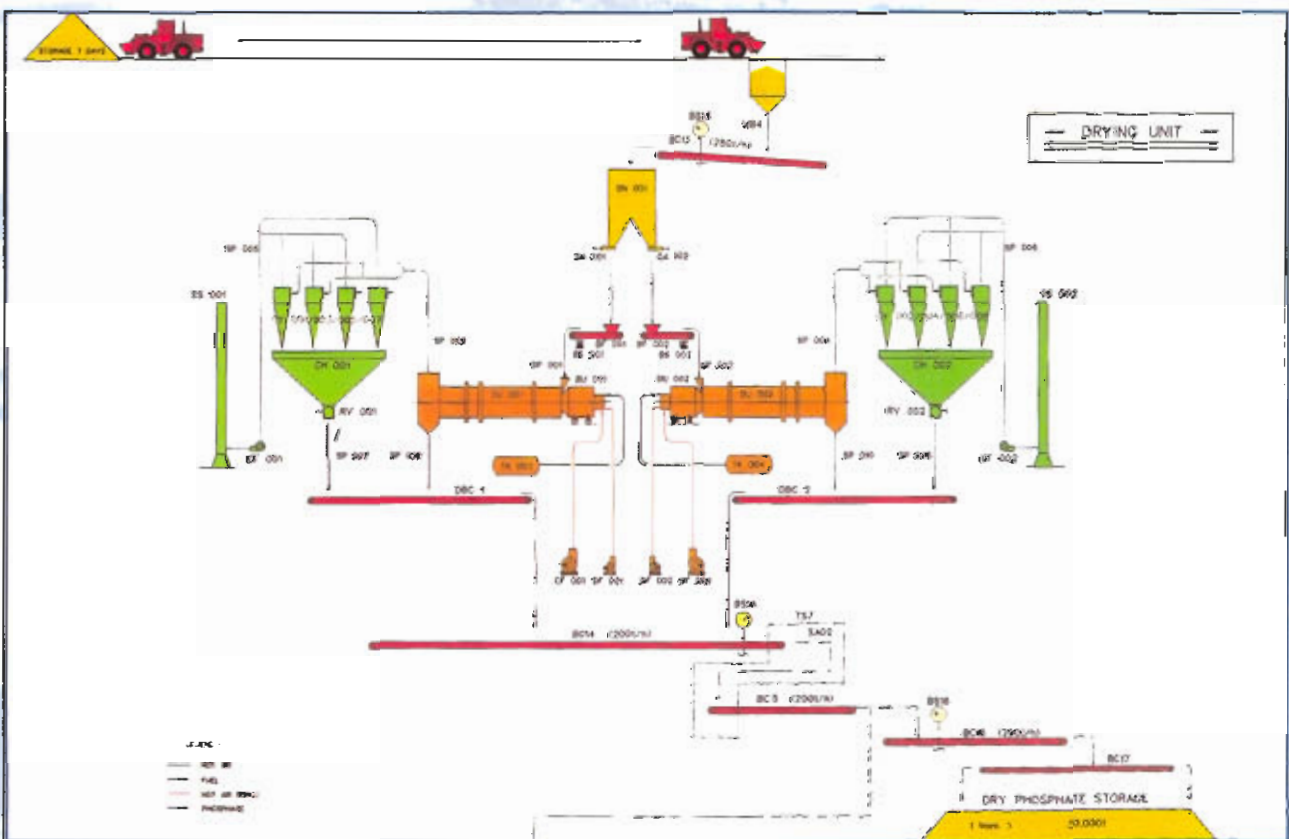


# ROTARY DRUMS

# EXPERTS IN DESIGN ENGINEERING, MANUFACTURING AND MAINTENANCE OF ROTARY AND STATIC DRUMS.

The rotary drum is a machine used by industry since the beginning of the twentieth century. It is basically a simple machine that aids in the processing of solid or sludge products from dumping produced by rotation or the curtain formed by blades.

The product advance is guaranteed by the slope of the axis drum or by inclined blades, pneumatic transport or internal rotors.



*Flow sheet of one Drying phosphate Installation*

The drive system can be effected by:  
 pinion and ring gear  
 pinion chain and gear wheel  
 wheel pull

The drums are usually equipped with driving and rolling support frames, inlet and outlet boxes, gas intake...  
 Sometimes there is specific equipment as an outlet squirrel cage, anticaking hammers, sprayers, etc...

**Basic and detailed engineering, manufacturing, assembly, start-up and after-sales service.**



*Indirect Dryer of PVC Ø 3,2 m x 28 m L.  
Group ACETEX (CANADA)*



*Installation of Drying waste material for  
Incineration furnace  
SOGAMA (GALICIA-SPAIN)*



*Granulator of NPK for Petroquimia  
GRESIK II (INDONESIA)*



*Rotary drum in solid stainless steel for ammonium nitrate, thickness 50 mm.  
Dimensions Ø 4,5 m x 30 m L  
FERTIBERIA (SAGUNTO-SPAIN)*

# DRYERS, GRANULATORS, COATERS, CALCINERS, COOLERS, CLASSIFIERS, MOULD STRIPPERS, REACTORS, QUENCHERS, WASHERS.

Calculations and simulations by computer: drying, cooling, calcining, costs, slopes, power, rollers, shafts, bearings, shells, pinnion, girth gear, tyres.

## SPECIFIC TECHNOLOGIES:

- Honeycomb shovels
- Double step/triple step
- Multistep (dehumidifiers)
- Indirect:
  - double jacket
  - axial tube
  - multitube (bladed or not)
  - multitube (floating head)
  - single transfer through the wall:
    - sprinklers (coolers)
    - heaters (drying and calcining)
      - electric
      - burners
  - sectional contact plates
- Window blinds
- Mixed dryer-cooler with air-outlet exhaust in center
- Statics, with buckets, disks, or rotary tubes

## TESTING LABORATORY

For drying and cooling tests up to semi-industrial scale.



*Rotary Dryer for NPK Ø 3,5 m x 28 m L.  
OMNIA  
GRANDE PAROISSE  
(SASOLBOURG-SOUTHAFRICA)*

## EXPERIENCE AND CAPACITY

### DRUMS

Weight: up to 400 T  
Thickness: up to 60 mm  
Production: up to 650.000 Kg/h  
Diameter: up to 5,4 m  
Length: up to 50 m  
Installed power: up to 1.000 kW

### RIDING RINGS (TYRES)

Diameter: up to 6000 mm  
Width: up to 600 mm  
Weight: up to 40 T

### RING GEARS

Pitch diameters: up to 8000 mm  
Module: up to 50 m  
Width: up to 500 m

### MATERIALS

Carbon steel, stainless steel, refractory steel, "corten" steel, aluminium, etc...  
Automatic lubrication, hammering or knocking, squirrel cage, barring device, reversibility.



*Rotary Dryer Ø 4,95 m. x 31,5 m. L for NPK, DAP and GTSP • SABIC-TPL (SAUDI ARABIA)*

## DRYING DRUMS

The COMSPAIN drying drums are equipment for the treatment of a large range of products.

With the help of hot gases in equiflow or counter-flow, it is possible to dry chemical products, fertilizers, minerals, solid waste materials, vegetables and fruits and a large range of granulated or pulverized solid products.

Hot gases in direct contact can be supplied by a traditional liquid or gas combustible, combustion chamber (fuel-oil, gas-oil, natural gas, propane...), by an air flow chamber, a steam or thermal oil air

heater, an interchanger crossed with combustion gas or by recycling gas from a cooler.

This rotary drum equipment is made with a strong shell provided with double thickness zones to support the mechanism. The shell-reinforcement fittings are chamfered according to the ASME code for pressure vessels. The large dimension drums (up to 5,4 x 50 m L) can be manufactured in two, three or more pieces with a junction system permitting pre-mounting, shop tests and welding "in situ".



*Rotary Dryer for Granulated Fertilizers Ø 3,2 m x 28 m L  
INABONOS ROULLIER GROUP (LODOSA-SPAIN)*

The internal scrolls and lifters introduce and dump the product. Long experience and constant testing have led us to find the most adequate lifters for each kind of product achieving good curtains and effective exchanges.

The usual drive system is by pinion and ring gear. The ring gear is mounted on a floating system to absorb the thermal dilatation.

The riding-rings (tyres) are made on a single-piece forged ring with a microslide mounting system.

**Rotary dryers, strong equipment with proven technology and a long service life.**



*Rotary Dryer for NPK Ø 3 m x 24 m L  
CNCCC-GUIXI-CHINA*

## GRANULATING DRUMS

**Highly effective rotary granulators for the chemical, food and fertilizer industries.**

Granulator drums make it possible to obtain granulated products starting from powder and additives.

They are short drums (the usual length/diameter ratio is more or less equal to 2), turning at a relatively high speed of 8 to 10 T/min.

The slope is usually low as the staying time (short, from 2 to 3 minutes) is determined basically by the diafragma height.

They are manufactured with double thickness shells in the rolling and coupling zones, according to the ASME code.

Inside they are equipped with a special floating rubber coating reinforced against:

- Abrasion
- High temperature (180° C)
- Acids
- Flexibility
- Caking

The rubber is fixed into the shell with stainless steel flat irons and its flotation is made possible by air holes in the shell.



