



*Case History on
“Repair of Kiln Shell”
At
Ankit Metals & Power Limited, Jorehira.*



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About: Ankit Metals & Power Ltd., Jorehira

Ankit Metals & Power Limited has a unit in Chattna (Post- Jorehira, Dist.-Bankura). This unit comprises of two phases. Phase-I consists of Sponge Iron unit having two units of capacity 350 TPD each. Phase II consists of pelletizing plant of capacity 0.6 MT along with the Captive power plant of 45 MW.

Ankit Metals & Power Limited is a part of the **SKP group**. The group is successful in all the diverse aspects of business - Manufacturing, Trading, Import and Export. It is one of the largest producers of Ferro chrome, Silicon manganese, Ferro manganese & Ferro silicon in India and exports 70% of the ferro alloys manufactured to the countries all over the globe.

Ankit Metals & Power Limited, Chattna unit includes:

Phase I : Sponge Iron Plant (2*350 TPD)

Phase II : Pelletizing Plant (0.6 MT)

Captive Power plant (45 MW)

Rolling Mill (under construction)



Process Detail : Sponge Iron Plant

The Rotary Kiln or Reduction Kiln is a very important part of any Sponge Iron plant. This is the place where reduction of the Iron ore takes place and as a result we get the finished product. The reduction of the Iron ore can be achieved by using either carbon bearing material (such as non coking coal) or a suitable reducing gas in the form of reformed natural gas. The processes employing coal are called **Coal-based processes** while the processes employing reducing gases are called **Gas-based processes**.

The working of Ankit Metals & Power Limited which is primarily a Coal-based Sponge Iron plant is mentioned below:

1. This type of plant generally utilizes non coking coal as a reducing agent along with the lumpy rich grade Iron ore.
2. The reduction is carried out in an inclined horizontal rotary Kiln, which rotates at a predetermined speed. A temperature range of 800-1050 degree centigrade is maintained throughout the length of the Kiln. As the materials flows down due to the gravity the ore gets reduced.
3. The hot reduced sponge Iron along with the semi burnt Coal, discharged from the kiln is cooled in water-cooled cylindrical rotary cooler to a temperature of 100-200 degree centigrade.
4. The discharge from the cooler consisting of Sponge Iron, Char and other contaminations are passed on through Magnetic separators so that the Sponge Iron can be separated from the other impurities.

Later the Sponge Iron is screened in two size fractions i.e. -3 mm & +3 mm. +3 mm fraction directly goes for usage and -3 mm fraction can be either used directly where ever it is possible or is to be briquetted by using molasses and hydrated lime as binders.

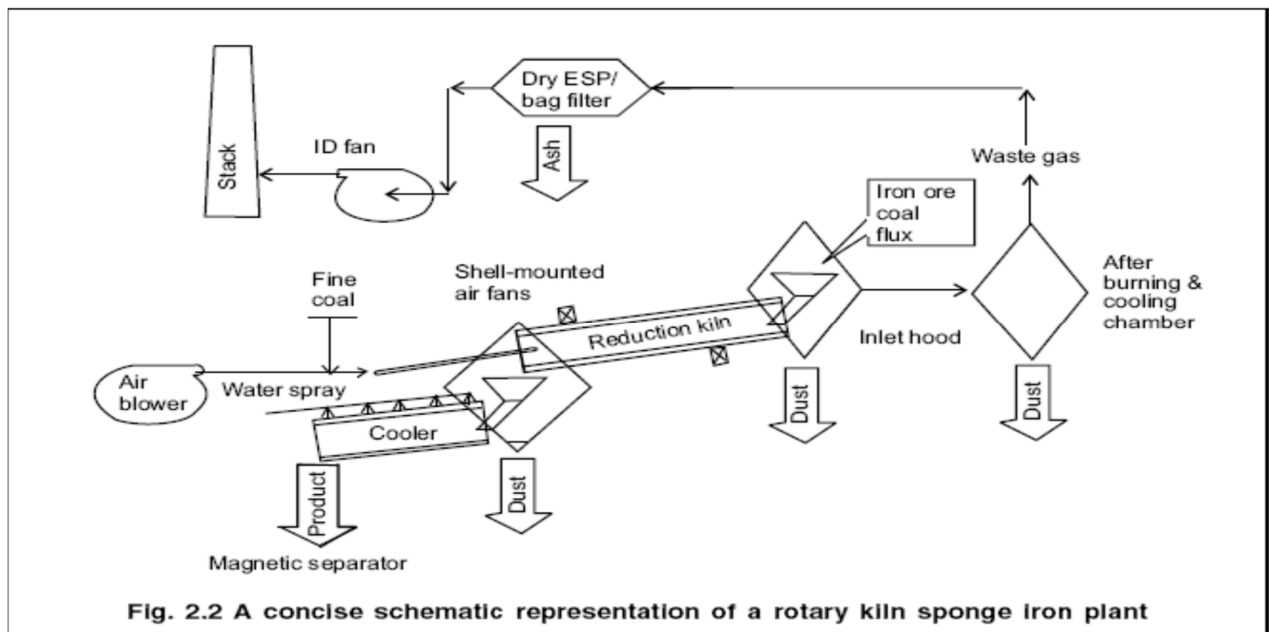


Fig. 2.2 A concise schematic representation of a rotary kiln sponge iron plant



Job Details

- **Customer** : Ankit Metal & Power Limited.
- **Department** : Sponge Iron
- **Machine** : Rotary Kiln
- **Part** : Kiln Shell
- **Make** : Hari Machinaries, Rourkela
- **Capacity** : 350 TPD
- **Base Material** : Boiler Quality Steel
- **No. Of Kilns** : 3 Nos.
- **Kiln Shell Length** : 82 Meter
- **Shell Diameter** : 4.2 Meter
- **Temperature** : 800-1300 degree centigrade
- **Kiln RPM** : 0.3-0.7
- **Kiln tilt angle** : 1.43 °

