KILN SHELL REPLACEMENT EXCUTED BY TASLUJA CEMENT COMPANY PROJECT FROM (TCC)

PREPAIRED BY:

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❖ Contents…….

Chapter I:

➢ Abstract:

The advantage of shell replacement in the cement plants are discuss. Shell replacement, as part of as schedule shutdown, can increases uptime and reduce equipment, maintenance, and power costs. Experience field personal are the key to the correct installation of new shell section and to maintaining the repair schedule also continuing to operate a kiln with damage shell generally results excessive unscheduled downtime ,increase refractory costs and could lead to a completely failure of the shell. There is also the potential to injure site personal and cause collateral damage to surrounding equipment. If a damaged shell section is not replacement in the time, a catastrophic failure again the way to avoid issues is to replace damaged shell section in an orderly, planned way.

Chapter II:

➢ Causes for Kiln Shell Section Replacement:

There many causes for kiln shell damage including loss electrical power, process problem, drive and support system failure and missing refractory /hot spots. An unscheduled outage to a power or equipment failure can cause significant damage to a kiln shell. Extreme shell temperature differentials can bow the shell to the point of lifting the tires off the rollers .the will lead to a reduction in the life of the refractory and to further ongoing maintenance and process issue. The distractive cycle of shell damage causing refractory failure and refractory failure causing more shell damage must be avoided also this following at below causing kiln shell damage:

1- Over- high output increasing the wear of rotary kiln mouth shell, and causes the overheat deformation of the kiln shell.

2- The heat flow is too large but the cooling zone is short or even no. the working environment of the kiln mouth is bad, the temperature of the outlet material is 1300-1400C^{0}, and the secondary air temperature is 1000-2000C^{0}.

3- The cylinder temperature is too high, the thermal expansion is large, while the strength of the high temperature resistance material is seriously attenuated.
4- The guard bolts at kiln mouth are loosen, so that the refractory materials fall off, and thus the shell is burnt.

5- Improper handling during burning contaminated soil causes server corrosion of the cylinder shell.

6- The corrosion of the sulfur, phosphoric and chlorine on the kiln shell reduces the thickness and strength of the kiln cylinder, also reduces the plasticity of the steel and increase the brittleness of the steel, which may lead to brittle failure of the kiln cylinder.

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Chapter III:

➢ Monitoring the conditions of a kiln shell for avoiding damage:

There are a number of a plant use a monitoring condition of a kiln shell. The typical kiln shell inspection technique include the flowing:

1- Visual check for the (kiln shell, migration, support roller, roller sur face, tier face, pad, pad support, clamping ring and inlet-outlet seal with lubrications).
2- Ovality measurements.
3- Temperature measurements (thermographic camera and barometer).
4- Runout (polar charts).
5- Thickness shell measuring and tier (using ultrasonic and thickness gauge tester)

An operating and maintenance routing that includes these inspections will prevent catastrophic failure and minimize unplanned shutdowns.

Chapter IV:

➢ Preparation Equipment and Tool:

1- Safety engineer and PPE with safety Equipment.
2- New shell section, should be same specification and detail.
3- Full Automatic cutting torch machine.
4- Submerged Arc welding machine.
5- Arc welding machine.
6- Hydraulic jack system.
7- Hydraulic Manual jack.
8- Gauging machine.
9- Crane truck 200 ton.
10- Special clamping for allayment.
11- Iron marker pen.
12- Colum support.
13- Grinding machine.
14- Preheating burner.
15- Special bracket and bolt with spanner.

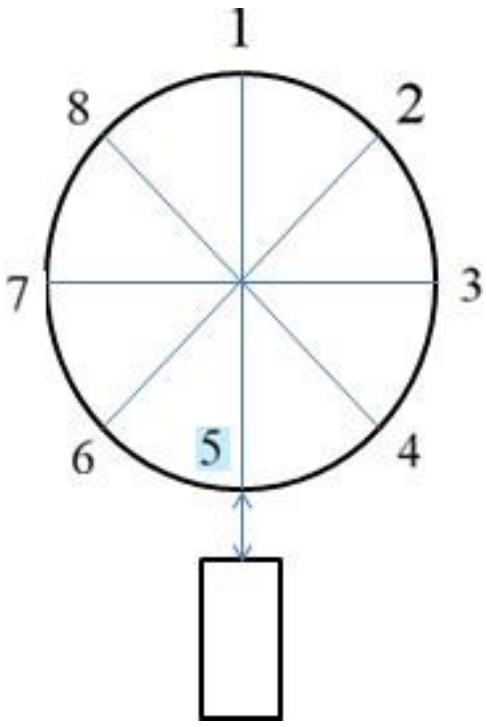
16- Scaffolding and stair runway.
17- Basket crane.
18- Auxiliary gear motor for kiln rotation.
19- Generator for electric source for kiln rotation.
20- Spider support for the kiln shell inside.
21- Support beams under each tier.
22- Ruler iron for the guide.
23- Special Welding inspector