*Granulator Drum Ø 2,6 m x 6,5 m L. CNCCC-YUNAN-CHINA*



This type of drum is normally manufactured by incorporating the "granulation system": an internal beam support of ammonia, acid or slurries injectors, a typical installation of the fertilizer industry.

They are equipped with gas inlet and outlet boxes.

*Granulator Drum for Bicalcic Phosphate  
TIMAC-SAINT MALO- FRANCE*

## COATING DRUMS

The coating drum is necessary equipment for the manufacturing of granulated fertilizers.

**In this drum, fertilizer grain is coated with products that improve its appearance and prevent the adherence of grains.**

These drums are equipped in an initial zone with scrolls (helicoidal blades) that facilitate entry of the product followed by low- placed blades (normally triangled) that permit gentle dumping, to facilitate total uniform impregnation of the coated product.

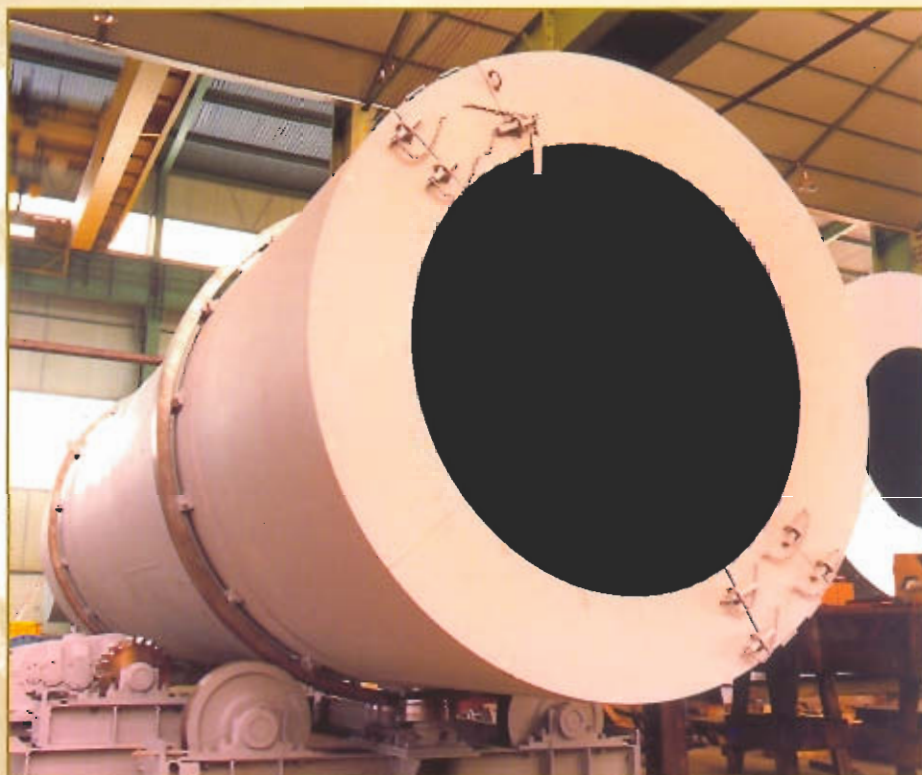
It is possible to coat with

- liquids: gas-oil, amines,
- solids: talc, kiesselguhr, etc...

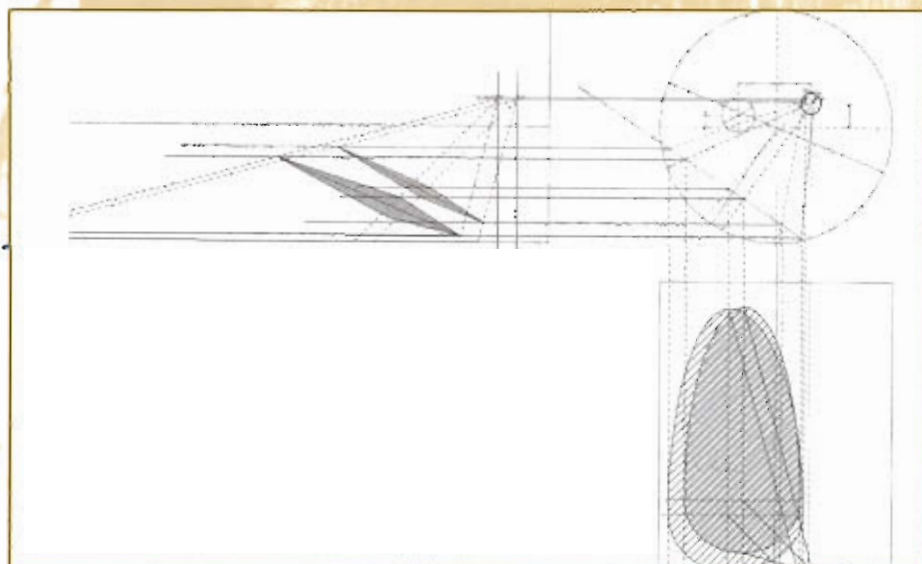
The COMSPAIN coaters are equipped with one to four mobile sprayers (deeply placed at an angle) for efficient irrigation.

The nozzles (normally full cone) are specially designed to prevent obstruction by foreign bodies.

The solid coater is inserted in the drum using an easily dismountable screw conveyor.



*Coater drum Ø 1,4m x 4 m L. TFC-TAIWAN*



*Spraying study made by  
Autocad*

## INDIRECT DRUMS

**Indirect drums permit working with very fine products (otherwise carried away by the gas flow) or those that should not be in contact with the exchange fluid.**

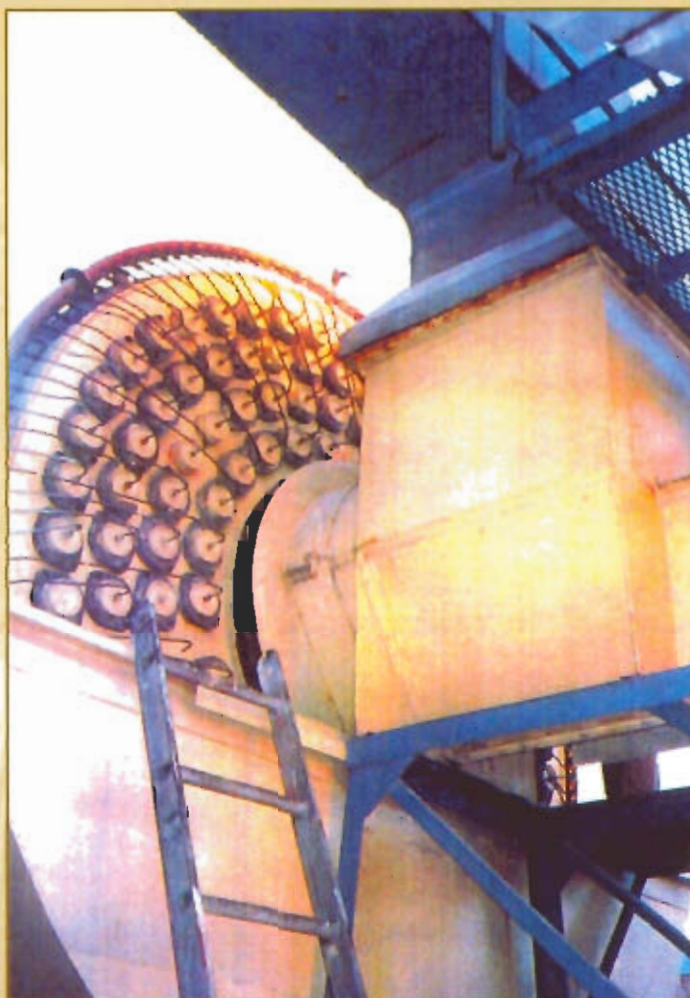
In the section "special technologies" it is possible to find different types of our indirect drums.

The most usual drums are:

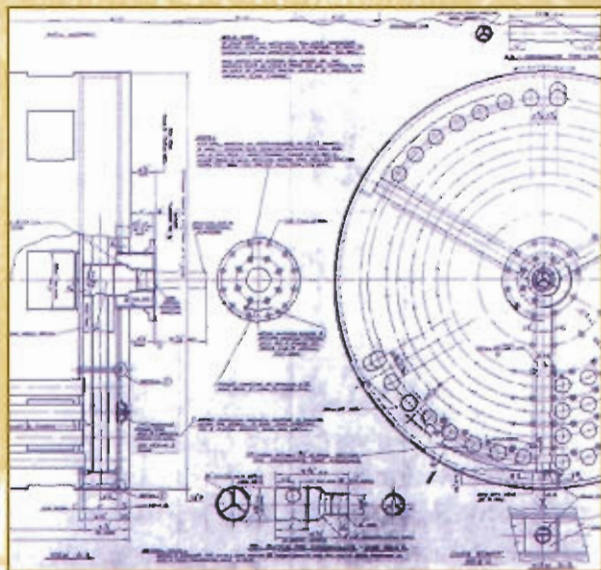
- Multitube
- Through-the-wall transfer
- Static with internal rotary blades and buckets and external steam or jacket.

