



# **ILBF CHINA 2004**

10TH - 12TH JUNE, 2004  
BEIJING INTERNATIONAL CONVENTION CENTRE  
CHINA

PRESENTATION BY:

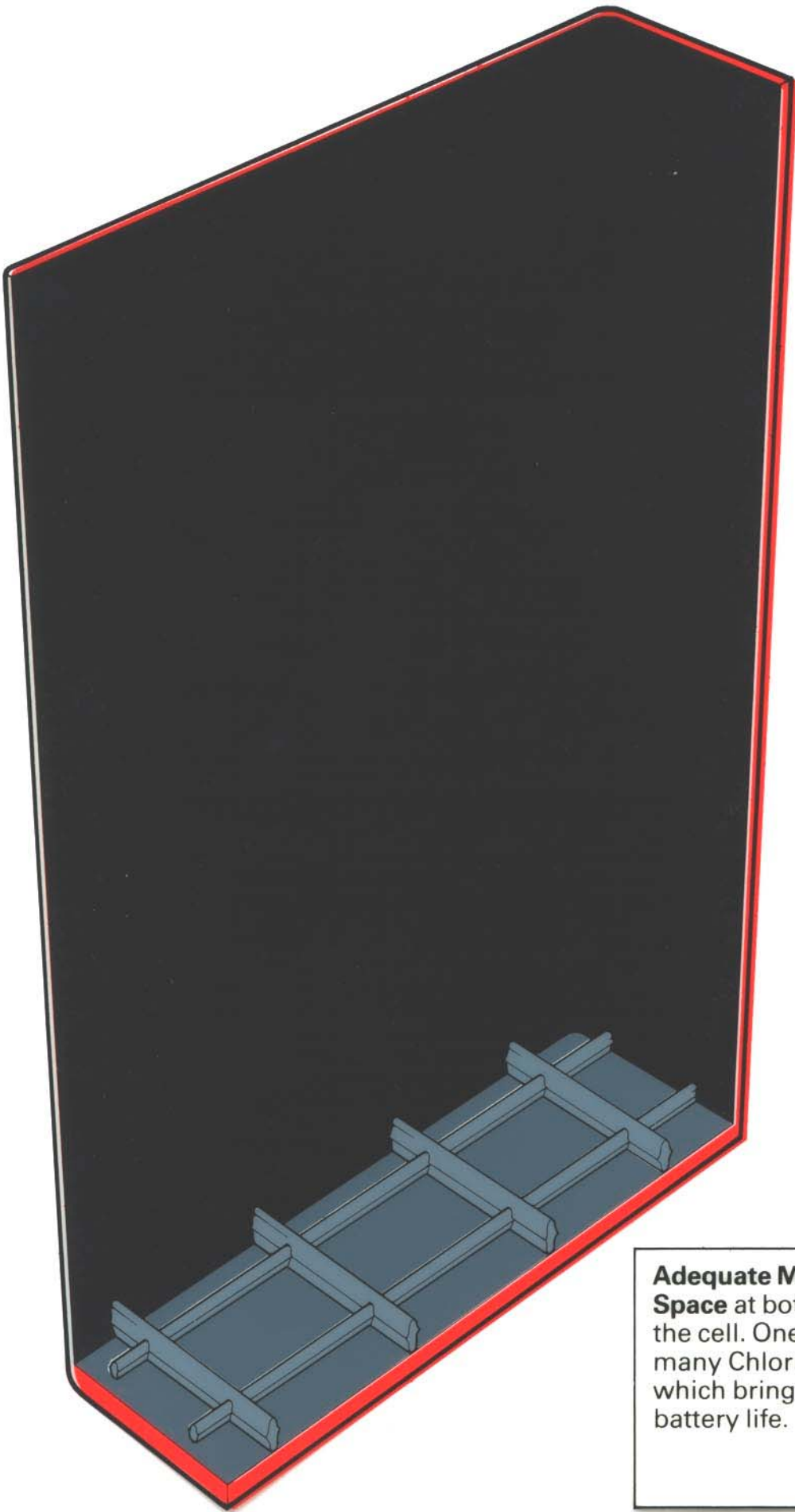
IAN A. PINSON  
MANAGING DIRECTOR  
CHLORIDE TECHNICAL AND TRADING LTD  
MANCHESTER, ENGLAND

“NEW MANUFACTURING TECHNOLOGY  
FOR TUBULAR LEAD ACID BATTERIES”

## **TYPICAL DESIGN FEATURES OF TUBULAR LEAD-ACID CELLS**

- Positive and negative active material utilisations between 11.0 - 13.0 grams per ampere hour
- Dry packed density 3.6 - 4.4 gm/cm<sup>3</sup>
- Gravimetric Energy Densities between 28-44 Watt hours per kilogram
- Ampere hour capacities between 50 and 1500 A/hrs.
- Capacities rated at 5 hours
- Average lives around 1,500 cycles
- The use of polyester as gauntlet material and microporous polyethylene/PVC as separation
- Average number of plates per cell 11/13
- Plates pitches of 18.0 mm (DIN) and 16.2 mm (BS)
- Tube internal diameters from 7.0 - 9.0 mm dependant on design criteria

# **CELL CONSTRUCTION DETAILS**



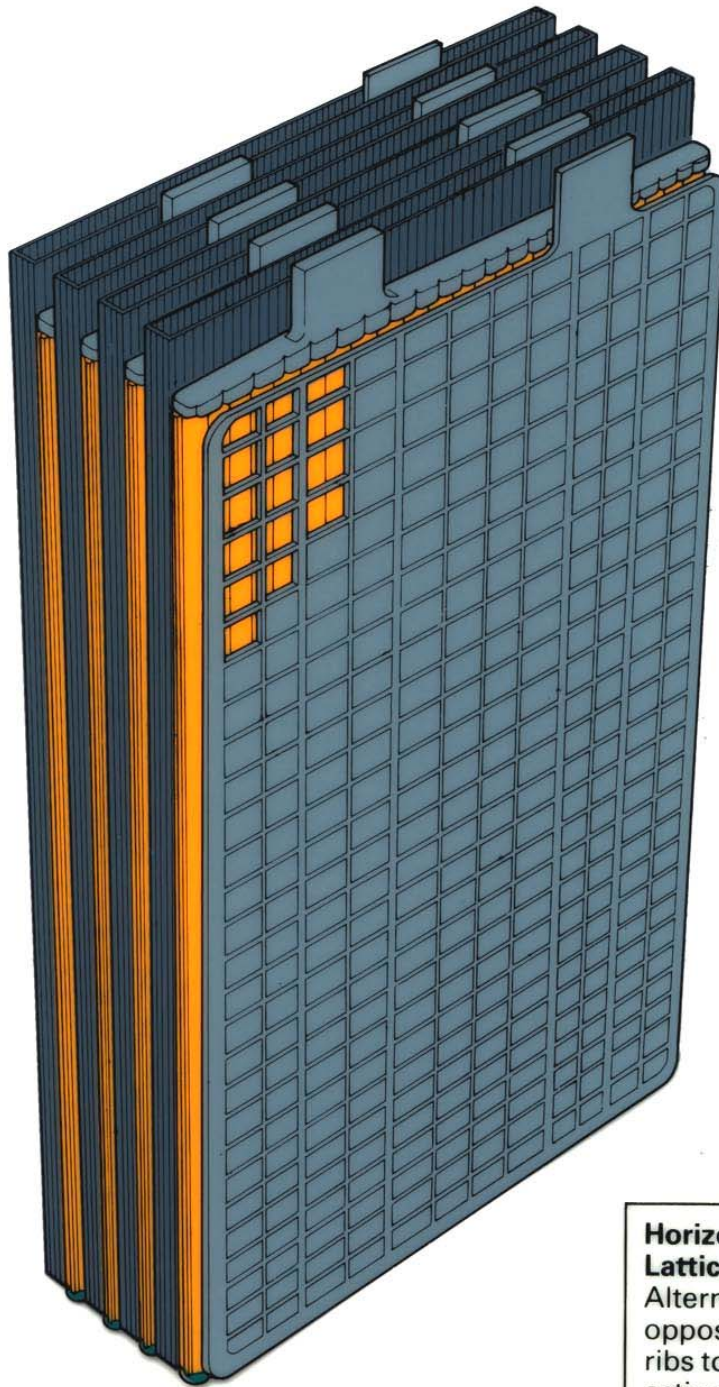
**Adequate Mud Space** at bottom of the cell. One of the many Chloride features which bring longer battery life.

