

A Ferragone Company

**HyCAL**  
CORP.

# DRIVING STEEL LIGHTWEIGHTING TECHNOLOGY FORWARD.



[hycalcorp.com](http://hycalcorp.com)

# New HyCAL hydrogen CA process delivers on spec, residual stress-free prime yield for AHSS/UHSS grades.

## The AHSS/UHSS rules have changed.

HyCAL is reinventing the AHSS/UHSS market with the start up of our new hydrogen CA line. With never before seen product quality and consistency—for DP, CP, Trip, MS, QP, HT, and all the 3rd Gen steels currently in use and under development—HyCAL is driving steel lightweighting technology forward.

## Consistent properties throughout.

Our infinitely variable and precisely controlled hydrogen quench results in incomparable consistency of properties across the entire strip width and length. You get a perfect and predictable balance of strength, formability and weldability, allowing you to engineer the material to its full capability, maximizing its lightweighting potential.

## Incomparable flatness.

Unlike material from water quench lines, our hydrogen quench process produces steel that is flat and ready for production

without the need for temper rolling or tension leveling to correct shape. Therefore no residual stresses are introduced into the steel thus increasing manufacturing efficiency.

## Revolutionary—continuous annealing on a toll basis.

The truly market changing development is that HyCAL supplies this cutting edge processing on a pure toll basis. We give you the flexibility to purchase only what you need, when you need it, and to source from a much broader supply base. We will deliver your steel production ready and just in time.

## Come see for yourself.

HyCAL is operational and producing superior quality AHSS/UHSS product with tighter specs and more consistent properties than the market has ever seen. Come see why HyCAL is driving steel lightweighting technology forward.



**Call us at (734) 561-2000.**



*Top:* Entry end accumulator  
*Bottom:* Jet Cooler and in-line hot leveler  
*Right:* Overview of CAL showing strip exiting the final cooling section



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# CA LINE SPECS

<b>MATERIAL</b> COLD-ROLLED FULL HARD STEEL STRIP	Width: 610 to 1,219 mm (24" to 48")	Thickness: 0.50 to 2.29 mm (0.02" to 0.09")	Processing Capacity: 109,000 mt/year (120,000 USt/year)	Effective Production Time: 6,400 h/year	Throughput Capacity: max. 18.2 mt/h (20.1 USt/h)
<b>HEATING CHAMBER</b> TEMPERATURE	Hydrogen atmosphere: more uniform heat dissipation	Heating section: max. 980°C (1,796°F)	Transformation section: max. 550°C (1,022°F)	155 single end recuperative radiant tubes	Strip exit temperature: <82°C (180°F)
<b>H2 QUENCH</b>	Hydrogen quenching results in on spec, residual stress-free prime yield and dead flat material	Dial in precise cooling across the entire strip profile, width and length	Can totally control the cooling process and engineer the strip to exact properties	No water is used for quenching, eliminating shape problems and post CAL processing that induces stress	Hydrogen quench results in cleaner strip with more precise properties across the entire strip
<b>MICROSTRUCTURAL</b> TARGETS	Up to 100% martensite	Dual Phases with varying volume fraction of ferrite and martensite	TRIP's and Complex Phase with varying volume fraction of martensite, bainite, retained austenite, & ferrite		
<b>Q &amp; P—FERRITE MATRIX, TEMPERED MARTENSITE, RETAINED AUSTENITE</b>	Quench Section provides quenching flexibility	Unique quench patterns possible to meet complex AHSS/ UHSS and next generation AHSS	Slow Cooling Zone after the furnace	Jet Cooler offers infinitely variable cooling rates	Quench can be interrupted for tailored microstructure [e.g. stop at bainite nose for QP steel or for partially transforming to martensite & retain austenite]
<b>OVERAGING OR TRANSFORMATION ZONE</b>	Can reheat the strip up to 1,022° F or not be utilized at all depending on target properties	Example: 1,500 M cycle developed for the furnace does not utilize any heat in the overaging zone	Example: 980 DP cycle developed for the furnace utilizes an overaging zone temperature of 824° F for 60 seconds	There is little microstructural change in the overaging zone, only tempering and diffusion	

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