The multitube drums have the following characteristics:

- Internal "chicanes" for supporting tubes.
- Hand holes for cleaning each tube
- Single floating heads to allow for thermal dilatation
- Inlet fluid manifold
- Inlet and outlet rotary valve, equipped with spherical graphite joint, without oils or lubricants
- Normally equipped with a screw conveyor to introduce solids



*HORMECAL - Chemical product, ALAVA - SPAIN*



Static drums equipped with rotary blades and buckets make it possible to work with a jacket that offers different temperature zones for drying, reaction or transformation of the product.

## ROTARY CALCINING DRUMS

The calciners work at countercurrent in order to attack with the hottest gases in the final stages at high temperatures of between 900 and 1000° C with the product reaching a relative humidity of 0%.

COSMPAIN manufactures different types of calciners, among others:

- Calciner lined in refractory material equipped with a burner in the drum axis (e.g. for flying ashes)
- Calciner equipped with scrolls and lifters manufactured in boiler steel, and with a combustion chamber in the drum axis (e.g. for washed phosphate).

The combustion chamber can be mounted on wheels and rails to permit its separation from the drum and for easy access.

- The outsized outlet box, permits the fall of the product, preventing the flying away of fine particles.
- This kind of equipment is usually equipped with auxiliary drive and is totally heat-resistant.



*Calcinator for flyight ashes Ø 2,8 m L x 22 m L. INDUMETAL-BILBAO-SPAIN*

# WASHING DRUMS

## MANUFACTURE

The cylinder manufactured in laminated steel has an internal dismountable covering in steel or reinforced rubber to resist wear and weight.

It is internally equipped with a lifter and feeder blades system that permits fall mixing and pulp production.

It is supported and driven by an assembly of independent portable wheels equipped with commercial tyres and mounted on chain-driven roller bearings or on gear reducers.

## USE

Washing drums are equipment designed for the energetic washing of gross size rocks, gravel, and minerals, and also for the preparation, disintegration and homogenization of products to be treated by humidity.

Washing of lumps, untreatable with conventional systems  
Dissolving and pulping of agglomerated clay or similar products



*Installation of Washer and Classification of uranium.  
ENUSA-SALAMANCA-SPAIN.*

## SOME ADVANTAGES

Silent with no vibrations due to the wheel mounting. Low maintenance cost and long life of equipment.

## DIMENSIONS STANDARS

Type (Ø) Tipo	Power (KW) Potencia	Empty Weight (Kg)	Loaded Weight (Kg)	Max. Size (mm)	Water (m³/h)	Capacity (T/H)	
						4 mn.	1,5 mn.
CM 06.02	1.1(1)	900	1.100	60	10	2	5
CM 11.03	4.0(1)	2.000	2.700	110	50	10	25
CM 14.04	11.0(2)	5.000	6.900	150	100	20	50
CM 16.04	15.0(2)	7.100	9.600	170	150	30	75
CM 18.05	22.0(2)	8.900	12.700	190	200	40	100
CM 20.06	33.0(3)	12.400	18.200	210	300	60	160
CM 22.07	44.0(4)	18.000	26.100	230	450	80	220
CM 25.08	74.0(4)	23.600	35.800	260	650	120	330
CM 29.09	111.0(6)	35.200	61.800	300	1.000	190	500
CM 33.10	180.0(6)	46.000	73.100	350	1.500	270	720
CM 37.11	240.0(8)	57.800	94.700	390	2.000	375	1.000

# CRUSHING AND CLASSIFYING DRUMS "TROMMELS"

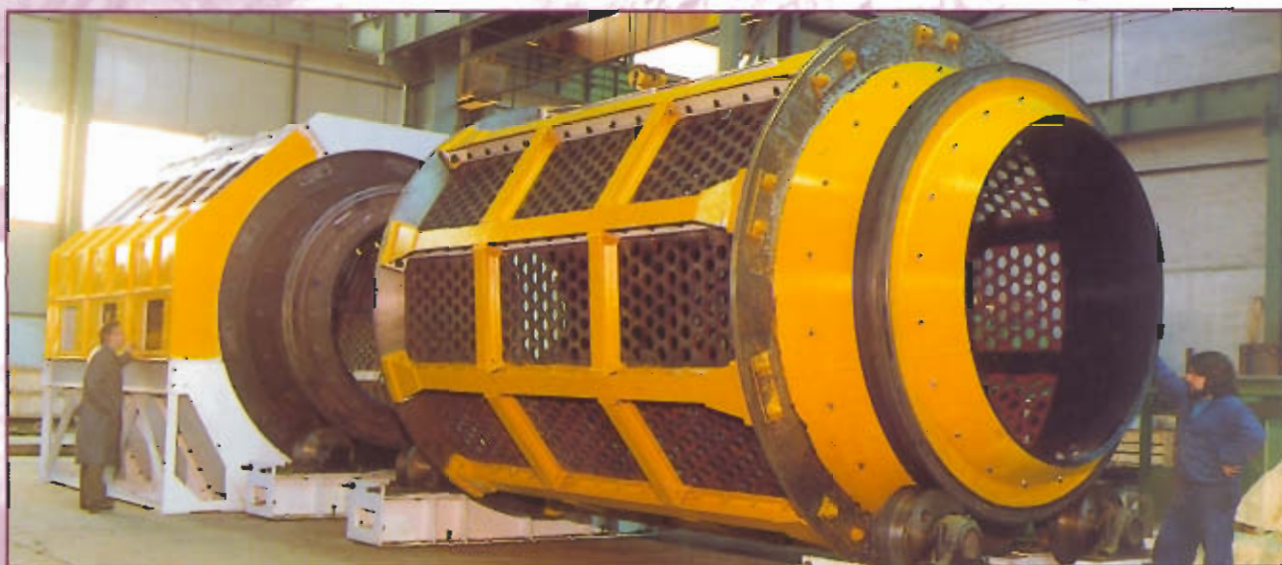


Crusher Ø 3,5 m x 9,1m L for coal  
GUAVIO-COLOMBIA

The COMSPAIN crushers and classifying trommels perform the tasks of self-crushing, classifying and separating of sterile and exceptionally hard parts of the product.

This extremely vigorous process is created mainly by an horizontal cylindrical cage covered inside by heavy perforated plates, and outside two truncated cones act as inlets for raw material and outlets for sterile material.

The assembly is supported on rollers that permit a gentle, uniform turn of all the equipment (driven by a chain, pinion and roller gear). A guard or cover is included.



Crusher Ø 2,8 m x 7,25 m L for coal • ENDESA-TERUEL-SPAIN

Inside there are inclined blades that permit the advance of the material and horizontal blades that work as an anvil, and also crush the material in its free fall.

**This is maintenance-free equipment.**

TYPES		TTS 28x37	TTS 28x49	TTS 35x49	TTS 35x61	TTS 35x74
Inner diameter chamber	mm	2.800	2.800	3.500	3.500	3.500
Free length chamber	mm	3.700	4.930	4.930	6.160	7.400
Total length chamber	mm	6.000	7.250	7.850	9.100	10.300
Total weight chamber	kg.	28.000	38.000	56.000	62.000	70.000
Power	kw.	27-37	30-50	33-56	44-60	60-75
Hourly production						
depending on coal	Ø30 mm t/mh	80-150	120-210	150-300	200-400	300-600
hardness and grading	Ø150 mm t/mh	125-250	300-450	400-650	650-1.100	1.000-1.500

## ROTARY TROMMELS

Used at solid waste treatment plants for:

- Classifying of organic materials
- Compost refining
- Compost finishing
- Bag crushing
- Classifying of "yellow bag" products
- . Production: from 8 T/h to 40 T/h
- . Material: anti-wear steel
- . Cut: circular (15 mm-250 mm) and rectangular
- . Power: up to 100 kW



*Classifier Trommel for Waste Material  
PLACOSOL-URBASER MALAGA-SPAIN*



*Thorns for breaking bags into a Classifier trommel*

- Rolling on blind reinforced shells
- Polyurethane lined wheels
- Axial retention system
- Interchangeable anti-wear perforated plates
- Anti-overflow material diaphragm
- Pass and rejection hoppers
- Labyrinth seal
- Support frame
- Platforms and stairs
- Airtight covering (hood)
- Quick access doors



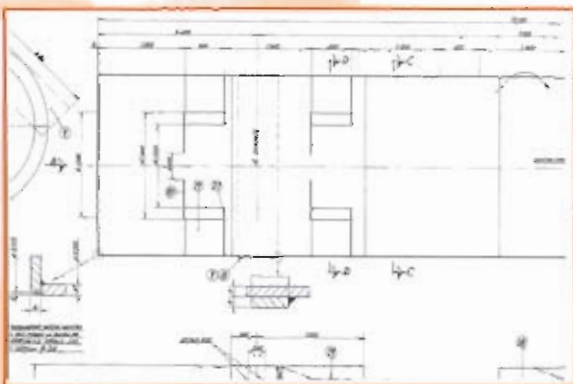
*Classifier trommel  
for Waste material  
DRAGADOS-TIRIADRID-  
SPAIN*

## DEHUMIDIFYING DRUMS

Dehumidifying is a special type of drying at high humidity for low-density products which are easily degradable if the drying occurs too quickly or if the temperature is too high.



Dehumidifier drum for barks. MECAPEÑA-BILBAO-SPAIN



Multipas system for Drying

This is a typical process for fruits, fodder, vegetables, bark, waste materials, etc...

