



40 YEARS OF PERFORMANCE DESIGNED SOLUTIONS

APPLICATION: **STEEL FOUNDRY**

LOCATION: **MIDWEST USA**

BACKGROUND ❖

A manganese alloy shop operating twelve 5,000# coreless furnaces used an 80% Al₂O₃ spinel dry vibrate and routinely experienced "window pane" cracking. After temperature cycling, areas of the hot face would spall at the crack locations. Over time, the spalling would cause sporadic lining performance, resulting in lining life from 1-6 weeks (50-150 heats). Aside from increased lining life, the customer's main goal was consistent, reliable and predictable performance, and the current lining program did not meet these expectations.

UNITED APPROACH ❖

Hot Face Lining

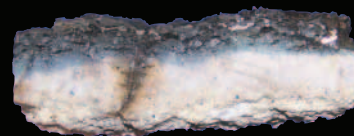
As a rule, the UNI-RAM VR-700 series is an excellent fit for this application. Smaller furnaces may benefit from UNI-RAM VR-788A. After studying this furnace's size, temperature and the metal chemistries, United installed UNI-RAM VR-790A. In this particular application, its combination of strength, chemistry and "depth of sintering" minimized the "window pane" cracking, reduced spalling, and increased overall performance life (see below).

TOP CAP Material

The original TOP CAP material required patching every 10-20 hts, and it did not meet customer demands. As an upgrade, UNI-RAM VR-793A TOP CAP was installed because its mechanical strength and volume stability are much more compatible with the UNI-RAM VR-790A, thereby running 50-70 hts before patching. To increase TOP CAP reliability even more, UNI-RAM VR-797A TOP CAP will be installed, as its composition will be most compatible with UNI-RAM VR-790A, showing more resistance to mechanical abuse along with permanent linear change (PLC) characteristics that closely mirror UNI-RAM VR-790A.



Reliable, consistent and cost effective refractory performance in the coreless furnace requires a "systems approach" that involves the refractory components and installation process.



Area opposite spout furnace #8-54 heats



Hotface surface lining furnace #6-185 heats

At this account, the original linings performed inconsistently. URC's analysis of both the process and the samples helped select UNI-RAM VR-790A as the key working lining component.

DELIVERED ❖ VALUE

	ORIGINAL LINING	IMPROVED SYSTEM
	80% Al ₂ O ₃ spinel dry vibrate	UNI-RAM VR-790A/VR-793A TOP CAP
Patching schedule	Every 35-40 hts	Every 60-80 hts
Lining Performance	130-150 hts	200-220 hts <i>(customer stopped at 200 hts for consistency)</i>
Approx. material cost per heat	\$17.0	\$12.7
Annual material savings	---	\$123,840
Annual installation savings	4.5 installs per week	3.0 installs per week 75 fewer installs per year= 12 hr (tearout & install) X \$50/hr (est. labor cost) <u>X 75 (fewer installs per wk)</u> = \$45,000
Annual sintering, form and misc. product savings		Approx. sinter cost \$300 per install Misc. products cost \$180 per install Approx. form cost \$250 per install Approx. ref. disposal \$200 per install Total cost \$930 per install <u>X 75 fewer installs</u> = \$69,750

TOTAL ANNUAL DELIVERED VALUE TO CUSTOMER \$238,590

Summary

To address and exceed customer expectations of consistent performance in the 200 ht range, a "systems approach" was required, including an understanding of the process, evaluations of past material and changes in both the working lining and the TOPCAP so the entire lining system works in concert and the **DELIVERED VALUE** to the customer is substantial.



The "systems approach" involves the installation process, and URC worked with the customer to select a specific vibrator design that optimized the process.

