

Anodes must be placed in soils or electrolytes for cathodic protection to function.

HSCI anodes work well in natural waters, but they are rarely buried in the ground without being bedded in high quality carbon fines (coke). Coke increases the area of anodic surface in contact with the earth to minimize resistance, and most importantly, to mitigate Groundbed Drying. Calcined petroleum coke breeze also serves to prevent drilled deep-wells from collapsing inwards.

Current Density Limitations: In operating systems, High Silicon Cast Iron (HSCI) anodes are invariably called upon to discharge current well below the limit that HSCI is able to handle without failing catastrophically. Anotec Article #13 supports the position that *Groundbed Drying*, not *HSCI Material Limitation*, constrains groundbed output.

How Current Density affects CP design is explored in: [Groundbed Design with HSCI Anodes](#).

Groundbed Life: Anode Life depends upon the consumption rate.

The [Consumption Rate](#) of high silicon cast iron increases moderately with current density. For example: During [Accelerated Corrosion Testing](#) of anodes manufactured by Anotec's [Chill Casting](#) process, current density had to be increased by 500% (from 11 A/sqM to 55 A/sqM) to increase the Consumption Rate by 50%. In contrast, for anodes manufactured by sand and centrifugal casting, Jacobs ⁽¹⁾ reported that for the same 50% increase of Consumption Rate, current density had to be increased by only 50%. Anotec attributes the significantly better performance of Chill Cast anodes compared to Sand Cast and Centrifugal Cast to the superior [Metallic Structure](#) from Anotec's Chill Casting process. For HVDC Groundings, 16% longer life for Chill Cast compared to Sand Cast is reported for High Silicon Iron Electrodes in salt water ⁽²⁾.

References:

1. Jakobs J. A., "Test of Performance of High Silicon and Graphite Anodes in Various Environments at Different Current Levels", Caproco, 1981. (L01)
2. ABB Report: "Corrosion Testing of Silicon Iron Electrodes operating as Anodes and / or Cathodes", 1999. (L93)