COMSPAIN normally uses the multistep process, where the drum is divided into different cells.

The transportation of the product is done cell by cell by a pneumatic system, thus achieving a reasonably high staying time with low-density products, using large quantities of gas at low temperatures.

They are light drums which operate by wheel-driven or chain pinion and gear wheel systems.

Due to the working philosophy of pneumatic transportation these drums are manufactured in anti-wear steel or lined with this type of steel.



Dehydrator for alfalfa  
STEIN-VENEZUELA

## COOLING DRUMS

This type of equipment has been replaced in part by fluid beds, but it still has a wide range of applications.

**They operate with cold air (ambient or conditioned) for an efficient gas-product transfer through dumping and an adequate curtain formation inside the shell.**

The cooling occurs at countercurrent in order to obtain the lowest possible product temperatures, near those of the cooling gas.

These drums are associated several times with dryers, causing the product to fall directly (dryer to cooler) by way of a transference box through which the mixed dryer and cooler gases are extracted.

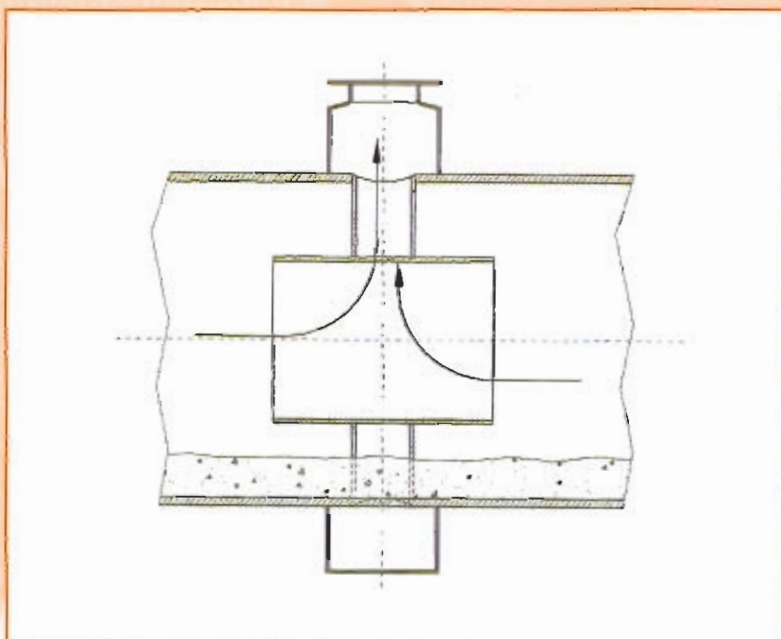
A less-common example is the mixed dryer/cooler. In this kind of drum the product is fed in a non-stop procedure and the drying and cooling gases are extracted through a concentric inner shell with air tubes.



*Cooler and Dryer Drums in stainless steel of ammonium sulphate  
PHILPHOS - PHILIPPINES*



*Transfer box in stainless steel for Cooler and Dryer Drums*



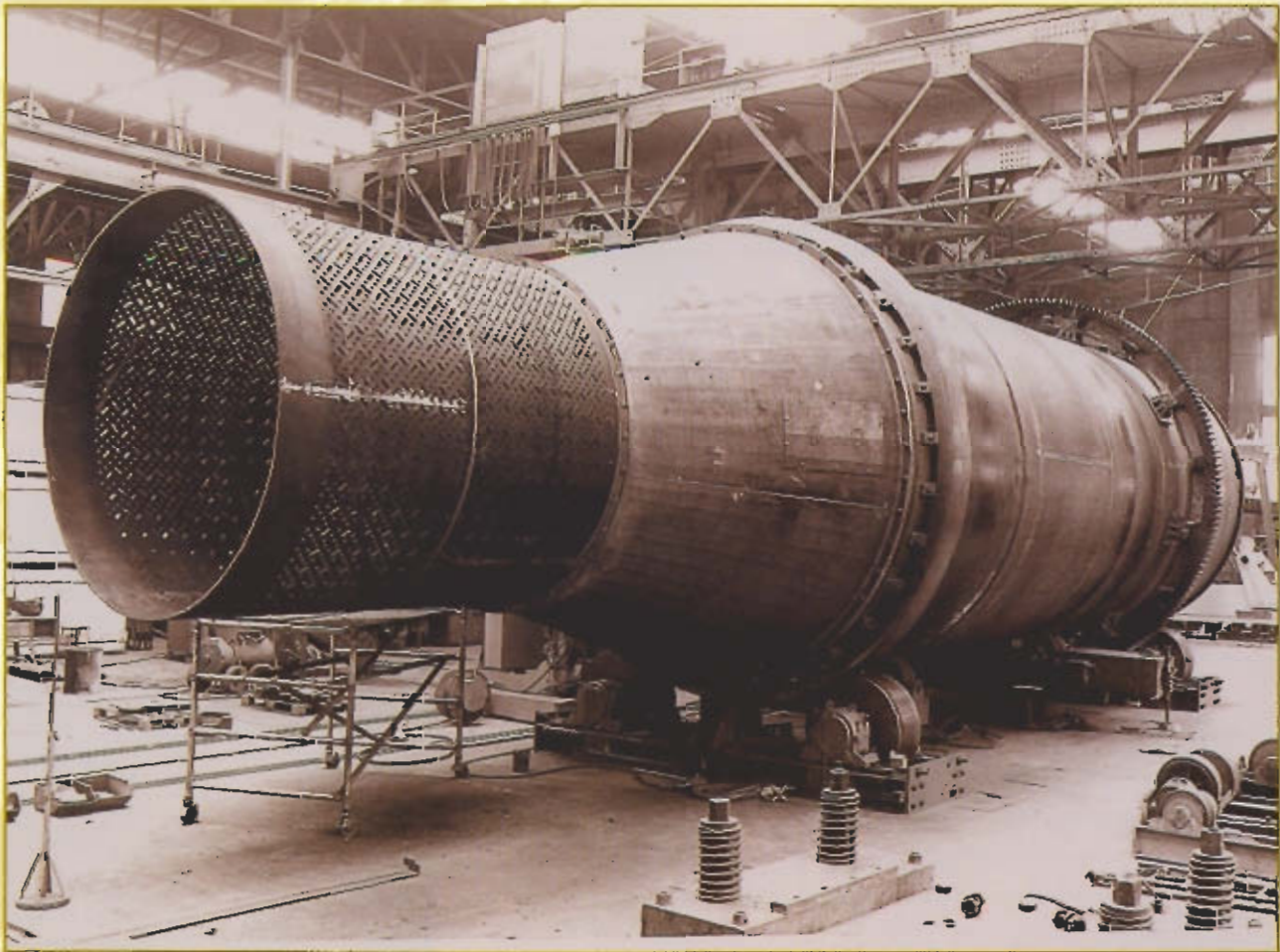
*Common outlet of gases into a Mixed Cooler-Dryer Drum*

## MOULD STRIPPING DRUMS

These drums achieve efficient non-stop separation of casting pieces and sand in casting foundries. Medium or large piece stripping can occur in a discontinuous process placing the box with sand, male pieces and parts on a vibrating grate (other COMSPAIN technology).

If it is necessary to strip numerous small pieces for mass production (as in the automobile industry), a stripping drum is required.

Boxes, parts, sand and male pieces are introduced into the mould stripping drum, and there they are separated by dumping.



*Mould stripper in serie for car pieces. FUCHOSA-ACHONDO-SPAIN*

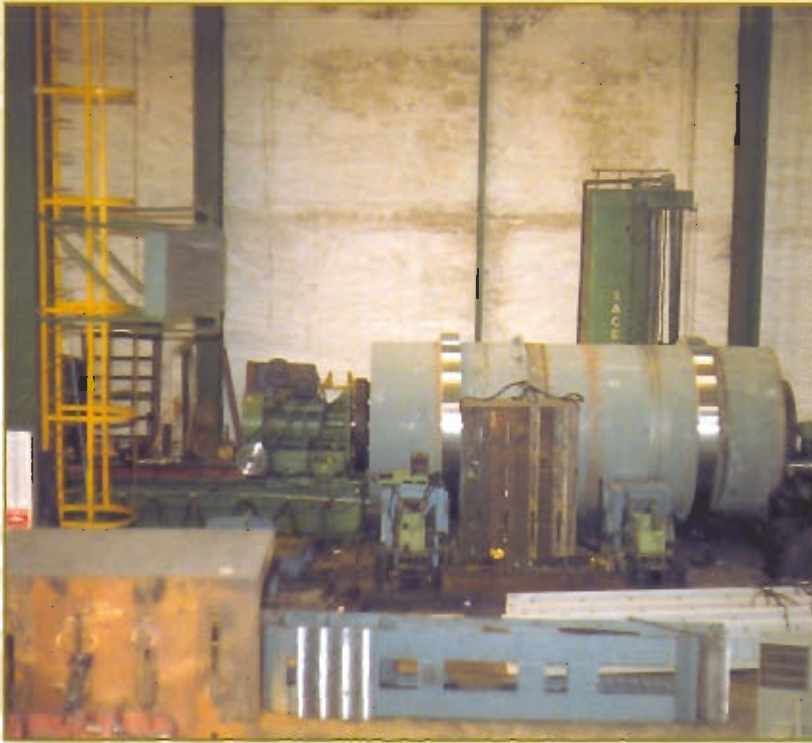
An adequate friction between pieces makes self cleaning possible.