**Tubular Positive Plate**  
has maximum surface  
area for higher voltage  
and more power for  
longer periods.



**Tube Closure**  
effected by  
corrosion-free  
insulating plastic for  
maximum retention of  
active material.

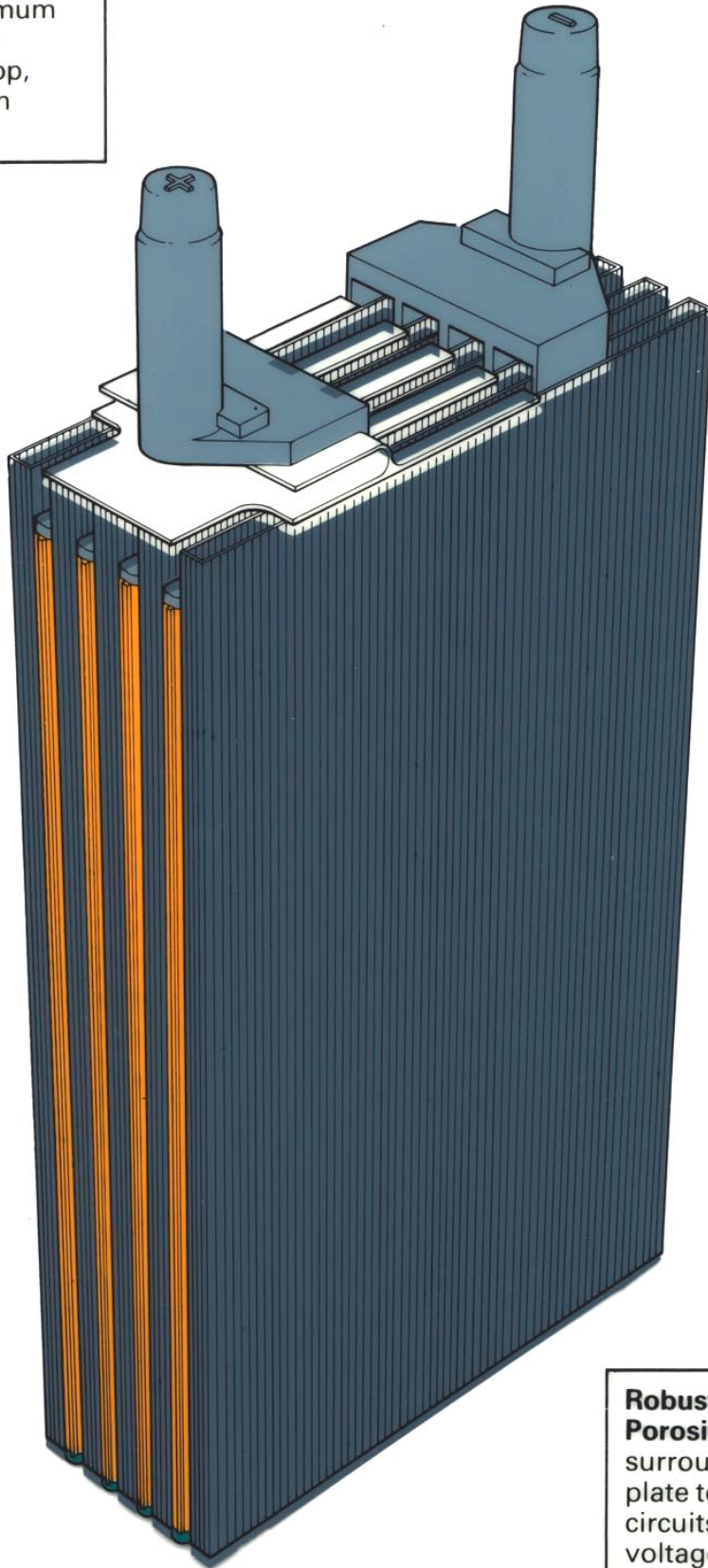
**Pasted Negative Plate**  
is of specially tough  
construction, designed  
to match the positive.



**Horizontal  
Lattice  
Ribs.**  
Alternatively cast onto  
opposite edges of vertical  
ribs to provide continuity of  
active material throughout  
length of plate to give high  
conductivity.



**Special Insulating Shield**  
prevents short circuits  
across tops of plates and  
loss of power.  
**Pillars welded to plate  
lugs** to give maximum  
conductivity, with  
minimum volt-drop,  
ensuring optimum  
power.



**Robust, High  
Porosity Separator,**  
surrounds the negative  
plate to prevent short  
circuits and provide higher  
voltage at the cell terminals.