Chapter V:

➢ (Work Procedure)

5-1: Take the Runout Measurement for the Old Kiln Sell

1- The old section before marking and cutting should take runout for it.
2- This section need to change should be Indicate the location of cutting shell.
3- Marking 8 points on circumference of shell in both sides and rotate the kiln also in each point should be stope rotation of kiln to take the measurement.



Kiln run out before cutting

point	girth gear	inlet side	outlet side
1	9.6 cm	9.6 cm	9.3 cm
2	9.7 cm	10.3 cm	9.6 cm
3	9.8 cm	10.2 cm	9.8 cm
4	9 cm	10.4 cm	11.1 cm
5	9.4 cm	10.6 cm	9.5 cm
6	9.6 cm	10.3 cm	9.7 cm
7	9.7 cm	10.7 cm	11.2 cm
8	9.2 cm	10.7 cm	9.6 cm

5-2: Prepare Foundation for the Old Kiln Shell

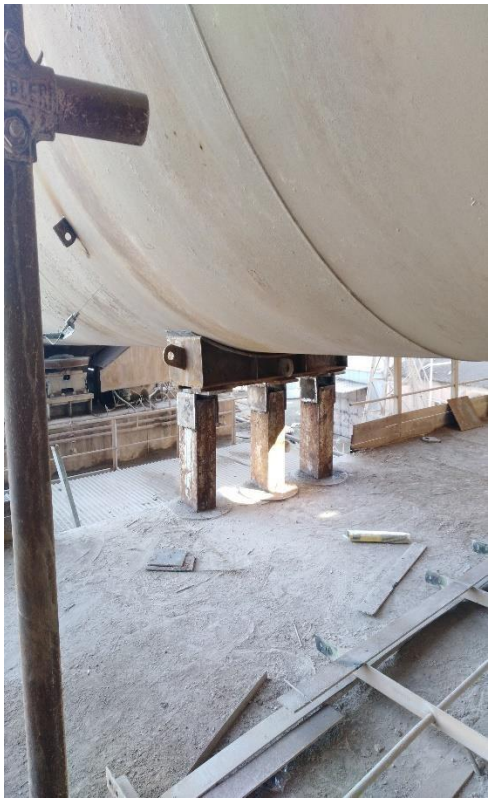
1- Isolate the area for work by the safety tap and isolate electrical equipment.

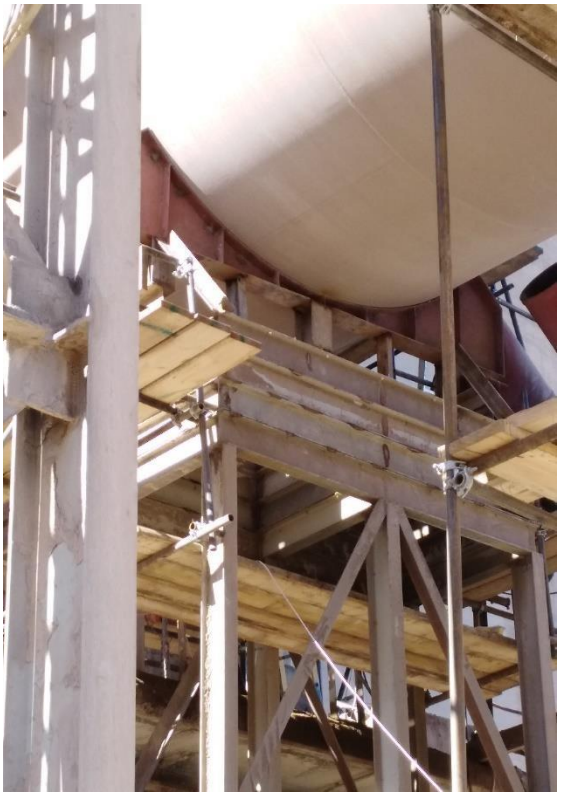
2- The section shell replacement was (9.40 m) and the thickness was (25mm).

