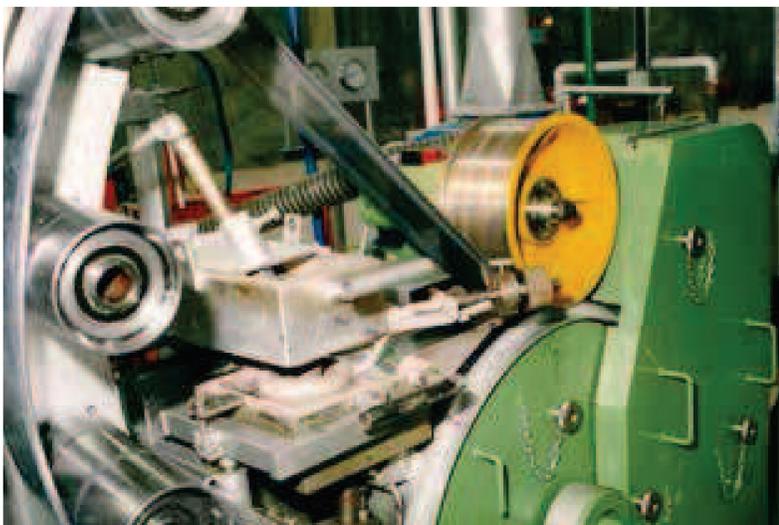


THE PROPERZI RANGE OF PRODUCTION FOR LEAD BATTERIES

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Casting Machine Tundish Set

Since we first began experimenting with lead in the 40s, when pure lead, as well as lead alloys, was transformed through continuous casting and rolling into wire and very narrow strip, we have accumulated a tremendous amount of experience. This helped us during the 80s when we introduced the first line producing Lead-Calcium strip, with a width of 70-90 mm, for the production of expanded grids for SLI batteries. After more than four decades, we have more than 40 lines in operation around the world and, thanks to continuous development, the Properzi CRS Casting and Rolling Lines for strip may be configured according to the specific customer's needs as follows:

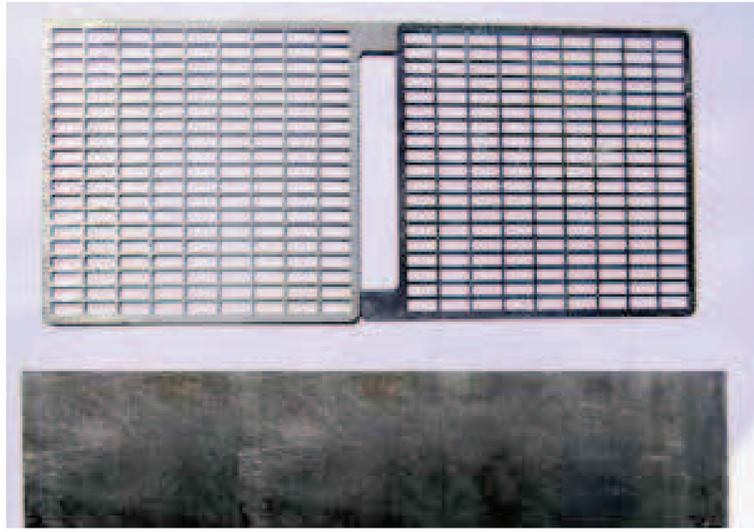
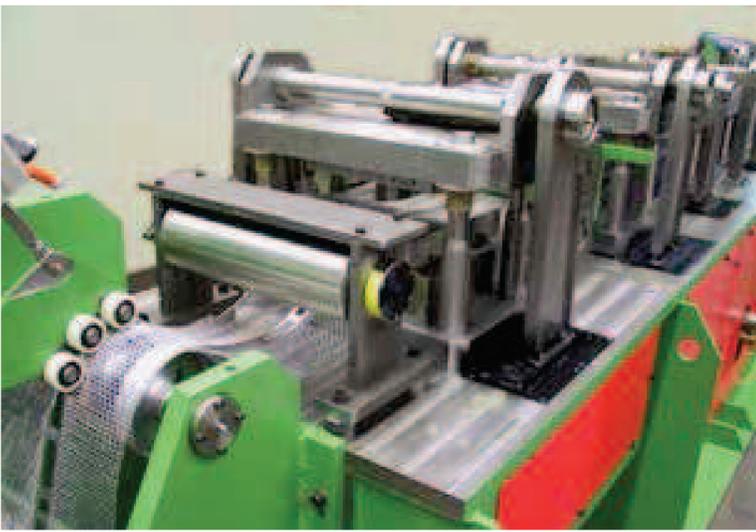
CRS Line nominal capacity (tph)	Corresponding battery output (batteries/year)
1 tph	~ 500'000
2 tph	~ 1'000'000
3 tph	~ 1'500'000
4 tph	~ 2'000'000
5.5 tph	~ 3'000'000
9 tph	~ 5'000'000
Higher capacities are available upon request	