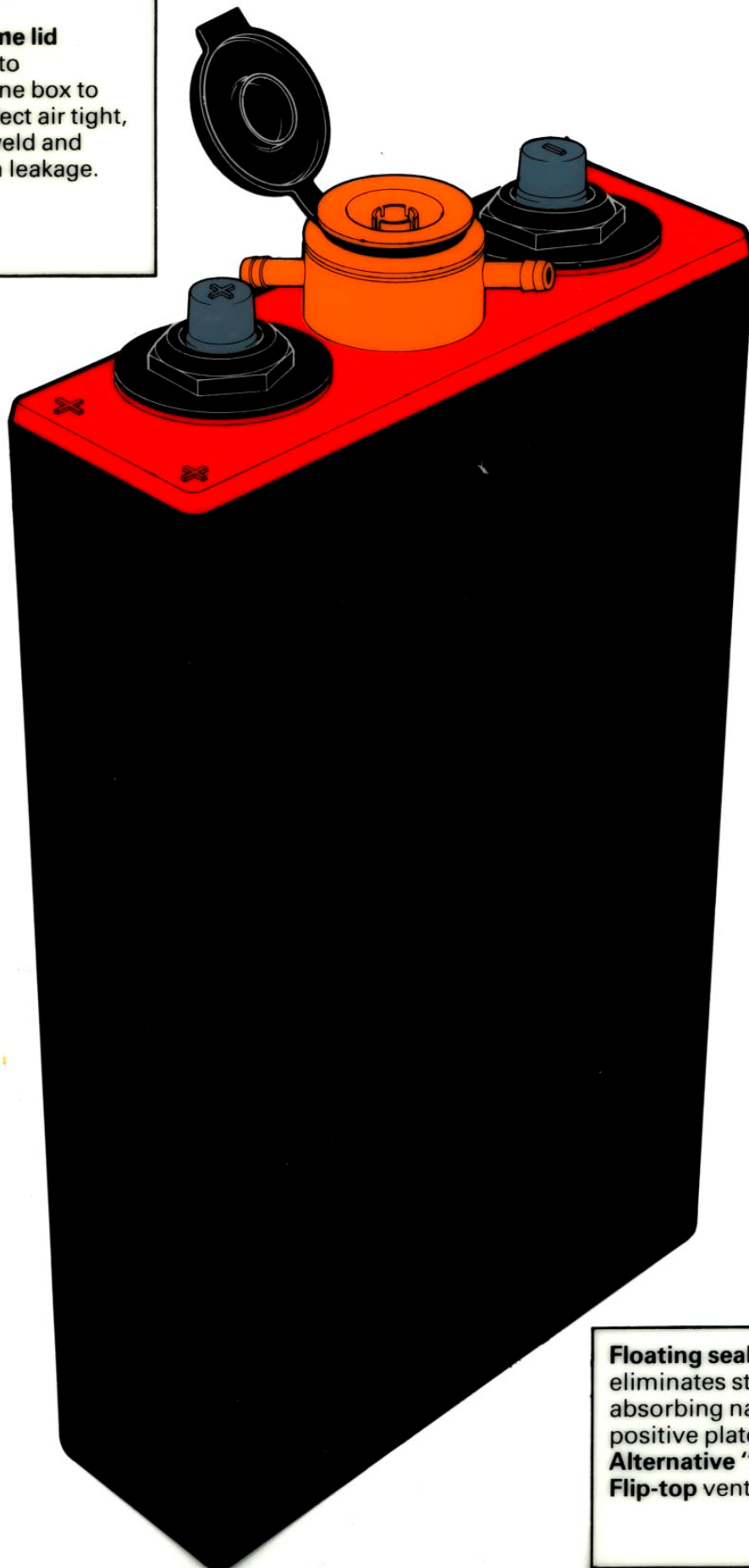
Maximum Electrolyte space above plate tops—minimises topping up and allows water to be added before charging commences.



**Polypropylene cell box.** Impact and abrasion resistant, to withstand the abuses of rugged operation.



**Easy-clean  
Polypropylene lid**  
heat-sealed to  
Polypropylene box to  
achieve perfect air tight,  
leak-proof weld and  
reduce earth leakage.



**Floating seal**  
eliminates stress by  
absorbing natural  
positive plate growth.  
**Alternative "Autofil" or  
Flip-top vent plugs.**

# Positive Plate Components



## **RED LEAD - THE BENEFITS**

- REDUCED FORMATION TIME
- IMPROVED INITIAL CAPACITY
- IMPROVED HIGH RATE PERFORMANCE



# Red Lead Manufacture



## **Red Lead Furnaces**

- ✓ ***20% to 98% Red Lead***
- ✓ ***Precision temperature control***
- ✓ ***Electrically heated***
- ✓ ***Continuous batching***



***Two sizes: 6 and 12 ton per day***

## Spezifikation

# Bleimennige Akkumulator-Typ

### Beschreibung

Bleimennige Akkumulator-Typ ist ein durch Oxidation von Blei (nach DIN 1719) hergestelltes orangefarbenes Blei(II/IV)oxid-Pulver mit der theoretischen Formel  $Pb_3O_4$ .

Bleimennige Akkumulator-Typ ist besonders geeignet für die Herstellung von hochwertigen positiven Elektrodenmassen.

## Specification

# Red Lead Accumulator Type

### Description

Red lead accumulator type is a lead(II/IV)oxide powder produced by the oxidation of lead (according to DIN 1719) having the theoretical formula  $Pb_3O_4$ .

Red lead accumulator type is particularly suited for the production of high grade positive electrode compounds.

**Blei  
Mennige**  
**Red  
Lead**

## Technische Daten

<b>PbO<sub>2</sub></b>	<b>min</b>	<b>25</b>	<b>%</b>	DIN 55916-7
<b>Pb<sub>3</sub>O<sub>4</sub></b>	<b>min</b>	<b>72</b>	<b>%</b>	DIN 55916-9
<b>Bleioxide<sub>gesamt</sub></b>	<b>min</b>	<b>99,7</b>	<b>%</b>	DIN 55916-9
Feuchtigkeit (105°C)	max	0,1	%	DIN EN ISO 787-2
Dichte	typ	9	g/cm <sup>3</sup>	DIN EN ISO 787-10A
Schüttdichte		1,5 - 1,9	g/cm <sup>3</sup>	DIN EN ISO 787-11
Stampfdichte		3,1 - 3,6	g/cm <sup>3</sup>	DIN EN ISO 787-11
Siebrückstand 63 µm	max	0,1	%	DIN 53195
<b>Spurengehalte</b>				
Ag	max	10	mg/kg	AAS
Bi	max	100/500	mg/kg	AAS · PV 103
Cu	max	10	mg/kg	AAS · PV 102
Fe	max	20	mg/kg	AAS · PV 101
Sb	max	20	mg/kg	AAS
Sn	max	10	mg/kg	AAS

## Technical Data

<b>PbO<sub>2</sub></b>	
<b>Pb<sub>3</sub>O<sub>4</sub></b>	
<b>Lead oxide<sub>total</sub></b>	
Moisture (105°C)	
Density	
Apparent density	
Tamped density	
Sieve residue 63 µm	
<b>Trace contents</b>	
Ag	
Bi	
Cu	
Fe	
Sb	
Sn	

## Verpackungen

Papiersack	25 kg	Paper bag
Hobbock	50 kg	Hobbock
Stahlblechtrommel	200 kg	Iron drum
Big Bag	1.000 kg	Big Bag
Container (bis)	2.000 kg	Container (up to)
Silo-LKW (bis)	24.000 kg	Silo-Truck (up to)

## Type of Packing

Alle technischen Daten und Informationen sollen Sie beraten und Hinweise für die Praxis geben. Die Angaben erfolgen nach bestem Wissen, jedoch ohne Gewähr.

All technical data and information are for guidance and assistance in your application. The particulars are made to the best of our knowledge but without liability.