The feeding of the drum occurs by vibrating spring blade transport which is also used to transport the final parts, permitting work at high temperatures.

**The drum is designed for heavy work, strong wear and frequent shocks.**

A rotary screen mounted over the outlet retainer ring enables the separation of the parts and sand.

## EXTINGUISHER DRUMS



*Extinguisher drum for pyrite ashes  
LURGI-RONTEALDE-SPAIN*

Extinguishing ashes is a specific problem (for example in calcining pyrite for sulfuric acid production) that requires a special drum design.

It is necessary to achieve a well-distributed sprinkling of the product for complete extinguishing which is aided by the dumping process.

Due to the large quantity of steam and gases in the process, the inlet and outlet rotary joints must be hermetic. These friction joints are mechanized and compressed by springs and they may be pressurized.

This type of drum has totally-mechanized rolling areas in the shell so that the manufacturer requires enormous lathes.

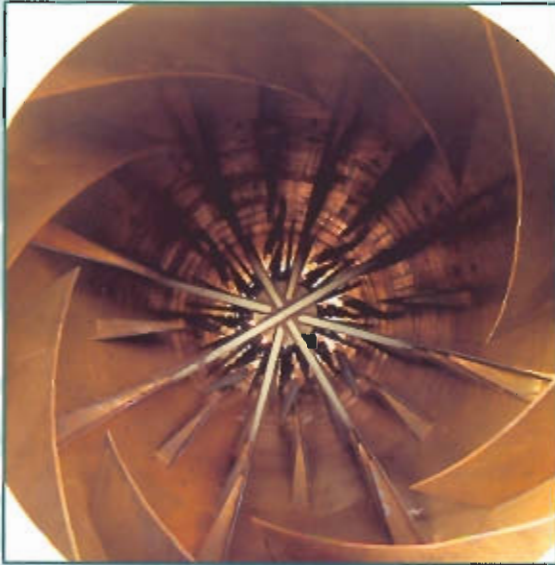
**Another typical procedure for extinguishing with similar characteristics occurs in soda or slaked lime production.**

In both manufacturing processes and similar ones, COMSPAIN provides specialized technology with top quality results.



*Extinguisher drum for chemical product  
ZAPICO-ARGENTINA*

## INTERNAL SCROLLS & LIFTERS



As mentioned before, the internal scrolls and lifters permit the introduction and dumping of the product.

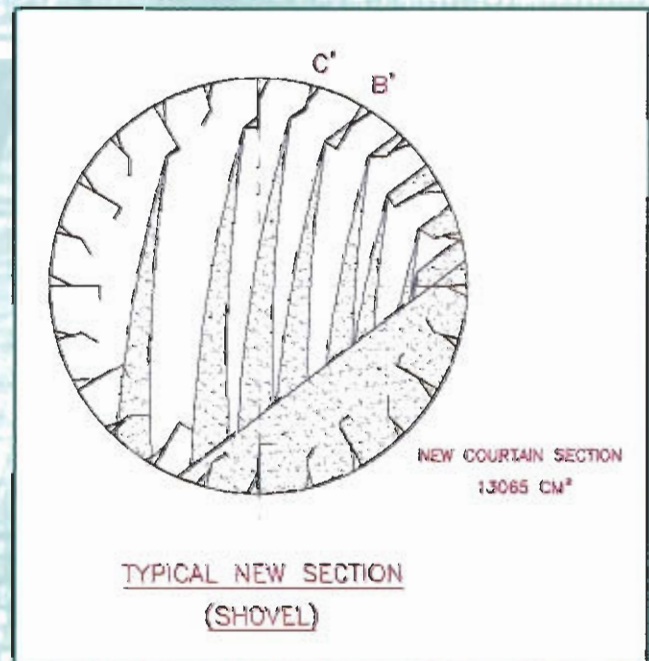
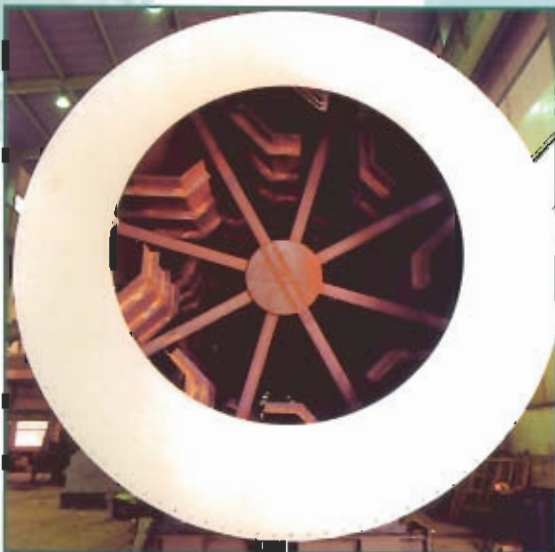
In an initial helicoidal zone the product is introduced avoiding overflow in the inlet. Then there is a blade-free zone followed by a radial lifters zone for processing wet filling products.

As the product advances in the drum drying (step by step), the blades become more plied until the product curtain covers more than half of the drum.

**Due to our extensive experience and constant testing and computer analysis, we have been able to discover the most adequate blades for each kind of product, achieving the best thermal exchange.**



The blades have special closed reinforcements to avoid caking and these may be welded or screwed to the shell.



*Computer study about curtains formation*

## DRIVES

The drive is the heart of the machine. COMSPAIN mainly uses pinion-ring gear drives, designed and manufactured for a long life, even with heavy loads.

The ring gear is manufactured in two parts under strict quality control, with 35 CD4 quality (chrome molybdenum steel), and a mass hardness of  $87 \text{ Kg/mm}^2$  (250 BRINELL).

The pinions normally have 23 teeth forged with 42CD4 quality (chrome molybdenum steel) and with a mass hardness of  $97 \text{ Kg/mm}^2$  (280 BRINELL).

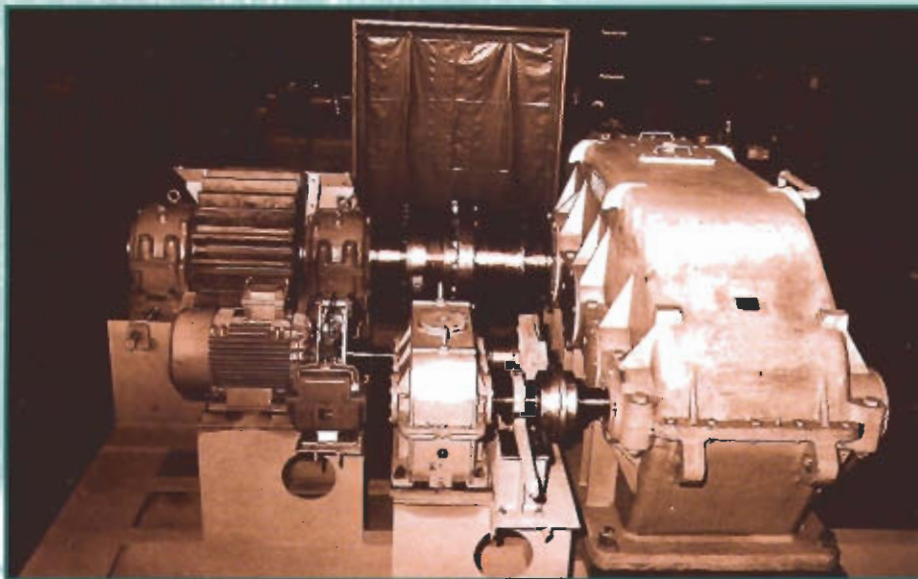
The pinion is operated by means of spherical teeth coupled with the gear reducer.

Between the electric motor and the gear reducer a fluid coupler is normally mounted to allow for progressive starting.

The largest drums are usually equipped with a low-speed auxiliary barring device to make it possible to empty the drum during a power break-down, installation or maintenance operation. The emergency drive has an auxiliary gear reducer, a free automatic coupling wheel and an electromagnetic brake.



*Manufacturing workshop of girth gears*



Pinion and girth gear are automatically lubricated with pulverized grease by compressed air following a program established by microcomputer.

*Cinematic chain with barring device*

## ROLLING AND THRUSTS

COMSPAIN manufactures top quality riding rings (tyres). These are single-piece forged tyres, 35CD4 quality with a mass hardness of 80 Kg/mm $\approx$  (230 BRINELL).



*Trunnion rollers in workshop for expedition  
INSTALLATION ABOCOL-COLOMBIA*

They are mounted on a floating disposition on shoes fixed to the shell with small adjustable plates.

The fit allows for sliding due to microdisplacement, which avoids uncommon wear.

The trunnion rollers are forged or laminated in 42CD4 quality and 90 Kg/mm $\approx$  mass hardness (260 BRINELL).

These rollers are fastened under heat to a F125 quality shaft mounted on spherical roll-bearings.

The thrust rollers that restrain the axial movement of the drum are manufactured with the same quality as the trunnion rollers.

Its conical design permits a simple rolling on the ring nearest to the ring gear avoiding friction. Graphite blocks allow for the greasing of the rollers.