3- Make the support Columns under each pair, and under the section replacement for both side.

4- Make the spider support inside the old shell replacement before cutting for both side.

5- The support under tier No.1&3 on the hydraulic jack.



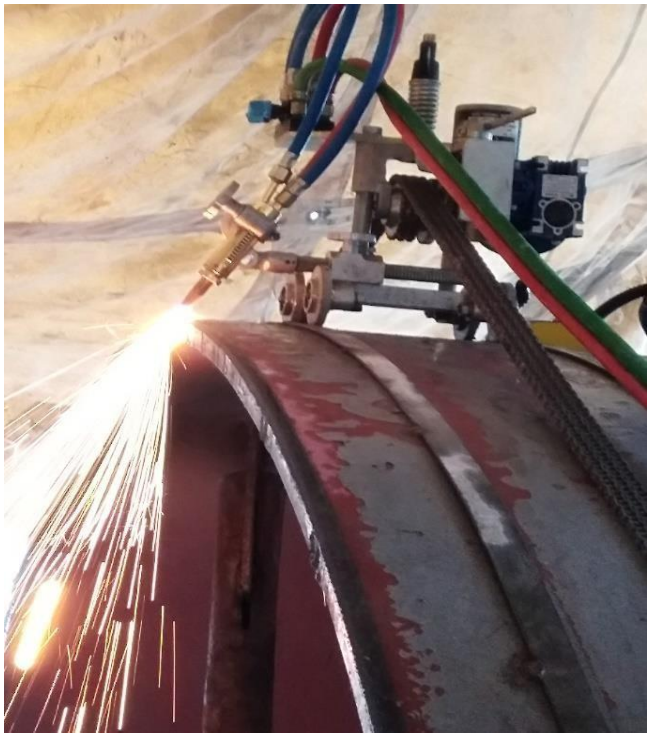


5-3: Prepare New Section Shell

1- Isolate the area for work by safety tap with PPE and hardness.
2- Prepare the new kiln shell and same dimension with the old section shell.
3- Installation the new section on the iron steel foundation, to work on it safely
4- New section need chamfering by the Automatic cutting torch.
5- The new kiln shell two sections, should be doing chamfer for both edges from each side of them.
6- Both section shells need to erect clamp on the cylindrical shell around the joint, for both sections to lifting it by the truck crane 100 ton, also for welding and alignment.
7- Install the special clamp, with the some rectangular steel plate for alignment the both sections before welding.
8- After the alignment completely finish, start the welding.

9- Both new kiln shell sections, welding need two-step, first by the Arc welding electrode size (E7018-G-H4R), and the second step by the electrode size 1/7018-G and both of them need to preheat for the electrode.

10- Each step for the alignment and welding need to the special welding inspector to inspect.




MITSU

5-4: Shell Removal

1- Isolate the area for work by safety tap with PPE and hardness also scaffolding and isolate main drive.
2- Indicate the location of cutting shell
3- New shell dimension is (L=940 cm, D=420 cm , t=25mm
4- Install the iron marker pen (H.S.S tool) on the support and rotate the kiln to marking the cutting sections around the kiln shell cylinder.
5- Install 4 stud with double bracket for kiln downward. 6-Erect the I-beam frame under tier No.3, like the stopper for kiln downward.
7- Make the spider support inside the kiln section for both side.
8- Install the scaffolding for both side kiln shell sections. 9-Make and install the guide way for the Automatic cutting torch for both side kiln shell.
10- Erect hydraulic jack under tier No.2&3 for rising up kiln shell before start cutting shell.
11- After cutting kiln shell, install the manual hydraulic jack inside kiln between removal section and unremoved shell from down hell

(from tier No.2) side.

12- Push the kiln shell 10cm to downward by the hydraulic manual under pressure 400 bar.

13- Remove the cutting section by the crane truck 200 ton, divide the length shell 9.40m/3=3.31 should be fix the steel wire on the kiln cylinder to be in the equilibrium for rising and movement.