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# Red Lead Specification



## 80% RED LEAD: Ultra High Purity Battery Grade

### APPLICATION

This material is produced for use in the positive plates of tubular traction batteries and as an additive to the plates of other lead-acid batteries to improve formation charging and initial capacity.

### CHEMICAL COMPOSITION

Pb <sub>3</sub> O <sub>2</sub> (red lead)	77% - 83 %
PbO (litharge)	17% - 23 %

### PHYSICAL PROPERTIES

Color	Red
Form	Powder
Specific Gravity	9.10 - 9.20
Apparent Density	16 - 19 g/cu.in.
Acid Absorption	200 - 230 mg./g.
Median Particle Size	2.0 µm
Screen Analysis (U.S. Standard Sieve)	99.9% < 325 mesh

### TRACE ELEMENTS

ELEMENT	MAXIMUM (%)	TYPICAL (%)
Fe	0.0020	0.0007
Zn	0.0008	0.0003
Cu	0.0007	0.0003
Ag	0.0015	0.0012
Bi	0.0270	0.0022
As, Sb, Sn	0.0014	<0.0008
Ni, Te, Th, Cd	0.0008	<0.0005
Co, Cr, Mn, Se	0.0002	<0.0001

### PACKAGING

25 lb. and 50 lb. paper bags,  
28 gallon steel drums (625 lbs.)

### NOTE:

This bulletin illustrates typical values for this product. If specific characteristics are required that are different from these values, please contact your area sales representative.

