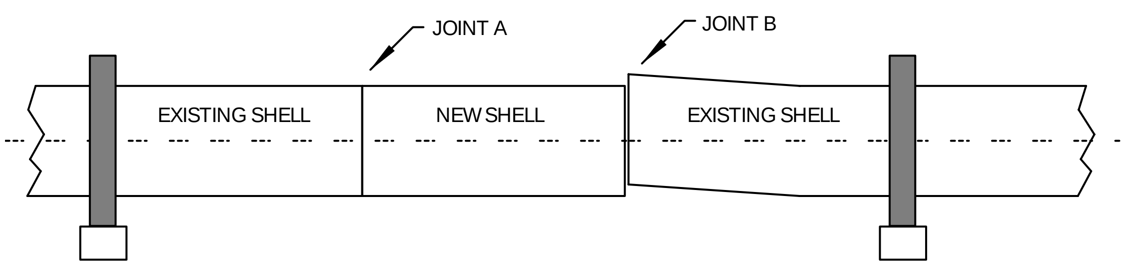
NAK SHELL SECTION ALIGNMENT PROCEDURES

NAK Instruction No. 0209
Revised February 09

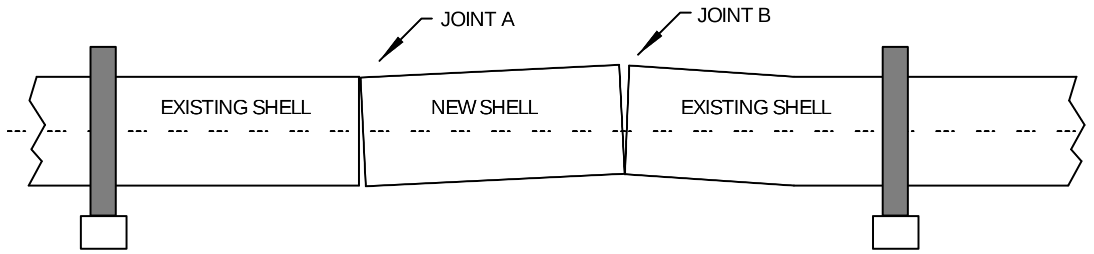
The conventional procedure for aligning kiln shell sections prior to welding is to adjust the joints as necessary so that they are centered on the kiln rotating axis. This is accomplished by measuring and minimizing the shell radial runout at the joints, or by centering the joints on a line of sight (or laser beam) along the center of the kiln. The technical reasoning in support of this alignment procedure is fundamentally flawed.

Please consider the sketch below. The cut line on the existing shell at joint B is obviously off the kiln center line. This condition is quite common on kilns that have had hot spots, (in other words, all kilns). The shell radial runout at midspan between piers on many kilns is often in excess of 3 inches, as is the case at joint B. In order to center the existing shell at joint B, the shell has to be forced in the direction of the kiln axis. This would result in a major load change on the adjacent piers. In other words, given the runout at B, the conventional shell alignment procedure would result in a dogleg condition. The symptom of this dogleg condition would be high pier load variations in the course of kiln rotation. Such load variation is detrimental to kiln stability. At the point of maximum pier load, ovality may be too high to facilitate optimum brick life.



Contrary to near universal practice, the adjustments at joints A and B have to be based on measuring and minimizing pier load variation in the course of kiln rotation. This conclusion obviously argues against fashionable wisdom and argues against a static shell alignment procedure. The kiln must be rotated to measure and minimize pier load variations, and thus assure proper joint alignment.

The counterintuitive inference from this line of reasoning is that joint radial runout has to be ignored in aligning shell sections. The correct shell configuration consistent with uniform pier loading in our example is show below. Please note that Joint B has an obvious radial runout. This runout is inconsequential in terms of mechanical stability. If Joint B were centered on the kiln axis on the other hand, the resulting dogleg condition would potentially make the kiln unstable.



This analysis clearly brings into question the rationale for shell radial runout studies, arguably another widespread misapplication of alleged mechanical common sense. Shell runout analysis mystics measure shell runout along the length of the kiln. But contrary to claims otherwise, they can divine no meaningful conclusions regarding dogleg conditions. If a kiln has a major dogleg, radial runout measurements are significantly reduced by massive changes in the distribution of shell stresses as the kiln rotates. The result of this shell stress fluctuation is zero radial runout readings at tire sections, even on kilns know to have major doglegs. Because this runout reduction cannot be quantified and the runout measurements cannot be accordingly adjusted, the runout readings have no diagnostic value as far as kiln condition is concerned.

Many kilns have large radial runouts at shell midspan, as in the example above. Radial runout analysis proponents argue in favor of correcting the “problem” with shell replacements. But if a midspan runout condition is not accompanied by pier load variations, there is no need for corrective action. Conversely, a kiln with high pier load variations, but zero shell runout, requires correction to optimize stability. The only reliable diagnostic tool for assessing doglegs that jeopardize stability - and therefore require correction - is pier load variation measurements in the course of kiln rotation. These measurements should be part of all shell replacements and hot kiln alignments.

Dogleg conditions are easily prevented or corrected in the course of replacing shell sections, but only if the joint adjustments are based on pier load measurements. NAK shell installation procedures guarantee optimum stability by way of this alignment method.

Proper analysis of problems affecting kiln stability requires in depth knowledge of the mechanical variables involved. If the above information is something you were not aware of, you need NAK as your kiln service provider. NAK is your best source for technical information pertaining to rotary kilns that makes sense. If you have questions regarding the above, please call NAK for convincing elaboration. Phone: 800 331-5456.

www.nakgoup.net

NAK