14- When the steel wire from the crane fix around the cylinder shell, should disconnect the stud bold to remove the kiln shell section.


magmaweld


BAZ CRANE

5-5: Shell Installation and Alignment

1- Isolate the area for work by safety tap with PPE and hardness also scaffolding and isolate main drive.
2- The kiln shell should make chamfer edges for both side due to the new shell have the chamfer adage and important for welding because of for welding with new kiln section need V shape for welding.
3- When the connect for the kiln shell sections finish, need 2 crane truck first one 50 ton and second 200 ton, for make new kiln shell lay down straight on the support.
4- Rise up the new shell by the crane truck 200 ton, divide the length shell 9.40m/3=3.31 should be fix the steel wire on the kiln cylinder to be in the equilibrium for rising and movement.
5- When the new shell rising up by the crane 200 ton and put on the Colum to stabile.
6- Inside kiln install 8 stud for both sides
7- Make the kiln upward 10cm by the hydraulic manual jack.
8- Fix the kiln shell from the 8 stud and install the special clamp for alignment.

9- The edges from kiln shell and new shell section should be doing cleaning and grinding due to need smooth edges for welding.

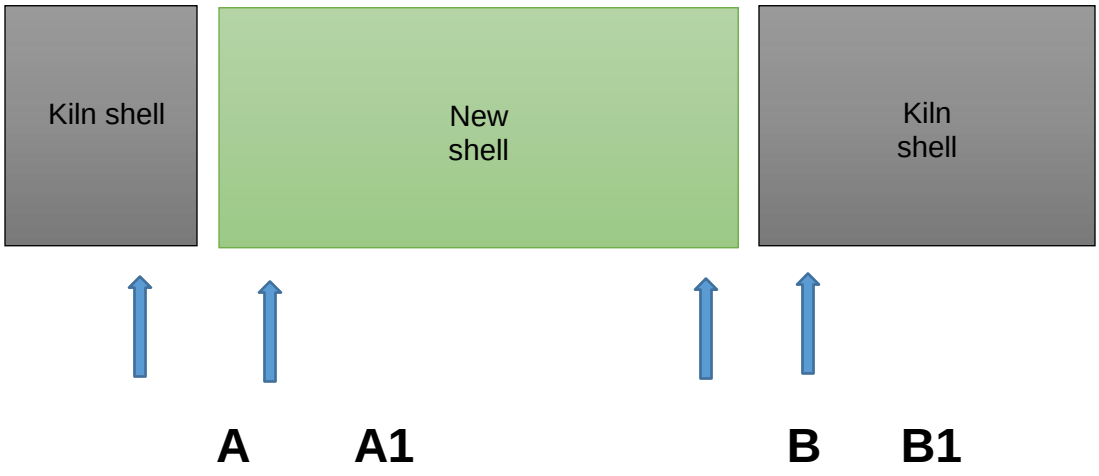
10- Start the alignment from the axial (top view), and radial alignment (front view).

• a)

• b)

11- When the alignment finish and the welder specialist check the alignment.

12- After alignment finish take runout from both sides and decide on the runout measurements and accept it on the reading



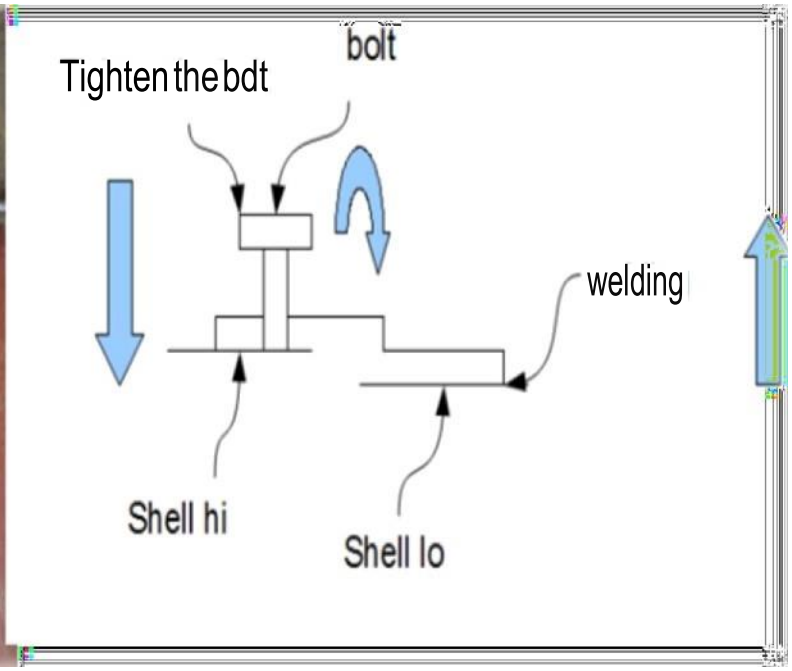
Kiln run out before cutting					
point	A	A1	B	B1	G
1	7.7	10.7	10.3	9	8.9
1'	7.8	11	10.1	9	8.4
2	7.7	10.8	9.5	8.9	9
2'	7.8	10.6	9.6	9	9
3	7.8	10.9	9.7	8.8	9
3'	7.6	10.7	10.1	9	9
4	7.4	10.8	10	8.9	9
4'	7.2	10.4	9.7	9.1	8.9
5	6.9	10	9.5	9	9.1
5'	7.9	10	9.4	8.3	8.9
6	7.3	10.3	10	8.3	8.8
6'	7.9	10.8	9.7	8.8	9
7	8	11	9	8.8	8.9
7'	7.5	11.5	8.7	8.3	8.8
8	7.7	10.6	9.5	8	8.7
8'	7.8	11.5	10.2	8.6	8.5