85041 JAL 04/02



SPECIALTY LEAD CHEMICALS

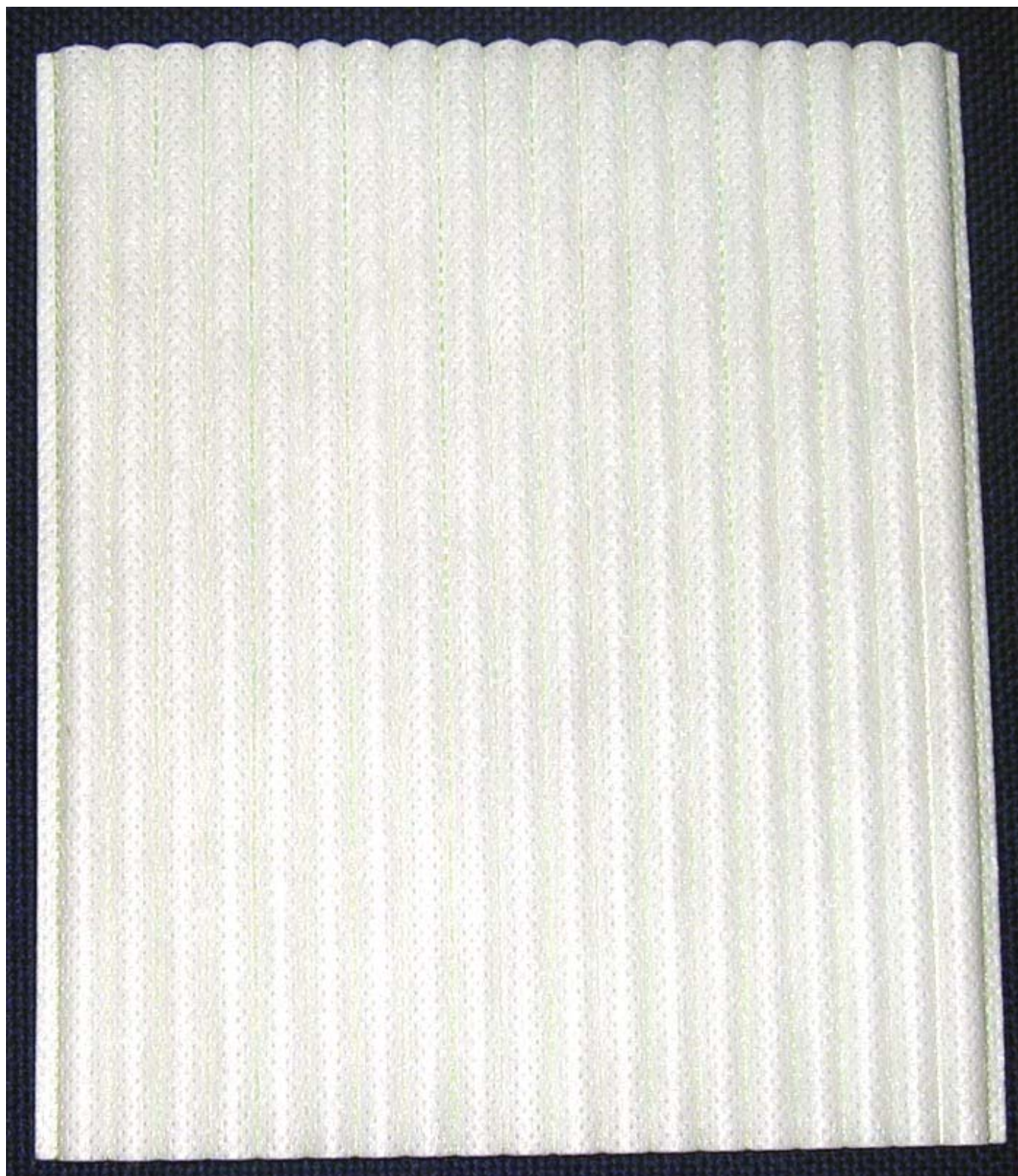
*A Division of Hammond Group, Inc.*

P.O. Box 6408 5231 Hohman Avenue Hammond, Indiana 46325 - 6408

Phone: 219-931-9360 FAX: 219-931-2140



## 19 Tube Non Woven Gauntlet



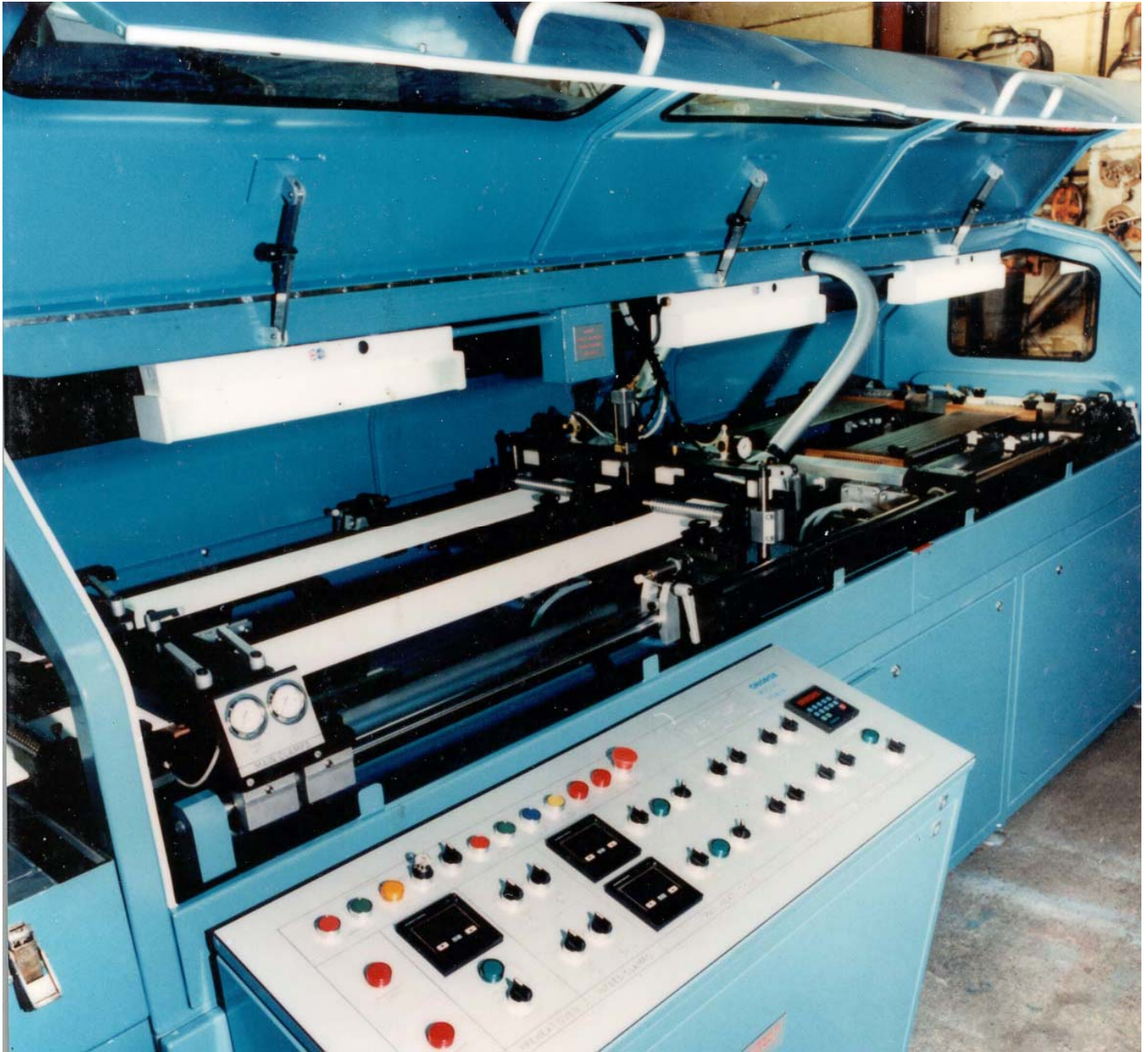


# 15 Tube Woven Gauntlet





# Chloride Continuous Gauntlet Manufacturing Process



# Amer-Sil S.A.

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## General specifications for AMER-SIL gauntlets – PT-CQ-S02 rev. 08

### 1. Dimensions:

1.	CHARACTERISTICS		UNIT	TOLERANCES			METHOD
	Number of tubes:	Tube pitch		Without edge protection	« C » Protection	Reinforced fabric	
	Total width (edges included):		mm				PT-CQ-G06
	6	10.3		62 - 65	62 - 65	62 - 65	
	14	8.9		127 - 132	125 - 130	125 - 132	
		9.6		137 - 142	135 - 140	135 - 142	
		9.7		138 - 143	136 - 140	136 - 142	
		10.1		144 - 149	142 - 147	142 - 149	
	15	8.9		136 - 141	134 - 139	134 - 141	
		9.6		146 - 152	145 - 149	145 - 152	
		9.7		148 - 153	146 - 149	146 - 152	
		10.1		154 - 159	152 - 157	152 - 159	
	16	8.9		145 - 150	143 - 148	143 - 150	
		9.6		156 - 161	154 - 159	154 - 161	
	18	8.9		162 - 170	160 - 166	160 - 168	
		9.6		175 - 183	173 - 180	173 - 181	
		9.7		177 - 184	175 - 180	175 - 181	
		10.1		184 - 192	182 - 188	182 - 190	
	19	8.9		171 - 179	169 - 175	169 - 177	
		9.6		185 - 192	183 - 189	183 - 190	
		9.7		186 - 194	184 - 189	184 - 190	
		10.1		194 - 202	192 - 198	192 - 200	
2.	Outer trim (measured from the sewing):						PT-CQ-G06
	Number of tubes:	≤ 17 ≥ 18	mm	2 - 3 2 - 4	1-2 1-2	1-3 1-3	
3.	Length:		mm	± 1,0			PT-CQ-G06
4.	Internal tube diameter:		mm	± 0,1			PT-CQ-G06
5.	Number of stitches per 10 cm length:		-	33 ± 2			PT-CQ-G06
6.	Orthogonality: ≤ 350 mm 351 - 750 mm		mm	± 0,5 ± 1,0			PT-CQ-G06
7.	Tube pitch: ∅ 7,2 mm: ∅ 8,0 - 8,7 mm: ∅ 8,4 - 8,9 mm: ∅ 8,9 - 9,0 mm: rect. 7,4 x 8,0 mm rect. 6,1 x 8,0 mm		mm	8,9 ± 0,10 9,6 ± 0,10 (9,7 ± 0,10)* 10,1 ± 0,10 9,7 ± 0,10 10,3 ± 0,10			PT-CQ-G06
8.	Lower sewing thread:			Outer thread: Tkt 50 – blue Inner thread: Tkt 100 – blue			PT-PR-14
9.	Upper sewing thread:			All: Tkt 50 - white (natural)			PT-PR-14

\* = can be used on request



## Amer-Sil S.A.

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### 2. Physical characteristics:

