

Tinned rolled Cu / Cu-Alloy

HDT vs Reflow tin comparison

Aurubis types of Tin Coating :

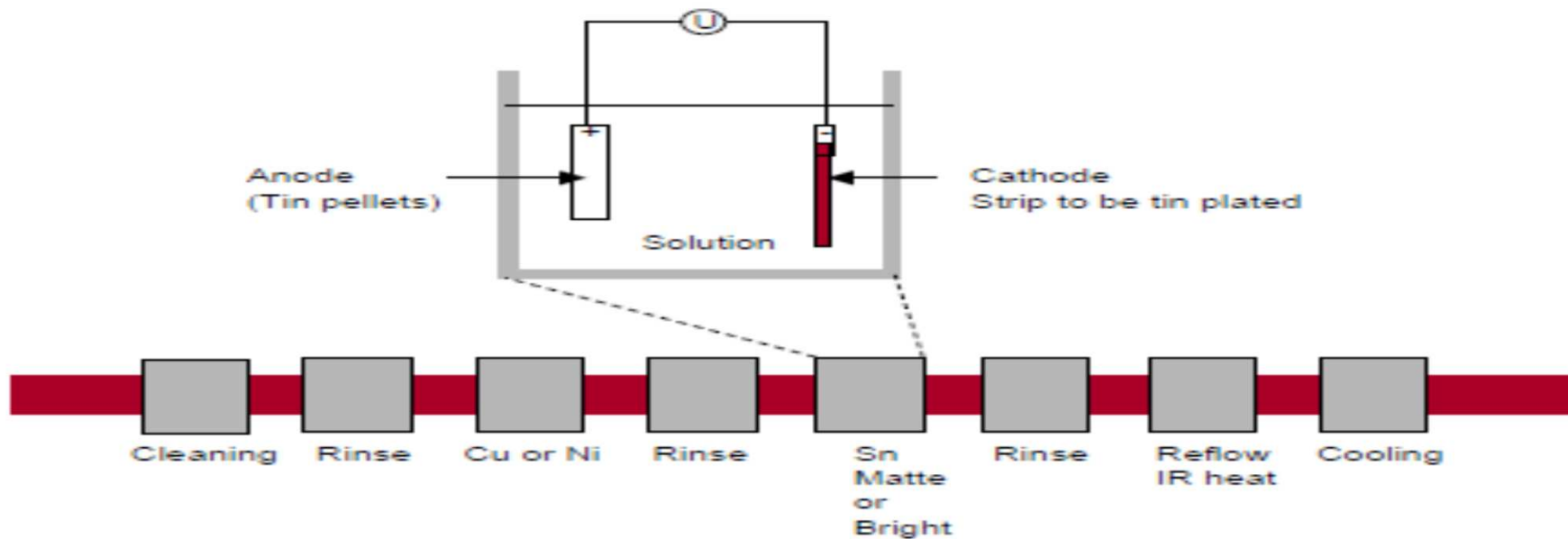
- **BET (Bright electro tin) : Aurubis N.L.**
- **MET (Matte electro tin) : Aurubis N.L.**
- **RET (Reflow electro tin) : Aurubis N.L.**
- **HALT (HDT) : Aurubis Ger.**



Tin Reflow strip dimension capability(Master coil)

| Strip Thickness | Strip width | Coil dimension |
|--------------------------------------|---------------------------------------|------------------------------|
| 0.15 - 0.8mm | 50mm-350mm | Weight : 3.5t |
| Over 0.8mm (ask for the feasibility) | Over 380 mm (ask for the feasibility) | Øint = 400mm Øext =1400mm |