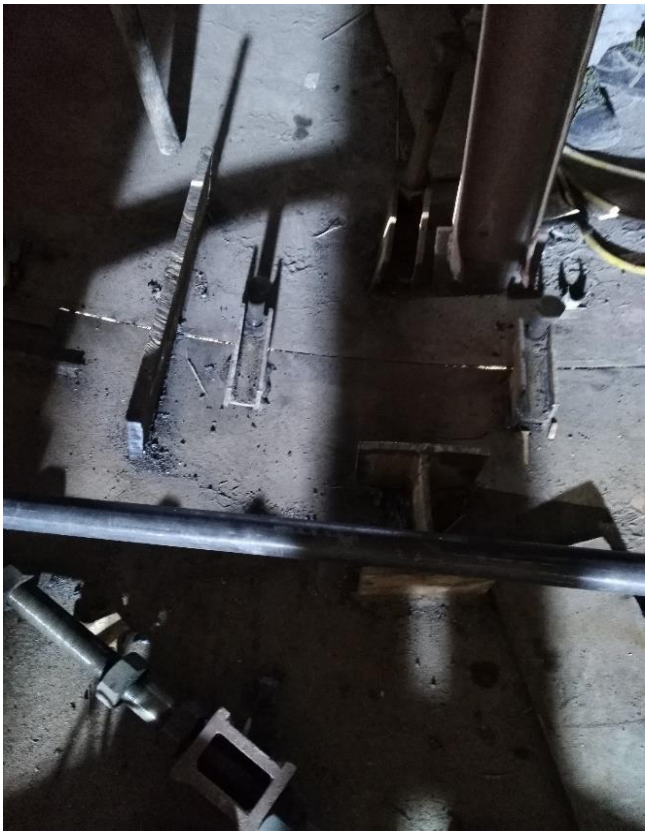
13- Start the welding on the both joint at the kiln outside. 14-The first step starting by the Arc welding.

15- When the arc welding finish the inspector welder check the quality of the welding.

16- After the arc welding finish at the kiln outside, start the second step welding is submerge arc welding(SAW) it is the Automatic welding, and need to kiln rotation at the specific fix speed depended on the SAW machine.

17- The SAW for each joint need 3 rotation welding with preheating and cleaning for starting until finish 3 rotation.


bolt
Tighten the bdt
welding
Shell hi
Shell lo



5-6: Arc Gauging Welding and Altera Sound Test

1- Isolate the area for work by safety tap with PPE and hardness also scaffolding and isolate main drive.
2- After the outside welding finish need to remove the spider support with stud inside the kiln from both side.
3- The joint between shell sections after removing the support, need to clean by the grinding machine and need to smooth the joint.
4- The joint between the new shell and kiln shell inside need to make V-shape for welding on the edge's, by the Arc gauging machine, this process names gauging for the shell.
5- After the gauging finish for both joint, start the Arc welding to penetrate on the V-shape.
6- The Arc welding shouldn't higher than the shell section joint, due to not effect on the brick.
7- After the welding finish inside the kiln, need to Altera sound test for the welding for any problem on the welding joint.