

**Tubular Advantage 1: Central Connection is more reliable long-term.**

A central connection Tube Anode is less vulnerable than an End Connection Stick Anode because:

- More current discharges from the anode end than the middle. (4 to 5 x more)
- Anode consumption is virtually proportional to current density. (Ends consume 4 to 5 x faster)
- Eventually, whether end-connected stick or center-connected tube, consumption eats into the cable connection, wasting unused anode mass along with associated cable, coke-breeze, deep-well drilling. As a result, end-connected sticks are more vulnerable to premature failure due to preferential consumption in the end-connection zone.

As a rule, tube anodes will function until 85 to 90% of their mass is consumed, compared to 60 to 65% of a stick. For example:

- A 110lb (50kg) stick anode will contribute 60 to 70lbs to CP; wasting 40 to 50 lb because the cable connection has been penetrated by end-effect consumption.
- In contrast a 90 lb tubular will contribute 75 to even 80 lbs of CP; wasting only 10 to 15 lbs.

**Economics:** Assuming that 100lb of anode material is required for CP, one would need to purchase 159 lbs of stick anode, or alternatively 114 lbs of tube.

Given that the cost of anodes may represent 15 to 20% of the total installed cost of an impressed current CP system, longer lasting anodes significantly improve the overall investment yield and reduce impact on the environment. Prematurely abandoned cables, drillings and backfill pay no dividends, and require premature replacement.

**Tubular Advantage 2. Weight Reduction.** Unnecessary anode weight is a burden for transportation, handling and installation.

**Tubular Advantage 3: Lower Resistance.** Length is an advantage in reducing resistance between the anode and the environment. Sticks are limited to 5ft (1.5m), whereas 7 ft (2.1m) tubes are readily available in a wider weight range. For anodes bedded in metallurgical or calcined petroleum coke; or for anodes in seawater, the resistance difference between 7 and 5 foot anodes will be almost insignificant in relation to the Total Resistance of the CP system.

**Tubular Advantage 4: More surface area per lb.** The benefit: Reduced current density into the surrounding media. If coke is the medium, the rate of ash formation around the anode surface is decreased. If electrolyte (natural water) is the medium, electrochemical impact is reduced. If clay-like soil surrounds coke backfill, the tendency for electro-osmotic drying and associated high resistance is modestly reduced.

**In Summary:**

In North America, the Middle East and most regions where major oil and gas transmission systems operate, tubular anodes are popular for deep wells. Experienced owners and engineers clearly recognize that modest premiums, paid up front for tubulars, significantly improve ground-bed economics. CP is predicated upon serious conservation and waste reduction. Compared to stick anodes, tubular anodes represent a better way to get the conservation job done well, at the outset.

[Advantages of New Z-Series Tubulars](#)