- >> Nominal capacity range
- >> Various configurations of the furnace set to melt lead ingots (standard 48 kg and large ones weighing 1 ton) are available. The furnace set includes holding furnaces for the necessary stabilization of the temperature and alloy
- >> Wheel & Belt type Continuous Casting Machine to cast the molten lead continuously coming from the holding furnace. The cooling system is completely adjustable
- >> Conveyor/Sensor to synchronize the casting and rolling speeds
- >> Cast Bar Shear to cut the cast bar
- >> Rolling Mill to roll the strip to the desired thickness
- >> Drying Tunnel to eliminate any trace of emulsion from the strip
- >> Trimming Unit to cut the strip to the desired width
- >> Twin Reel Coiler to continuously collect the strip and provide the desired length per coil
- >> One single process for the production of positive and negative grids
- >> The lines are easily upgradable
- >> Environmental-friendly with no waste as all the circuits are closed-loop type
- >> Our customers have recorded OEE up to 85% in good working conditions

The tendency today is towards punched grids requiring a wider strip, approximately 350 mm wide. The wide strip is punched into grids with a full frame and can therefore withstand the high compression required in the elements of AGM (Absorbed Glass Mat) and semi-AGM batteries and it can also be used for the production of motorcycle batteries. The wide strip can be punched



View of the Rolling Mill



Wide Strip and Punched Grids

Properzi Expander

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according to any design, as defined by the customer, and since the strip is continuously cast and rolled it provides significant savings in weight.

We have further developed and optimized the casting and rolling of wide lead strip. These developments include:

- >> Various configurations of the furnace set to melt lead ingots as well as re-melt the large amount of scrap returning from the punching process are available. The furnace set includes holding furnaces for the necessary stabilization of the temperature and alloy.
- >> Our wheel-type in-line casting: this machine configuration has been specifically developed for large size cast bar, to avoid any deviation from the rolling mill axis thus avoiding any deflection of the cast bar itself.
- >> Fully adjustable casting machine cooling system
- >> Minimum thickness of the cast strip
- >> Rolling Mill on a single frame with independently-driven rolling stands: this solution allows the highest machine flexibility since the speed of each stand can be adjusted independently, according to the final thickness of the strip which is being rolled
- >> Trimming Unit able to cut the strip according to the desired final width allowing tight dimensional tolerances
- >> Double Strip Coiler able to collect the wide strip into coils in manual, semi-automatic or fully automatic manner
- >> Various output capacities starting from 5.5 tph
- >> One single process for the production of positive and negative grids
- >> The only upgradeable equipment

Metallurgical characteristics of the Properzi Lead strip include:

- >> Effective weight reduction
- >> Increase of specific performance
- >> Grid with elevated mechanical characteristics
- >> Strip width up to 360 mm (wider strips can be produced upon request)
- >> Grid thickness starting from 0.65 mm (thinner strips can be produced upon request)

Continuous-Properzi also provides CES Lead Strip Expanders with the following main features:

- >> Nominal continuous working speed up to 30 m/min
- >> Triple or quadruple step expander
- >> Standard step 36-48 mm
- >> 29-33 mm step mould
- >> Reduced overall dimensions: 4.5 m length x 1.3 m width x 1.5 m height
- >> Capable of expanding both negative and positive lead strip alloy
- >> Absence of teeth lubrication: emulsion is not necessary thereby providing remarkable advantages to the quality of the final product
- >> Absence of vibration: the machine is perfectly balanced and can be installed simply and easily with expansion bolts. Anti-vibration floor is not required.
- >> Minimized set-up time for different grid design
- >> 100% complementary to the Properzi CRS lead strip lines
- >> The best grid dimensional tolerances on the market (independent from the speed of the expander)

Due to our extensive experience and our continuous improvement approach, we have developed capabilities and knowledge to supply complete turnkey plants with the following services:

- >> Complete Battery Design
- >> Battery Technology Definition
- >> Process Parameters Definition
- >> Quality Controls Procedure
- >> Laboratory and Quality Control Test Procedure
- >> Raw Material Controls Specifications
- >> Production Organization
- >> Battery Know-How Transfer and Training

Properzi is available to supply such plants on EPC (Engineering, Procurement, Construction) basis so that the Buyer is only minimally involved with the installation of the plant.

By G.M.

Sketch of SLI Battery

