

WORLD NETWORK



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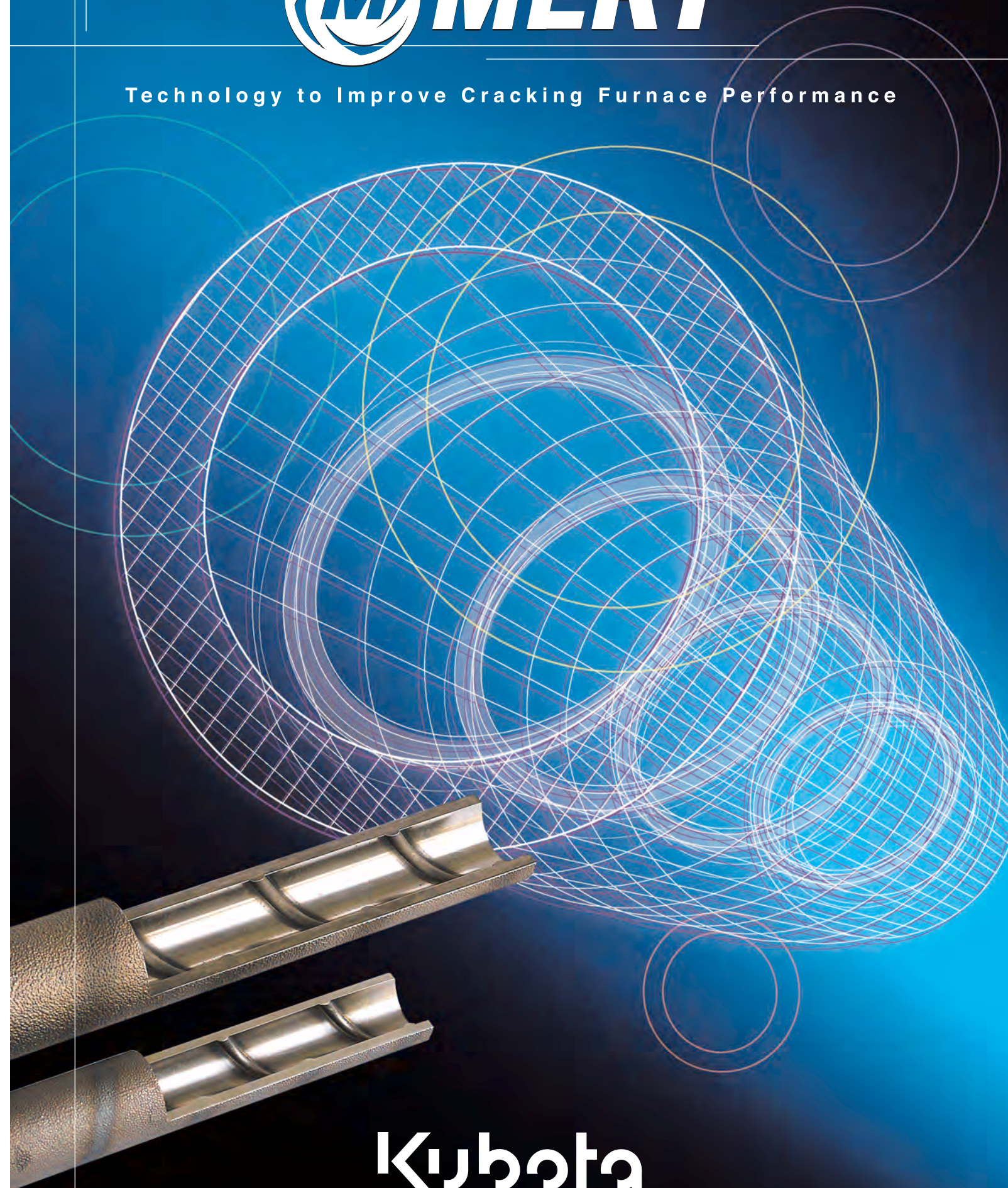
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Technology to Improve Cracking Furnace Performance



