

**EXIDE
TUBULAR
INDUSTRIAL**

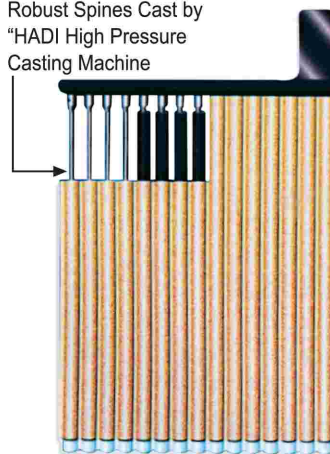


Are you getting



for your Standby Batteries ?

Robust Spines Cast by
"HADI High Pressure
Casting Machine



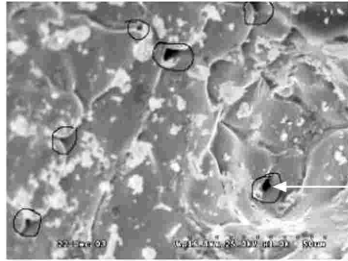
**Tough Conditions
Tougher Spines**

Are you getting **TORR TUBULAR** for your Standby Batteries ?

Tubular batteries have always been widely used for Standby application. While all tubular batteries behave similarly in the beginning, the strength of their guts and their life, especially in heavy duties, is decided by the way their spines are cast.

There are three standard casting practices : 1. Gravity Casting 2. Low Pressure Casting 3. High Pressure "HADI" Casting

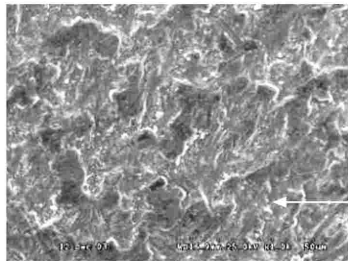
1. Gravity Casting (SEM Picture of plate)



Big voids
Non uniform
Micro
hardness

Machine Cost : Rs. 50,000/-

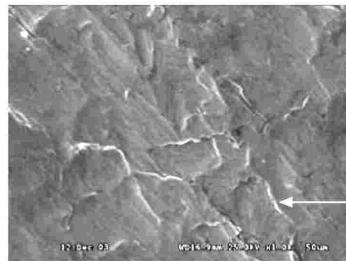
2. Low Pressure Casting (10 Bar) (SEM Picture of plate)



Small voids
Very low
micro
hardness

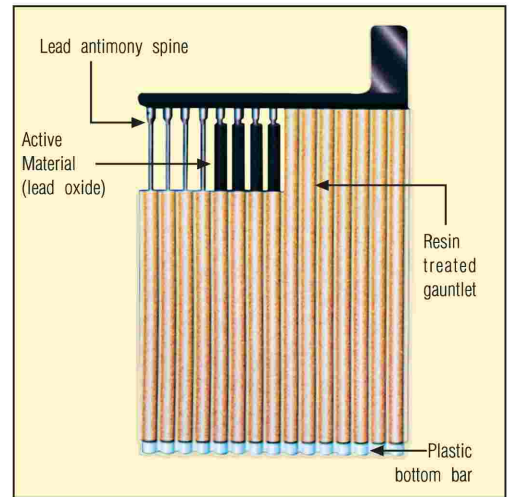
Machine Cost : Rs. 2 lakhs

3. High Pressure "HADI" Casting (100 Bar) used by EXIDE (SEM Picture of plate)



No voids
uniform
Micro
hardness

Machine Cost : Rs. 2.5 Crores



Tubular Plate and its various components



100 Bar High Pressure Die Casting machine from HADI GMBH, Austria costing Rs. 2.5 crores

Both the low pressure casting and the gravity casting which is used for flat plate manufacturing process show inconsistency in the grain orientation which can lead to failure by the process known as creep which happens when the plate grows in the charging cycle. Moreover these two casting processes generate casting with open pores. The corrosion process penetrates in the cross section of the plate and leads to early failure compared to situation where the corrosion is limited to the surface.

Product Comparison by Scanning Electron Microscope Study*

Properties	Gravity	Low Pressure (10 Bar)	High Pressure HADI Casting (100 Bar) used by Exide
Micro hardness (Vicker hardness HV)	Micro hardness is low compared to the other two varying from 21.5 to 28.4	Micro hardness is not uniform varying from 17.5 to 18.2	Uniform micro hardness of 24.3 throughout the sample
Grain size	Inconsistent grain size	Combination of coarse and fine	Consistent
Grain Orientation	Random orientation	Random orientation	Grains are oriented in single direction
Surface condition	Voids are seen and bigger than low pressure casting	Voids are seen (Small black spots)	No voids

Insist on "HADI" Bar High Pressure Casting Tubular for long life Standby Batteries

*Basis CECRI Report

*Applied for



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