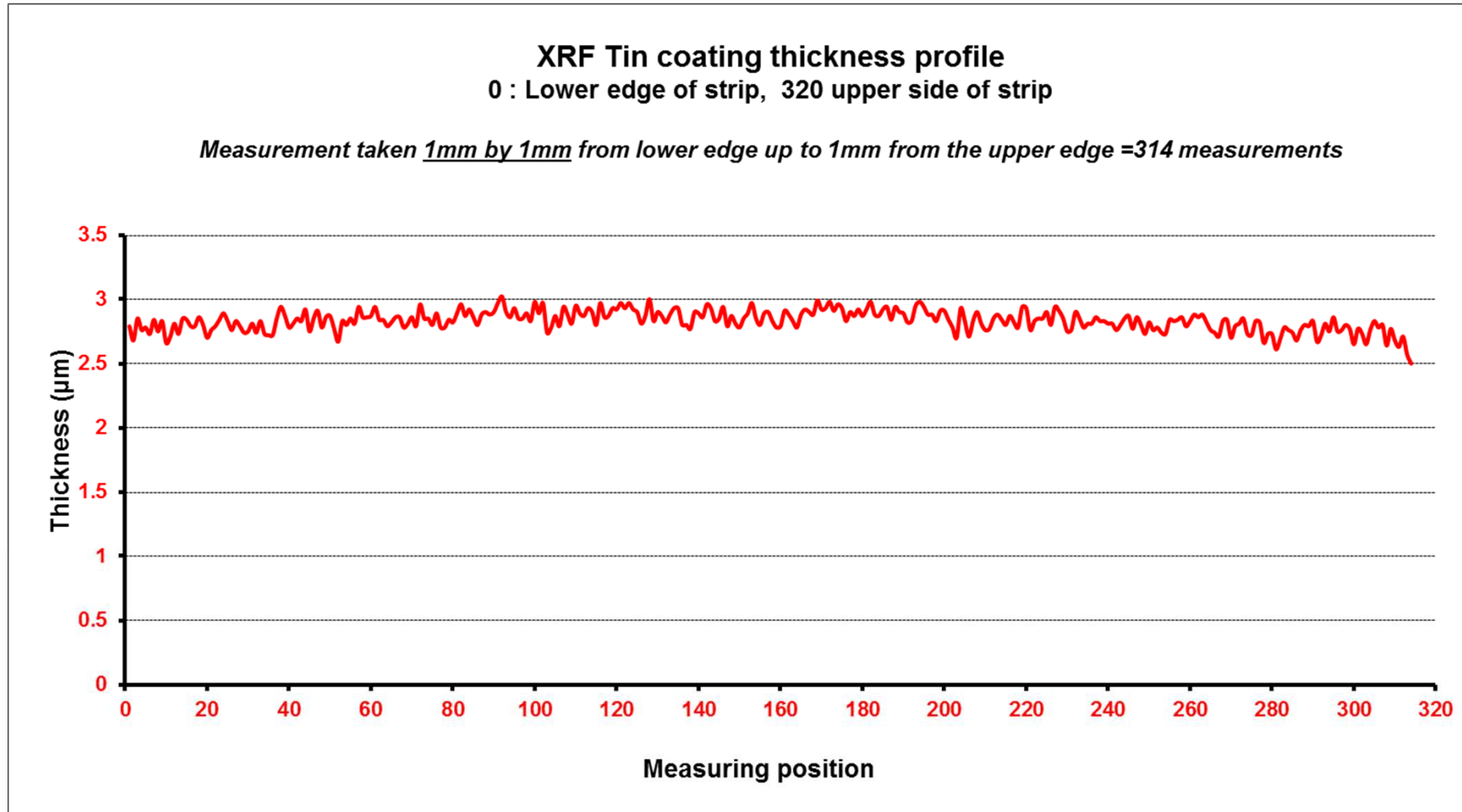
Electrolytic coating

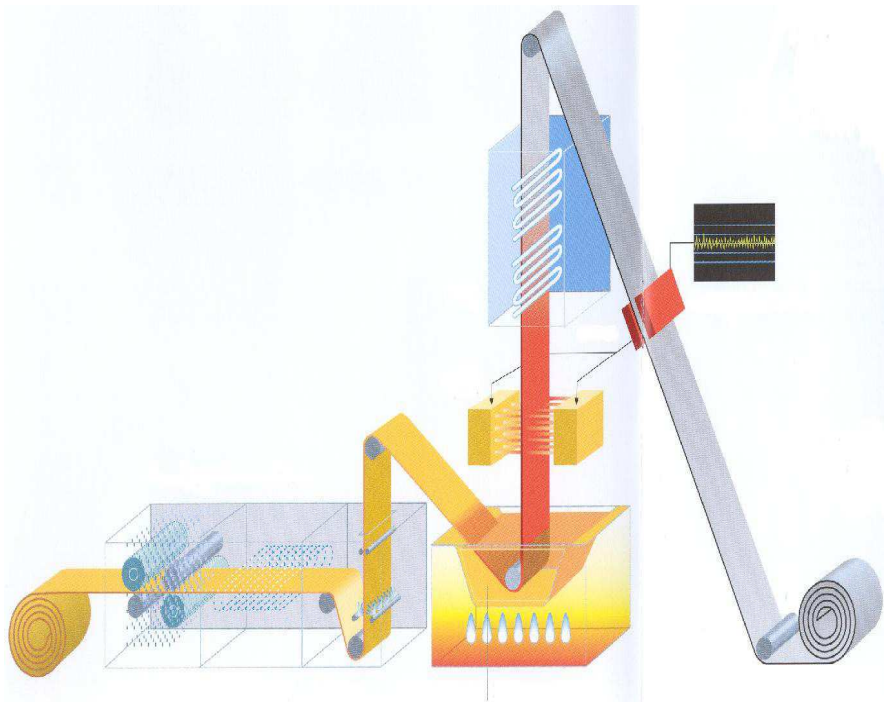


Tin reflow thickness tolerances

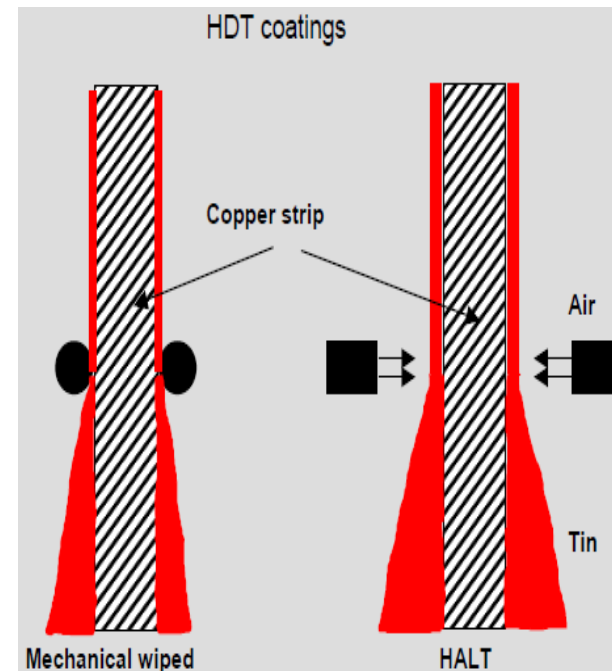
| Copper thickness Tolerance | Tin Coating types | Tin thickness Tolerance | Comment |
|--|---|--|---|
| <p><u>Standard Thickness:</u></p> <p>-1 to 2µm or 1 to 3µm -2 to 3µm or 2 to 4µm -3 to 4µm or 3 to 5µm</p> <p>- Flash: up to 0.5µm</p> <p>- 0.5 to 1 µm “not accurate”</p> | <p>Bright</p> | <p>Up to 1µm</p> <p>- 1 to 3 µm - 2 to 4 µm - 3 to 5 µm - 4 to 6 µm - 5 to 7 µm - 6 to 8 µm - 7 to 9 µm - Over 10µm</p> | <p>- Plated alloys : brass, copper and HPA</p> <p>- Fretting : interleave paper/plastic possible (but extra cost).</p> <p>- Dog bone : no dog bone at ETP (flat) “Strip could be used till the last few mm from edge”</p> <p>- Nickel thickness tolerance = Copper thickness tolerance</p> |
| | <p>Matte</p> <p>Brushed</p> | | |
| | <p>Reflow</p> | <p>Up to 1µm</p> <p>- 1 to 3 µm - 2 to 4 µm - 3 to 5 µm - 4 to 6 µm</p> | |