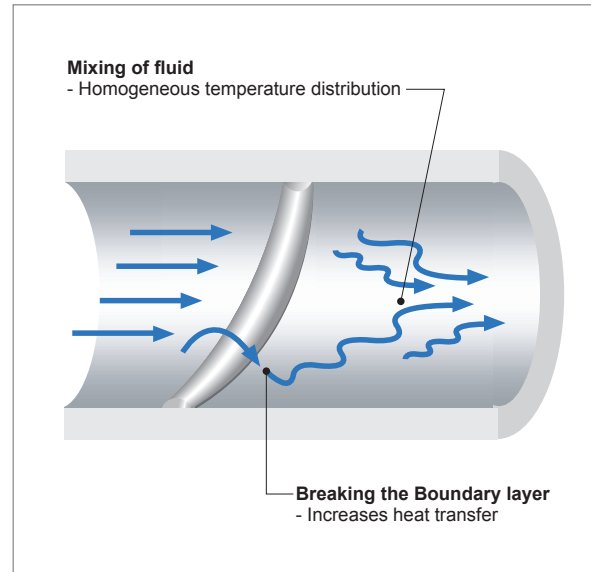
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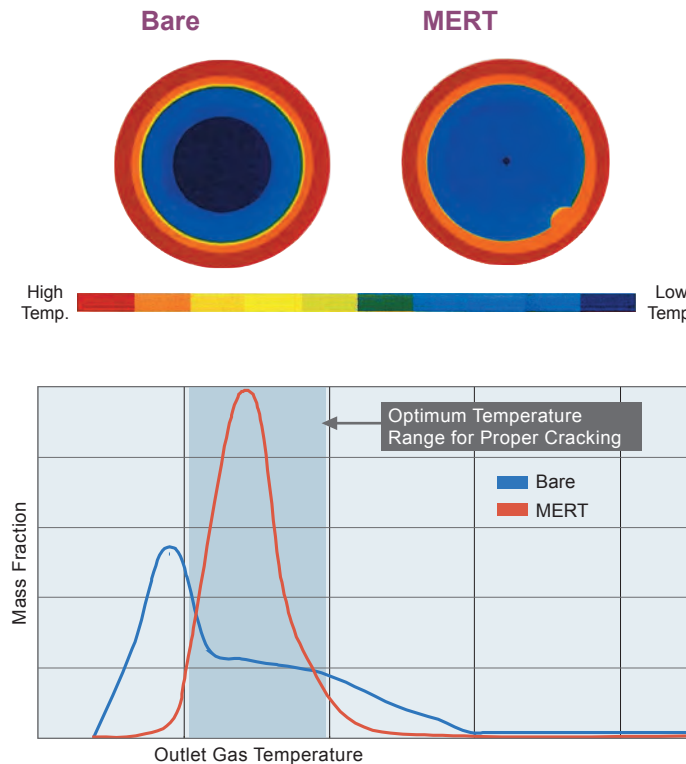
MERT—New Technology for Cracking Tube

“What Are Benefits of MERT” with MERT Advantages

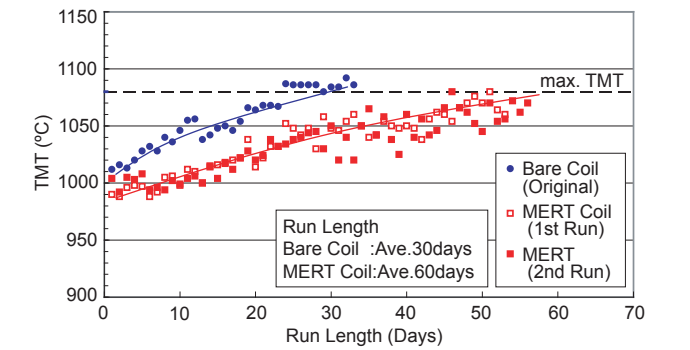
In a straight run of smooth bare tube, laminar flow in the boundary layer acts to reduce heat transfer. This boundary layer effect promotes coking, increases firing rates and elevates tube temperature. MERT works by periodically breaking up the boundary layer, mixing the hot surface gases with the cooler turbulent flow at the core.



Temperature Distribution in Gas (CFD Analysis Result)



Commercial Furnace Performance (Lummus / SRT-6)



Better mixing and heat transfer can provide

- Increased heat transfer resulting in lower TMT,
- Reducing coking due to better mixing and reduction of the hot laminar gas layer,
- Improving fluid temperature profile resulting in better control of under and over cracking.

