

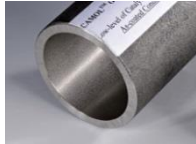
# CAMOL™ Catalytic Coatings

Delivering improved operational performance for steam cracker furnaces

With its unique ability as both a barrier and a catalyst, CAMOL™ enables improved operational efficiency. This is realized by increasing on-line production time as well as significantly reducing energy requirements and Greenhouse gas emissions, while maintaining or improving furnace yields.

quantiam<sup>®</sup>  
technologies inc.

## Field Trial Data Sheet

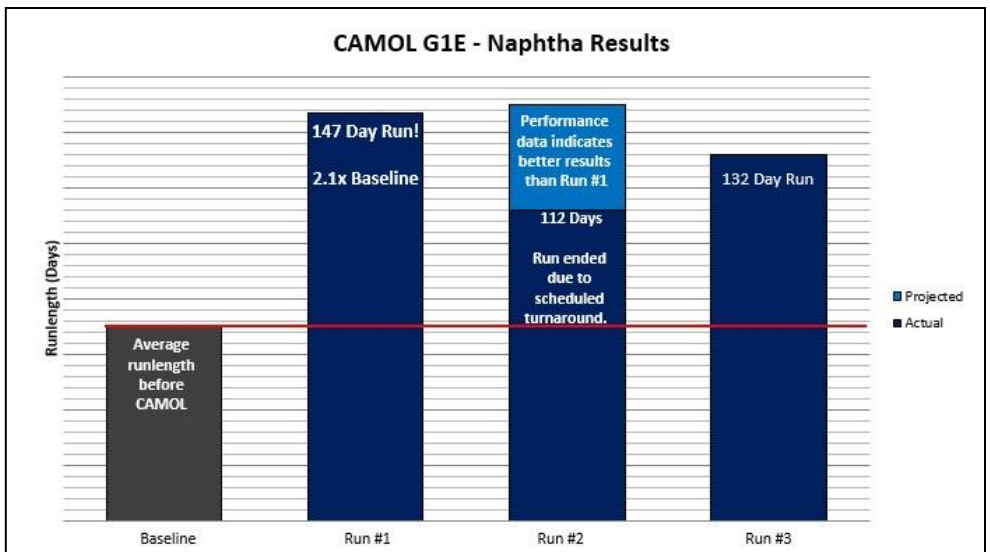


These advanced catalytic coatings are applied on the internal surface of steam cracker furnace tubes and fittings used to manufacture radiant furnace coils, enabling the Catalytically-Assisted Manufacture of Olefins (CAMOL™) from petrochemical feedstocks. The coatings are designed to improve operational profitability of petrochemical furnaces by reducing carbon formation, thus increasing on-line production time, and reducing energy requirements and CO<sub>2</sub> emissions.

**As a barrier** - CAMOL™ protects the surface of the tubes by generating an inert barrier between the Fe/Ni in the base steel and the hydrocarbon feed. The barrier is an oxide layer which is <10 microns in thickness, and can be repeatedly regenerated through normal operation.

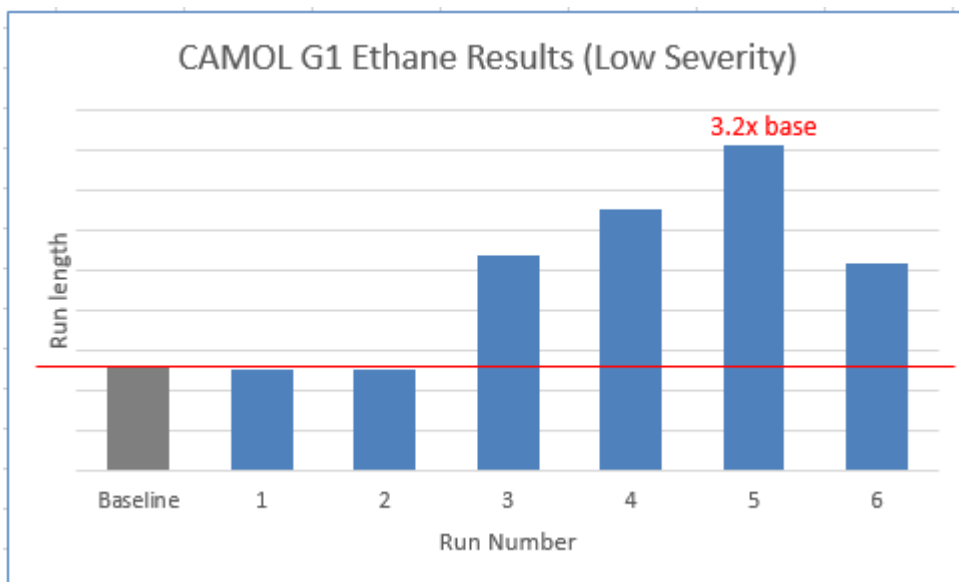
**As a catalyst** - CAMOL™ provides a kinetic solution to gasify coke and coke precursors to CO and/or CO<sub>2</sub>, thus offering a two-pronged approach to address both catalytic and pyrolytic (amorphous) coke.

### Commercial Furnace Data - CAMOL™ Gen 1E run length results



### Additional Benefits

- 1. Energy reduction:**
  - 3-7% reduced energy via fuelgas
- 2. Environmental benefit:**
  - 3-7% reduced carbon emissions via fuelgas
- 3. Coil life extended:**
  - 15-40% coil life extension, based on multiple full life installations
- 4. Minor yields improvement:** (non-catalytic / due to operating conditions)
  - Minor increase in ethylene & propylene yield observed during naphtha feed test, presumably due to reduced pressure drop & higher heat transfer effects of



## Operation within the Operating Envelope of Base Steel and Coating

CAMOL™ coated products are the first-ever coatings brought to market that if operated reasonably within the **Operating Envelope** of both the base steel and the coating, provide their engineered properties for a full life cycle of 4-7 years depending on operating conditions. To-date, 3 full-cycle field trials have been completed and fully autopsied satisfying the Operating Envelope requirements, two in ethane and one in naphtha (4.5 years and 7.5 years in ethane; 5.5 years in naphtha) **with run-lengths at the end-of-life being near-equivalent to those at start-of-life, and benefits lifetime universally of at least 5 years.**

## Quantiam's Mission

Quantiam is an innovation leader and a pioneer in commercially exploiting the properties of matter at the nano- and sub-nano scale to continually extend the frontiers of advanced materials for energy-intensive and extreme-service industrial applications. Quantiam excels in the development and commercialization of high-value, world-first, disruptive new products based on NanoScience, NanoTechnology, Advanced Materials, Coatings, Surfaces, Catalysis, and Advanced Manufacturing.

## About Us

Quantiam focus is to exploit the properties of materials at the nano-scale and smaller for energy and greenhouse gas emissions reductions, and for life-cycle improvements of critical materials used in extreme operating environments.

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Our new product teams strive for quantum leaps in innovation through exploiting unique properties of matter and bringing paradigm shifts to targeted market applications.

We offer advanced catalytic coatings that are applied on the internal surfaces of steam cracker furnace coils used in the global petro-chemical industry. These heat-resistant CAMOL™ coatings improve operational profitability of steam crackers by reducing carbon formation and increasing on-line production time, resulting in a reduction of energy requirements and CO<sub>2</sub> emissions.

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