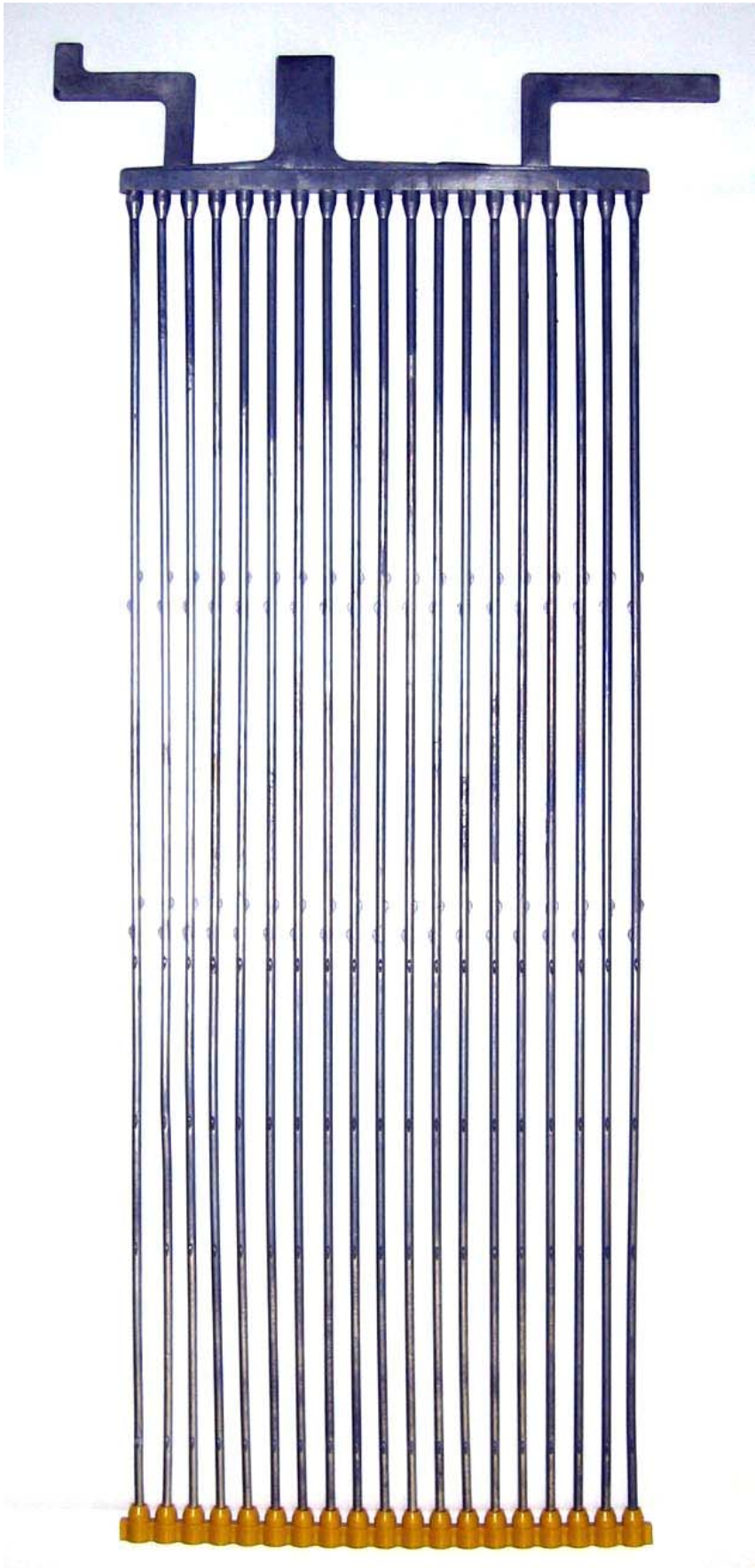
	CHARACTERISTICS	UNIT	TOLERANCES	METHOD
1.	Electrical resistance: - normal fabric: - reinforced fabric:	m $\Omega$ x cm <sup>2</sup>	max. 280 max. 450	PT-CQ-F07
2.	Oxidation weight loss :	%	max. 10	PT-CQ-F04
3.	Tube burst pressure :	bar	min. 12	PT-CQ-G09
4.	Rigidity (Compression test)	N	>310	PT-CQ-G08

### 3. Chemical composition:

	CHARACTERISTICS	UNIT	TOLERANCES	METHOD
1.	Type of non woven fabric		100 % polyester	PT-PR-14
2.	Type of sewing thread		100 % polyester natural and blue color	PT-PR-14
3.	Type of resin		Acrylic	-
4.	Resin content** normal fabric: reinforced fabric:	%	20 $\pm$ 2 > 25	PT-CQ-F09
5.	Fe content	ppm	Max. 30	PT-CQ-P06
6.	Mn content	ppm	Max. 3	PT-CQ-P06
7.	Cu content	ppm	Max. 3	PT-CQ-P06
8.	Ni content	ppm	Max. 3	PT-CQ-P06
9.	Free chloride content	ppm	Max.40	PT-CQ-P02

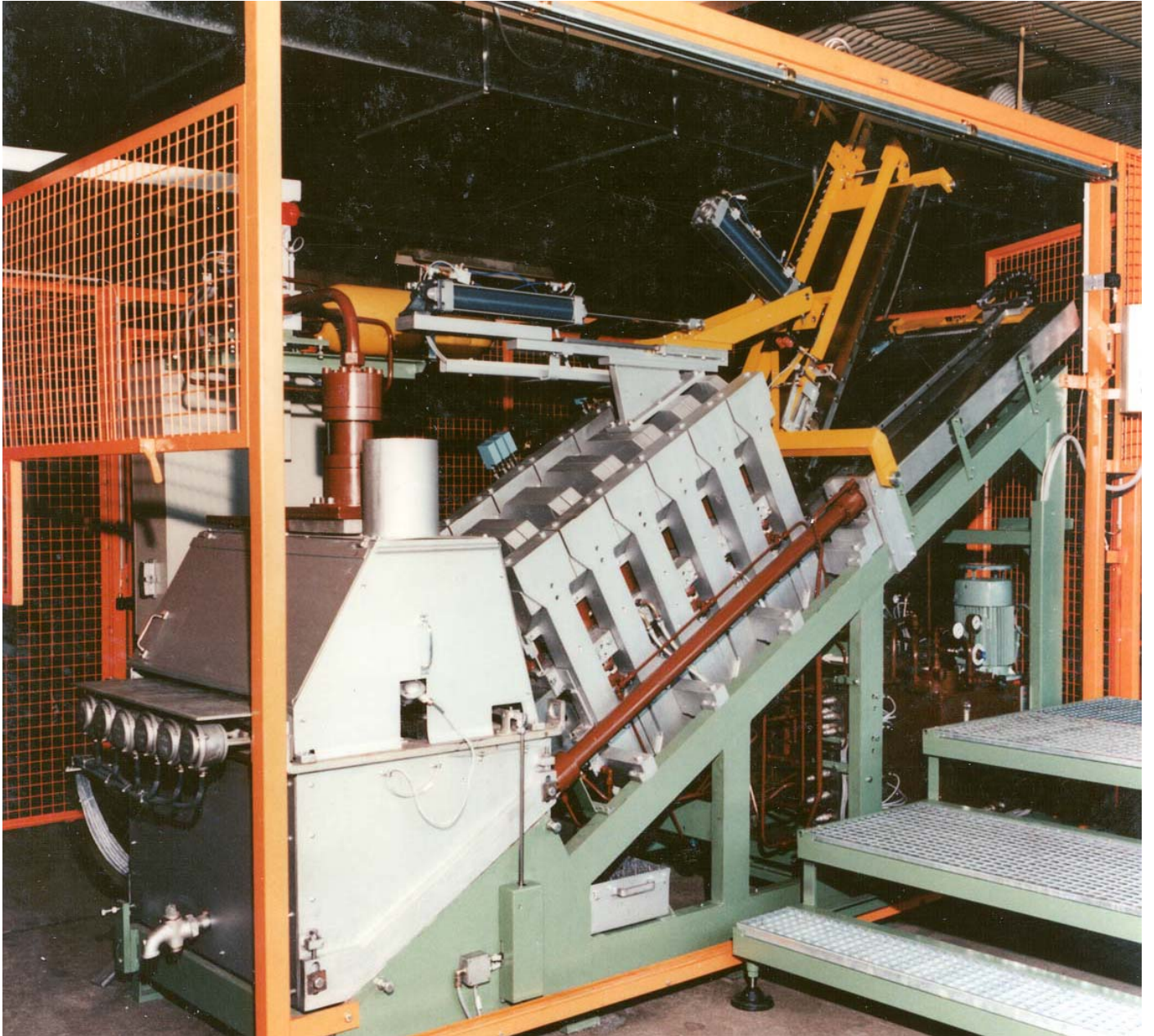
\*\* calculated on the basis of fabric without resin.