*Riding ring. Installation of Pequiven-VENEZUELA*

## AUXILIARY EQUIPMENT

The different types of drums require diverse auxiliary equipment, depending on each process.

COMSPAIN supplies top quality auxiliary equipment adapted to its drums.



*Combustion Chamber by air vein  
INSTALLATION for GUBRE-TURKEY*

### COMBUSTION CHAMBERS

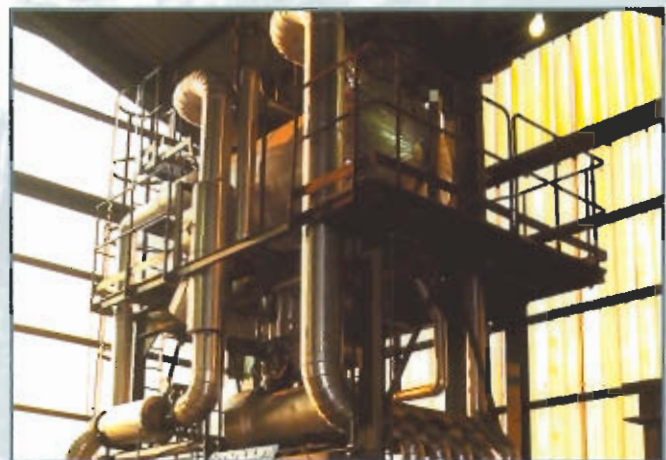
Up to 36.000 Th/h per line.  
Operate with gas-oil, fuel-oil, or natural gas with static or rotative cup burners  
Fully automated process  
Constant flow  
Air cooling firebox

### AIR CONDITIONING UNITS

Up to 3.000.000 frig/hour per line  
Operate on an open ammonia circuit or a closed refrigerated gas and alternative or screw compressor circuit.  
Include filters, air coolers, air heaters, demisters, etc....

### DEDUSTING

Cyclones, multicyclones, filters, scrubbers, to guarantee the strictest European environmental standards.



*Cooling group. Open circuit of ammonia. 2.000.000 Frigories  
FERTIBERIA (BILBAO-SPAIN)*



*Dedusting cyclones for Dryer  
UHDE-ALLEMAGNE for IFI-ARKLOW-IRLAND*



*Filtering installation for Drying sepiolite  
SEPIOLSA (GUADALAJARA-SPAIN)*

# PRODUCTS

## MINERALS

Sand  
Clays  
Atapulghite  
Bauxite  
Limestone  
Coke  
Dolomite  
Feldspath  
Fluorspath  
Magnesite  
Iron Oxide  
Pyrite  
Pyrotite  
Sepiolite  
Talc  
etc...

## CHEMICAL INDUSTRY

Boric acid  
Oxalic acid  
Triotic acid  
Fertilizers  
(Na, Na<sub>2</sub>, Dap, Npk, Urea, Tsp,  
Nitrosulphate, Compost,  
Organominerals, Map)  
Alumina  
Aminoacids  
Potasium bromure  
Catalytics  
Polyvinyl chlorat  
Potassium chlorat  
Sodium chlorat  
Manganese dioxide  
Explosives  
Phosphate  
Bicalcic phosphate  
Trisodium phosphate  
Sodium metalbisulphite  
Sodium metasilicate  
Sodium monopersulphate  
etc...

Potassium nitrate  
Porous nitrate  
Sodium nitrate  
Sodium perborate  
Polystirene  
Ammonia sulphate  
Magnesium sulphate  
Sodium sulphate  
Resin  
Sodium tripoliphosphate  
etc...

## FOOD

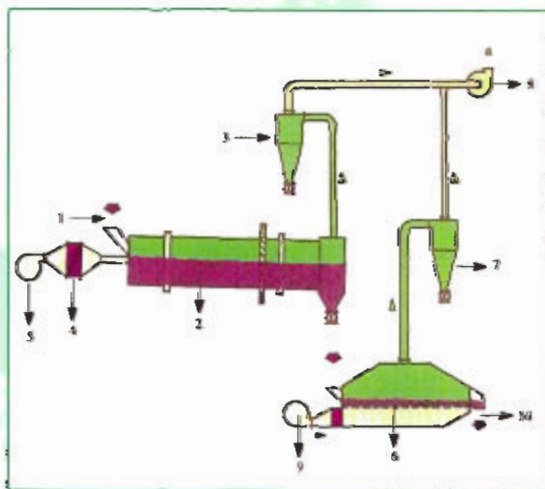
Sugar  
Lemond acid  
Starch  
Coffee beans  
Coffee powder  
Colza oil,  
Dried fruit  
Snacks  
Chocolate powder  
Sunflower  
Flour  
Lactose  
Leaven  
Milk powder  
Lisine  
Nutmeg  
Pollen  
Tomatos powder  
Protein  
Salt  
Soja  
etc...

## DIVERSES

Rubber  
Matches  
Bark  
Fibre  
Bath salt  
Waste material  
etc...

## DRYER DRUMS and FLUIDIZATION

The collaboration between our two departments origine our mixte process.



1. Inlet chuse
2. Rotary dryer
3. Cyclone
4. Air heater
5. Blower
6. Fluid bed
7. Cyclone
8. Exhauster
9. Blower
10. Discharge

*The COMSPAIN fluid bed dryer may be used alone or it may be placed downstream of the rotary dryer to permit final drying or cooling of the processed material. In some cases when fluidisation of the product is doubtful, predrying is feasible in a COMSPAIN vibrating fluid bed.*

*Final drying or cooling is carried out in a standard fluid bed or in a vibrating fluid bed dryer.*

## QUALITY

Quality control at COMSPAIN operates with total independence from the Technical Office, reporting directly to the General Management.

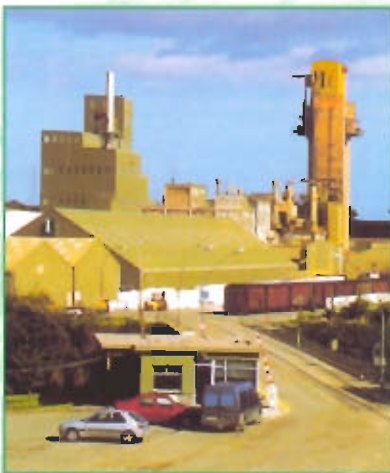
COMSPAIN subscribes to the **UNE-EN-ISO-9001** quality control norms.