Tin reflow profile thickness





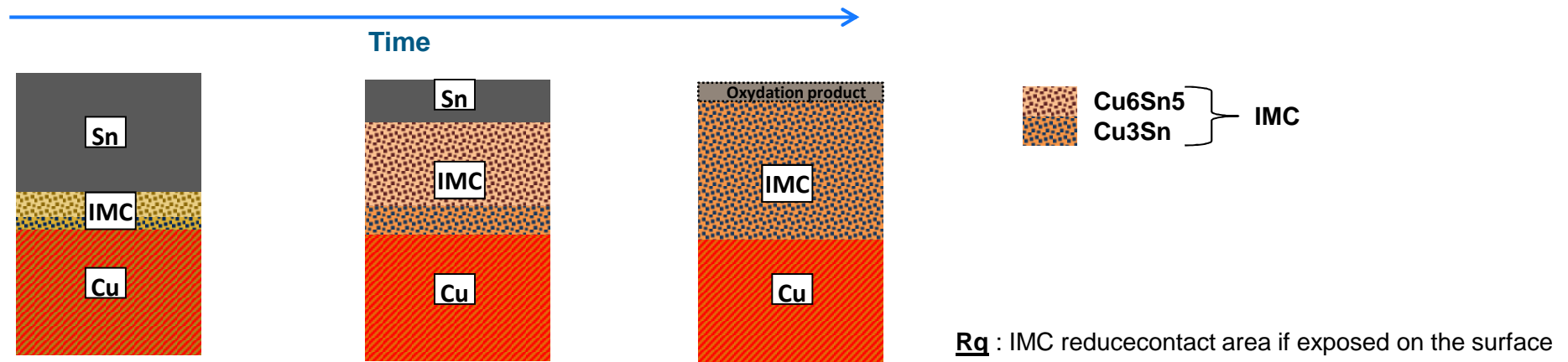
HALT (hot air levelled tin)



HDT (hot dip tin)

Copper-Tin Intermetallic Compounds (IMC)

IMC : Every tin plated Cu-alloy experiences the formation of Copper-tin intermetallic ($\text{Cu}_6\text{Sn}_5/\text{Cu}_3\text{Sn}$) at the interface of tin and the base metal. The IMC continue growing until all the tin is consumed.



IMC in different type of Tin processes :

HALT, HDT, Reflow and electro-tin coating are produced in different way. Their IMC reach the surface at different time :

- **HDT** : quickly forms an IMC layer of up to $1\mu\text{m}$ → less free tin after production with uniform IMC.
- **HALT** : Air jet allows a thicker tin Layer → it has an abundance of free residual tin with uniform IMC
- **Electrotinned** : almost no IMC after plating with un-uniform IMC layer (if no underlayer)
- **Reflow tin** : starts as electro-tinned with copper barrier then the melted tin gives IMC layer about the same thickness as in HALT

Direct Comparison of HDt to reflow Tin

| Hot Dip Tin | | Reflow Tin | |
|---|-------------------------------------|---|--------------------------------|
| Pro | Contra | Pro | Contra |
| Economic | Minimum thickness harder to achieve | Sandwich layers simple to achieve (Ni) | Waste water treatment required |
| Resistant against whisker growth | Undercoating not possible | Resistant against whisker growth | |
| Simple process | | Long shelves live | Process complex |
| IMC barrier against migration of Zinc | | Copper undercoating and IMC barrier against migration of Zinc | |
| Both plating processes widely used, market shares vary locally strongly | | | |