# 19 Spine Positive (DIN)





# HADI Spine Caster PA-V7



# **THE FILLING PROCESS**

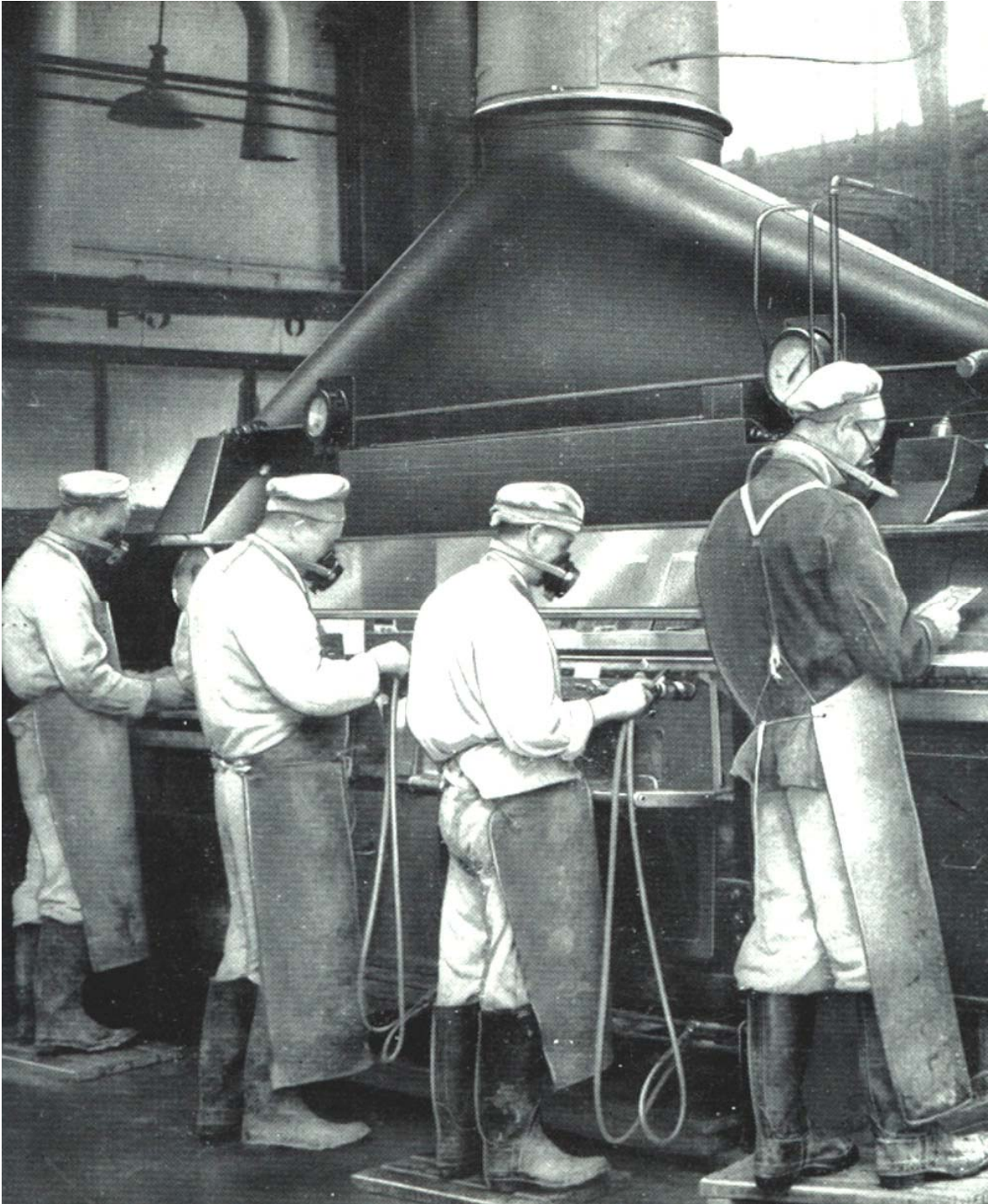


## The way we were



**Dry Filling Exide "Ironclad" Positives (circa 1950)**

## The way we were



**Dry Filling Exide "Ironclad" Positives (circa 1950)**

## **DRY FILLING - THE DISADVANTAGES**

- UNHYGIENIC
- NOISE
- LABOUR INTENSIVE

## **THE WAY AHEAD**



# HADI PRP-N1



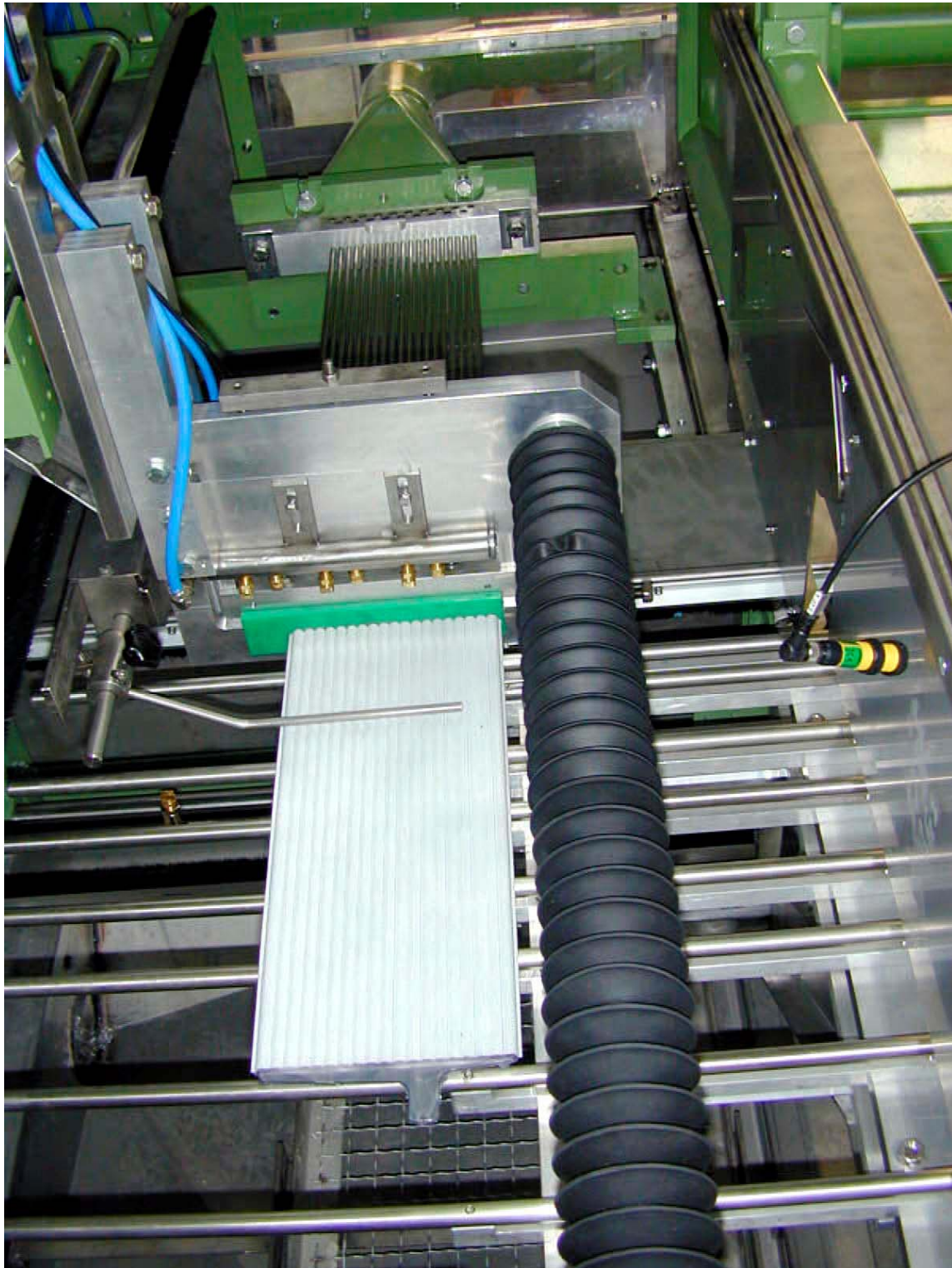
**Fully Automatic Spine Casting  
&  
Gauntlet Filling Machine**