*Bicalcic phosphate TIMAC-ROULLIER (FRANCE)*



*NPK-DAP-TSP-SABIC (SAUDI ARABIA)*



*NA and NAC UHDE (GERMANY)*



*NPK and ammonium sulphate  
PHILPHOS (PHILIPPINES)*



*Copper - OUTUKUMPU (FINLAND)*



*PVC-ERKOL-RHÔNE POULENC (FRANCE)*



*Special Fertilizers - INABONOS - LODOSA (SPAIN)*



*Ammonium sulphate PROQUIMED-Group UBE (JAPAN)*



*Ammonium nitrate - AZF (FRANCE)*



*Granulation - SIAPE - GABES (TUNISIA)*

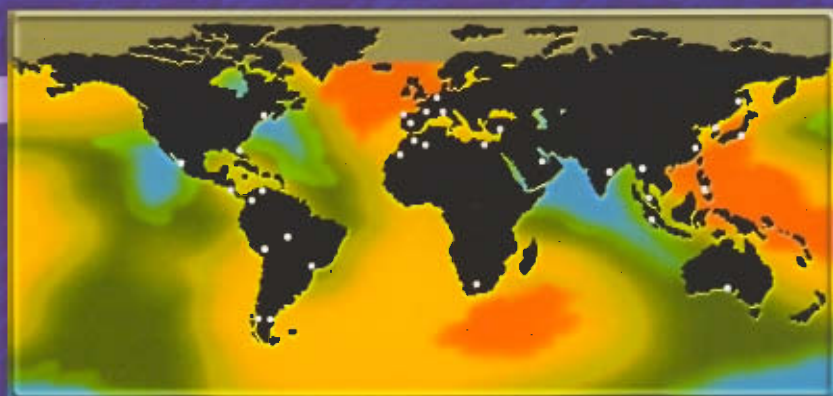
# REFERENCES SUMMARY

COUNTRY	CUSTOMER	EQUIPMENT	PRODUCT	COUNTRY	CUSTOMER	EQUIPMENT	PRODUCT
ALGERIA	BECHTEL for SONATRACH	Dryer Ø 0,80 x 5,00 m	Sand	FRANCE	PILLARD		
ALGERIA	KREBS-SONATRACH	Calciner Ø 3,30 x 25,00 m + 0,8	Sodium tripolyphosphate	FRANCE	PILLARD		
ALGERIA	KREBS for ANNABA COMPLEX	2 Granulators Ø 4,00 x 6,00 m 2 Dryers Ø 5,00 x 35,00 m 2 Coaters Ø 2,23 x 5,75 m	NPK	FRANCE	PLATRIERES DE VAUCLUSE		
BELGIUM	RAFFINERIE NOTRE DAME	Pre-Dryer Ø 2,00 x 10,00 m	Refined sugar	FRANCE	PONT A MOUSSON		
BELGIUM	RAFFINERIE NOTRE DAME	Pre-Dryer Ø 2,00 x 8,00 m	Crystallized sugar	FRANCE	PULPOSEC		
COLOMBIA	ABOCOL I / ABOCOL II	Dryer Ø 3,80 x 30,00 m Granulator Ø 3,00 x 7,00 m Granulator Ø 2,6 x 6,50 m	NPK-DAP	FRANCE	RAFFIN		
CHINA	CNCCC - YUNNAN	Dryer Ø 3,00 x 24,00 m	DAP-NPK	FRANCE	RAFFINERIE TIRLEMONTAISE		
CHINA	GUIXI	Dryer Ø 2,90 x 21,2 m	DAP	FRANCE	RENAULT		
CHINA	LUZHAI	Dryer Ø 1,20 x 8,00 m	Cane sugar	FRANCE	RENO		
ECUADOR	FIVES LILLE CAIL for AZUCARERA DE AZTRA			FRANCE	RHONE PROGIL		
FRANCE	AZUCARERA DE NASSANDRES	Dryer Ø 1,00 x 6,00 m	White sugar	FRANCE	S.B.F.M.		
FRANCE	BADGER	Dryer Ø 1,20 x 5,00 m	Rubber granules	FRANCE	SECAUBOIS		
FRANCE	BLANZEL-ALIZAY	Dryer Ø 1,60 x 12,00 m	Biancose	FRANCE	SERETE para UNION CARBIDE		
FRANCE	BOUCHON ET PAJOT	Dryer Ø 1,80 x 10,00 m	Refined sugar	FRANCE	SEPPIC		
FRANCE	CATTEAU ST. MAXIMIM	Dryer Ø 2,20 x 13,00 m	Sand	FRANCE	SIPLAST for MONDOUBLEAU		
FRANCE	CECA	Dryer Ø 1,60 x 14,00 m	Siliporite	FRANCE	S.N.P.E.		
FRANCE	CECA-VELIZY	Calciner Ø 0,80 x 6,50 m	Mineral product	FRANCE	SECADOUR LE BOUCAU		
FRANCE	C.F.F.C. ROCHEFORT	Mould stripper Ø 1,30 x 6,00 m	Sand and foundry pieces	FRANCE	SOFREM		
FRANCE	CHRISTIAN LECOESTER	Granulator Ø 2,75 x 7,00 m	Fertilizers	FRANCE	SOGEREM		
FRANCE	CIMENTS FRANÇAIS	Dryer Ø 1,50 x 8,00 m	Limestone	FRANCE	SOVRAM		
FRANCE	CITROËN CHARLEVILLE	Mould stripper Ø 4,20 x 18,10 m	Sand and foundry pieces	FRANCE	STE. HEURTEY for DENAIN		
FRANCE	CONSORTIUM C.I. for COSTA DE MARFIL	Dryer Ø 2,00 x 7,00 m	Citric residues from squeezed goods	FRANCE	STE. LANGUEDOCIENNE DE SOUFRE & MICRON-COULEURS		
FRANCE	COOPERATIVE DE DESHIDRATATION DE PICARDIE BRETEUIL	Dehydrator Ø 3,50 x 15,00 m	Pasture and/ beetroot pulpe	FRANCE	STE. GMYA-ORGN para LES MARGRES BLANCS DE PY		
FRANCE	DENAIN ANZAIN	Dryer Ø 1,50 x 9,00 m	Pea gravel	FRANCE	SUCRIERE AGRICOLE DE WAGNIES		
FRANCE	DISTILLERIES DE BAGNOLS	Dryer Ø 1,40 x 8,40 m	Wine sediment	FRANCE	SUCRIERE AGRICOLE DE COLLEVILLE		
FRANCE	DISTILLERIE COOPERATIVE DE RAVIERES	Dehydrator Ø 2,80 x 14,50 m	Distilled pulps and fields	FRANCE	SUCRIERES ET RAFFINERIES D'ERSTEIN		
FRANCE	FRANCE	Dryer Ø 1,00 x 6,00 m	Limestone	FRANCE	SUCRIERE LEBAUDY-SOMMIER		
FRANCE	DUETAG-LONGUEIL	Dryer Ø 2,20 x 14,00 m	Fertilizers	FRANCE	TECHMINEMENT LIZY LE NICKEL		
FRANCE	DUROX	Dryer Ø 1,50 x 8,00 m	Sand	FRANCE	TIMAC		
FRANCE	EATON MANIL	Mould stripper Ø 1,60 x 7,00 m	Sand and foundry pieces	FRANCE	UNION PAYSANNE		
FRANCE	ENOF	Dryer Ø 2,00 x 10,00 m	Clay	FRANCE	UNIPECTINE		
FRANCE	ENSA	Coater Ø 1,40 x 6,00 m	Fertilizers	FRANCE	VERRES DE SECURITE DURAND		
FRANCE	ETS. CHRISTIAN LECOESTER COUAIX	Granulator Ø 2,75 x 7,00 m Main dryer Ø 3,18 x 18,00 m Final dryer Ø 2,23 x 15,00 m Cooler Ø 2,23 x 14,00 m Coater Ø 1,60 x 3,00 m	NPK-DAP	FRANCE	VERTO-FERODO-AMIENS		
FRANCE	ETS. GARDINER	Coater Ø 1,00 x 3,60 m	Fertilizers	GERMANY	C.I.E. para ROSTOCK		
FRANCE	ETS. GARDINER	Coater Ø 1,80 x 4,00 m	Fertilizers	GERMANY	W. HUNDHAUSEN		
FRANCE	ETS. GAUTHIER	Dehydrator Ø 2,00 x 7,00 m	Bovine manure with straw	GERMANY	PEC/KAVALA		
FRANCE	ETS. GAUTHIER	Dehydrator three stages Ø 2,20 x 6,00 m	Compost	HOLLAND	CREUSOT LOIRE para HOLLAND		
FRANCE	F.C.B.	Pre-Dryer Ø 2,00 x 10,00 m	Sugar	INDONESIA	REKAYASA-PTK GRESIK II		
FRANCE	F.C.B.	Dryer Ø 1,80 x 12,00 m	Cane sugar	INDONESIA	SPIE BATIONOLLES - PTK GRESIK I		
FRANCE	FIVES LILLE CAIL	Dryer Ø 1,80 x 12,00 m	Refined sugar	IRELAND	CEGA IRISH		
FRANCE	FIVES LILLE CAIL	Dryer Ø 2,40 x 12,00 m	Sugar	ISRAEL	FIVES LILLE CAIL for AZUCARERA DE KIRIAT-GAT		
FRANCE	FULCHIRON	Dryer Ø 2,2/2,7 x 9,00 m	Glass sand	ITALY	FOVETRO		
FRANCE	GENERALE DES ENGRAIS	Coater Ø 1,80 x 5,00 m	Fertilizers	JAPON	TOYO		
FRANCE	GENERALE DES ENGRAIS	Dryer Ø 2,50 x 16,60 m	Fertilizers	KOREA	CHOBİ		
FRANCE	IDEAL STANDARD	Mould stripper Ø 1,10 x 4,50 m	Foundry pieces	KOREA	DONGBU		
FRANCE	IN.R.A. DOMAINE DE BRESSONVILLIERS	Dehydrator Ø 2,20 x 3,00 m	Pasture	MARRUECOS	O.C.P. MAROC PHOSPHORE		
FRANCE	KREBS-SONATRACH	Dryer Ø 2,60 x 15,00 m + 0,5	Sodium Orthophosphate	MEXICO	BABCOCK WILCOX for AZUCARERA TUXTEPEC		
FRANCE	LANGUEDOCIENNE DE SOUFRE	Dryer Ø 0,90 x 8,00 m	Iron mineral	MEXICO	AZUCARERA IBERICA		
FRANCE	MAHAGUNA	Dryer Ø 2,20 x 15,00 m	Red sugar	MEXICO	KREBS for FERTIMEX		
FRANCE	M.D.P.A.	Dryer Ø 3,00 x 13,00 m	Chemical products (potassium)	MEXICO	FERTIMEX		
FRANCE	M.D.P.A.	Conditioning Ø 2,20 x 4,00 m	Potassium chloride				
FRANCE	ORSAN	Dryer Ø 1,80 x 11,00 m	Sodium monoglutamate				
FRANCE	PEC for HCPF	Granulator Ø 3,00 x 6,00 m Dryer Ø 3,30 x 27,00 m Coater Ø 1,80 x 5,00 m	Fertilizers				
FRANCE	PECHINEY-RIBEUCURT	Dryer Ø 1,00 x 5,00	Polystyrene				