Kubota customizes MERT for each installation through sophisticated computer simulations to provide the maximum performance benefit.

- Increased feed for better productivity.
- Longer runs for fewer de-coke cycles.
- Increased firebox efficiency to reduce energy costs.
- Longer tube life through lower average TMT.

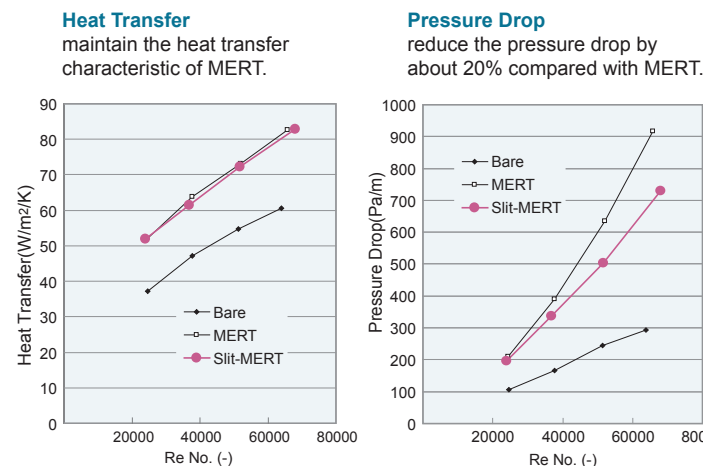
“Go To Next Stage” with MERT Advancement

Since 1996, when the first MERT was installed in a commercial ethylene furnace, there have been hundreds of MERT installations worldwide. MERT has proved to be effective and reliable resulting in many repeat customers. Some furnace designs are unable to benefit from MERT due to pressure drop limitations. To address this limitation, Kubota has developed the next generation of MERT, named “Slit-MERT.” By using a discontinuous element, Slit-MERT maintains the established heat transfer benefits of MERT while reducing the pressure drop. Slit-MERT has successfully been installed in more than hundred (100) furnaces since commercialization in 2003.

Slit-MERT



Slit-MERT Performance



Commercial Furnace (1996~2017)

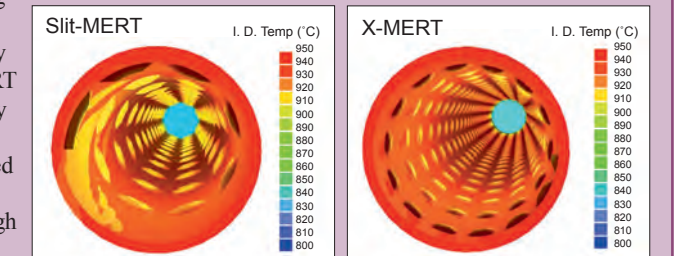
Furnace Type	No. of Installations		
	MERT	Slit-MERT	X-MERT
SRT-I&1.5	8	3	1
SRT-II	6	0	0
SRT-III	11	1	0
SRT-IV	2	11	0
SRT-V	58	70	35
SRT-VI	4	19	13
Millisecond	115	19	2
U-coil	10	19	18
W-coil	12	3	1
Split-U	7	11	5
GK-5	0	3	1
GK-6	1	0	9
Other	48	46	7
Total	282	205	92

▶ Total 579 Furnaces

Innovation on Slit-MERT “X-MERT”

“X-MERT” has been developed as an innovation of Slit-MERT and commercialized since 2007

with a novel manufacturing process. X-MERT can reduce the pressure drop by further 10% over Slit-MERT by optimizing the geometry and frequency of the element. It is recommended to the customer whose furnace does not have enough room for pressure drop.



Kubota has been supplying ethylene producers with high performance alloy since 1965. As alloy technology has progressed from HK through HP (35Ni/25Cr), and 45Ni/35Cr, Kubota has led the industry. Apart from alloy development, Kubota has also developed an innovative concept for cracking tubes which achieves lower tube metal temperatures and reduced coke formation compared to conventional tubes. Kubota has named this new technology MERT (Mixing Element Radiant Tube). MERT is a centrifugally cast tube in Kubota’s high quality alloy with a spiral mixing element on the inside surface.