# HADI PRP-N1



**Gauntlet Filling Machine**

# HADI PRP-N1 Gauntlet Filling



## **FULLY AUTOMATIC PASTE FILLING LINE FOR**

### **TUBULAR PLATES**

- FULLY AUTOMATIC HYDRAULIC DIE CASTING MACHINE WITH LEAD BAR FEEDER AND AUTOMATIC GRID REMOVAL
- GRID CROPPING AND SLEEVING MACHINE
- GRID STACK TRANSPORT
- AUTOMATIC PLATE FEEDING DEVICE
- PASTE FILLING MACHINE
- AUTOMATIC BOTTOM BAR FITTING DEVICE
- WASHING STATION
- WEIGHING STATION
- PLATE TRANSPORT DEVICE
- AUTOMATIC STACKING STATION (HORIZONTAL OR VERTICAL)

## **TYPICAL TUBULAR PRODUCTS**



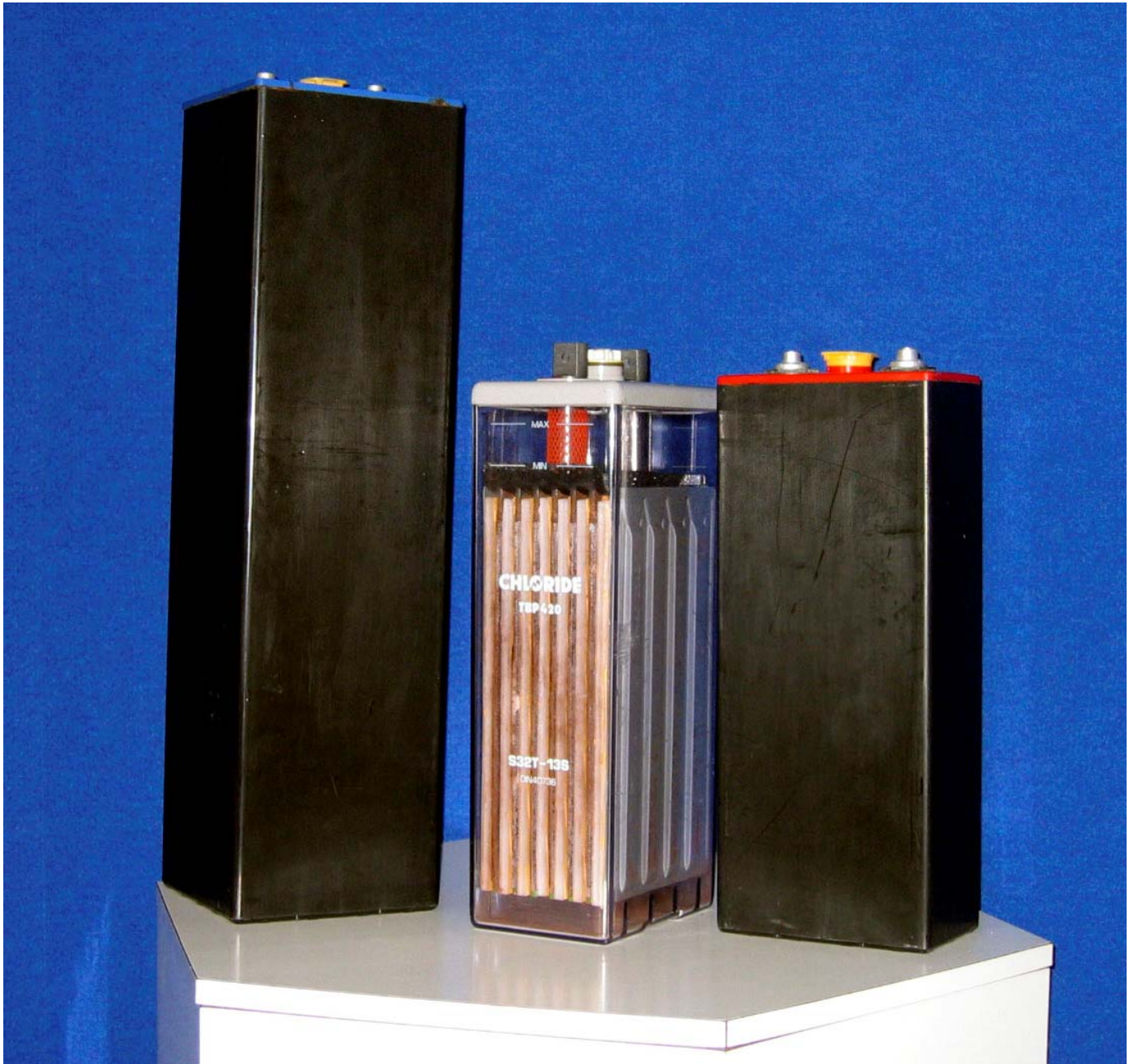


**DIN (19 Tube) Traction Cell**





**DIN (19 Tube), (BS 15 Tube)  
and Super DIN (19 Tube)  
Traction Cells**



**DIN (19 Tube) Traction Cells and OPzS (DIN) Standby Cell**





**AGM Recombinant Traction Cell**





**Miners Cap Lamp**



**Submarine**



**Submarine**