EQUIPMENT	PRODUCT
Cooler Ø 2,60 x 15,0 m	Pyrolysis-Oxide Cooler Ø 1,50x 9,00 m
Activator Ø 0,60 x 6,00 m	Moleculaires mesh
Dryer Ø 1,50 x 9,00 m	Clay
Dryer Ø 2,40 x 13,00 m	Gypsum
Mould stripper Ø 3,50 x 17,00 m	Sand and foundry pieces
Dehydrator Ø 3,50 x 15,00 m	Beetroot pulpes
Dryer Ø 1,80 x 11,00 m	Crushed marble
Dryer/Cooler Ø 2,80 x 15,00 m	Sugar
Mould stripper Ø 1,80 x 8,00 m	Sand and foundry pieces
Granulator Ø 1,60 x 4,00 m	Fertilizers
Calciner Ø 0,82 x 6,00 m	Granulated catalitics
Dryer Ø 1,5/1,8 x 8,00 m	Sand
Dryer Ø 1,80 x 9,00 m	Sand
Cooler Ø 1,80 x 7,00 m	
2 Coolers Ø 2,80 x 2,20 m	Coke and pitch
Dryer Ø 0,50 x 4,00 m	Chemical
Dryer Ø 1,00 x 7,00 m	Pea gravel
Dryer Ø 0,80 x 3,00 m	Dust mineral
Granulator Ø 3,20 x 6,00 m	Fertilizers
Calciner Ø 1,50 x 7,00 m	Cobalt oxide
Dryer Ø 1,2/2,00 x 5,50 m	Spar fluor
2 Dryers Ø 3,60 x 20,00 m	Phosphate
Dryer Ø 0,90 x 6,00 m	Iron mineral
Dryer Ø 0,90 x 8,00 m	Iron mineral
Dryer Ø 2,23 x 8,00 m	Marble
Dryer Ø 1,40 x 10,00 m	Glass sugar
Dryer Ø 1,20 x 8,00 m	Glass sugar
Dryer Ø 1,20 x 8,00 m	Glass sugar
Dryer Ø 2,00 x 12,00 m	Glass sugar
Dryer Ø 0,63 x 3,00 m	Granulated Iron-nickel
Mixer Ø 2,00 x 4,00 m	Phosphate bicalcique
Granulator	Fertilizers
Debarkers Ø 3,00 x 5,50 m	
Dryer Ø 2,00 x 7,00 m	Caspia
Dryer Ø 1,20 x 6,00 m	Glass sand
Dryer Ø 1,40 x 7,00 m	Sand of foundry
Dryer Ø 1,80 x 8,00 m	
Dryer Ø 1,60 x 5,00 m	NA
Cooler Ø 1,90 x 4,00 m	
Dryer Ø 2,40 x 10,00 m	
Cooler Ø 2,70 x 10,00 m	
Cooler Ø 1,90/2,2 x 6,40 m	
Cooler Ø 4,60 x 22,50 m	Chemical product
Mould stripper	foundry
2 Coaters Ø 1,80 x 5,00 m	NPK
Dryer Ø 1,70 x 6,00 m	Manures
Dryer Ø 3,20 x 30,00 m	NPK
Granulator Ø 3,20 x 8,00 m	
Coater Ø 2,20 x 8,00 m	
Dryer Ø 4,30 x 33,50 m	Fertilizers
Granulator Ø 3,70 x 7,70 m	
Cooler Ø 3,20 x 15,00 m	
Cooler Ø 2,75 x 6,00 m	
Calciner Ø 2,40 x 24,80 m	Turf
Dryer Ø 1,70 x 6,00 m	White sugar
Dryer Ø 1,50 x 10,00 m	Glass sand
Dryer Ø 3,00 x 21,00 m	DAP
Granulator Ø 2,50 x 6,10 m	DAP-NPK
Dryer Ø 2,60 x 20,00 m	NPK
4 Dryers Ø 4,00 x 30,00 m	NPK-DAP
4 Granulators Ø 3,75 x 8,00 m	
4 Coaters Ø 2,50 x 7,00 m	
Dryer Ø 1,80 x 10,00 m	Refined sugar
Dryer Ø 1,40 x 8,00 m	
Dryer Ø 2,40 x 24,00 m	Fertilizers
Pre-Dryer Ø 2,70 x 20,00 m	Fertilizers
Granulator Ø 1,70 x 6,00 m	

COUNTRY	CUSTOMER	EQUIPMENT	PRODUCT
NEW CALEDONIA	LE NICKEL for CONIAMBO	Granulator Ø 1,50 x 10,00 m	Granulated Iron-nickel
PHILIPPINES	DRAGADOS for PHILPHOS	Dryer Ø 1,80 x 14,00 m	Ammonic sulphate
		Cooler Ø 1,80 x 14,00 m	
PHILIPPINES	PHILPHOS	Dryer Ø 4,50 x 27,00 m	DAP-NPK
POLAND	C.L.E.	Granulator Ø 1,50 x 5,00 m	Fertilizers
RUMANIA	FIVES LILLE CAIL (2 Instalations) for AZUCARERA LUDUS GLU and BUDECEA GBA	2 Dryers Ø 1,70 x 6,00 m	White sugar
SAUDI ARABIA	TPL for SABIC	Dryer Ø 4,95 x 31,50 m	DAP-GTSP
		Granulator Ø 4,10 x 8,20 m	DAP-GTSP
		Dryer Ø 4,95 x 31,50 m	NP-NPK
		Granulator Ø 4,10 x 8,20 m	NP-NPK
		Coater Ø 2,60 x 9,00 m	NP-NPK
		Dryer Ø 3,50 x 7,00 m	TSP/DAP/NAP
		Granulator Ø 3,60 x 30,00 m	
		Granulator Ø 3,50 x 7,00 m	NPK
		Dryer Ø 3,50 x 28,00 m	
		Dryer Ø 3,20 x 22,00 m	Ammonic sulphate
		Calciner Ø 2,30 x 12,00 m	Flying ashes
		2 Coaters and coating system Ø 2,35 x 6,00 m	Fertilizers
		Dryer Ø 2,00 x 8,00 m	Sugar
		Dryer Ø 2,00 x 14,00 m	CU
		Dryer Ø 2,50 x 20,70 m	NAC
		Granulator Ø 2,50 x 5,00 m	
		Coater Ø 1,30 x 4,50 m	
		Dryer Ø 3,50 x 22,00 m	NA-NAC
		Dryer Ø 4,50 x 26,50 m	NA-NAC
		Coater Ø 2,60 x 6,50 m	
		2 Dryers Ø 2,30 x 20,00 m	PVC
		Dryer Ø 3,00 x 24,00 m	DAP-NPK
		Indirect dryer Ø 3,00 x 18,00 m	Chemical product
		Dryer Ø 1,20 x 8,00 m	Talc mineral
		Dryer Ø 2,20 x 16,00 m	Ammonic sulphate
		Dryer Ø 2,86 x 18,00 m	Potassium chloride
		Dryer Ø 3,20 x 28,00 m	NPK, Fertilizers
		Granulator Ø 3,20 x 8,00 m	
		Dryer Ø 3,20 x 30,00 m	NPK
		Granulator Ø 3,20 x 8,00 m	
		Coater Ø 3,20 x 8,00 m	
		Dryer Ø 2,80 x 20,00 m	NPK
		Granulator Ø 2,50 x 6,00 m	DAP-NPK
		Granulator Ø 2,50 x 6,10 m	DAP-NPK
		Humydifier type III Ø 1,40 x 4,00 m	Ash pyrite
		Humydifier type V Ø 2,50 x 5,00 m	
		Dryer Ø 2,80 x 24,00 m	NPK
		Calciner Ø 1,60 x 4,00 m	Oxide
		Trommels Ø 2,50 x 17,30 m	R.S.U.
		Dryer Ø 2,00 x 15,00 m	Sulphate ammonic
		Dryer Ø 3,50 x 24,00 m	NAC
		2 Dryers Ø 3,60 x 25,00 m	R.S.U.
		Trommel Ø 2,30 x 15,00 m	R.S.U.
		2 Dryers Ø 3,60 x 20,00 m	Phosphate
		Granulator Ø 2,00 x 5,00 m	NPK-DAP
		Dryer Ø 2,50 x 16,00 m	
		Coater Ø 1,40 x 4,00 m	
		Dryer Ø 2,60 x 20,00 m	Fertilizers
		Granulator Ø 2,75 x 6,00 m	T.S.P.
		Dryer Ø 3,00 x 20,00 m	
		Granulator Ø 3,50 x 8,00 m	DAP-NP-NPK-NAC
		Dryer Ø 4,60 x 27,00 m	
		Ø 2,50 x 9,00 m	
		Coater Ø 1,8 x 7,00 m	NPK
		Granulator Ø 1,30 x 7,00 m	NPK
		Coater Ø 2,40 x 8,00 m	Fertilizers
		Mould stripper Ø 2,40 x 8,21 m	Sand and foundry pieces
		Dryer Ø 0,90 x 3,50 m	Refined sugar
		Coater Ø 2,20 x 5,00 m	NPK-DAP
		Cooler Ø 1,60 x 7,00 m	Fertilizers
		Final cooler Ø 1,80 x 8,0 m	
		Coater Ø 1,00 x 3,50 m	
		Granulator Ø 3,00 x 6,00 m	NPK
		Dryer Ø 3,30 x 25,00 m + 0,6	
TUNISIA	GRANUPHOS		
TUNISIA	S.R.R.I. for ICM		
TUNISIA	TECLANT INGEST for GABES		
TURKEY	INTECSA		
TURKEY	INTECSA		
TURKEY	CREUSOT-LOIRE		
USA	CHRYSLER		
VENEZUELA	FIVES LILLE CAIL para AZUCARERA DE URENA		
VENEZUELA	PEQUIVEN-INCRO VENEZUELA		
ZAMBIA	KESTNER-INDECO KAFUE		
ZAMBIA	SPIE BATIGNOLLES-INDECO		

COMSPAIN



AFFILIATES, REPRESENTATIVES AND ASSOCIATED COMPANIES



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