The case study is about the repair of Kiln Shell crack of Kiln-2 of 350 TPD capacities. This was earlier repaired with E7018 alloy. During regular use a crack originated from the same repaired portion. The crack actually generated from manhole adapter area in both the sides in semi circular fashion



Crack -1:

- Length of the Crack : 2000 mm.
- Depth of the Crack : 25 mm.

Crack-2:

- Length of the Crack : 800 mm.
- Depth of the Crack : 25 mm

Crack-3: (Adapter joining)

- Circumference of adapter: 2000 mm.
- Depth of the Crack : 25 mm



EWAC SOLUTION

Analysing the cause of crack & its nature & depending on the working parameters, EWAC Alloys Limited suggested welding alloy CPHFD 011 for repairing of the complete crack.

Product : CPHFD 011

Size : 3.15 mm (Root Run) & 4.0 mm (Final Layer)

CPHFD 011:

- An excellent welding alloy for joining, build-up & repair of new, worn-out or cracked steel structures.
- Good resistance to cracks, moisture & having excellent mechanical strength.
- Excellent for machinery components & other heavy duty equipment.
- No temper embrittlement of weld deposit
- Dense deposit with excellent Bead formation.
- **Tensile Strength : 67 kg/mm² (96,500psi)**

Welding Procedure

- **Weld Process :** MMAW
- **Welding Machine :** Rectifier (400 Amps)
- **Electrode Diameter :** 4.00 mm
- **Polarity:** DC +
- **Current:** 120-135 Amperes (Minimum current to be used)
- **Welding technique:** Stringer bead.
- **Welding angle :** Electrode angle to be 10° to the Normal to the base
- **Before Welding:** Surface preparation to be done. Tools & Tackles to be ready (Wire brush, chipping hammer, etc.)



Welding of “ Rotary Kiln Shell” Crack

1. First of all DP test was carried out to find out the total length of the crack.
2. After analyzing the full crack length, a hole was drilled at both the crack ends to arrest the cracks.
3. Removal of refractory linings from inside the kiln shell.



4. Alignment of shell plate was done from inside using L & key arrangement so that proper welding can be done.





5. After shell plate alignment, gouging has been started from outside the kiln shell. Since total plate thickness is 25 mm hence double V was made.



6. Preheating at 300-350 deg Celcius & maintaining temperature throughout welding.



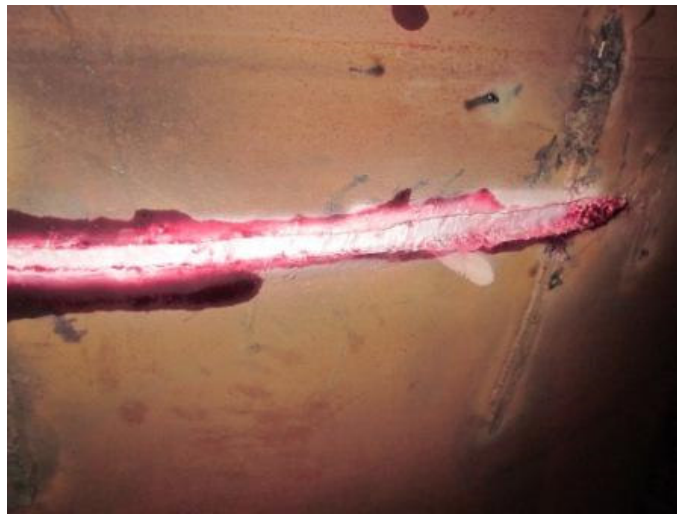
7. After heating the whole V portion, & setting the current to a minimum requirement, root run of CPHFD 011 , 3.15 mm was given throughout the V groove crack from outside in a skip weld technique.



8. After giving the root run grinding was done to ensure no slag presence.



9. DP test was carried out to ensure the absence of any crack.



10. After DP test, the whole V groove was build up by CPHFD 011 , 4.0 mm.





11. After complete welding of V groove from outside, gouging from inside was started followed by grinding & surface preparation.



12. Following the similar steps of welding as done for outer groove , the inner V groove was welded.



13. After complete welding, slow cooling has been done in still air & then DP test was carried out to ensure crack free welding.



Do's & Don'ts :

Sl No.	Do's	Don't
1.	Before starting welding, check your PPE's & set welding parameters on waste work piece.	Don't neglect safety, don't set current arbitrarily..
2	Using CPHFD 011, set minimum current as per range given in instruction.	Don't use high current for easy Welding.
3	Electrode angle to be 10° to the normal/perpendicular as per the crack position	Don't neglect recommended angle.
4	Use skip weld technique as crack length is long.	Don't do continuous welding
5	Make stringent bead.	Don't weave.
6	Chip slags, peen weld bead when red hot.	Don't peen when the bead has lost its heat, its of no use
7	Maintain inter pass temperature.	Don't overheat the job, have time gaps between two weld beads by chipping & peening.



SERVICE REPORT

		EWAC ALLOYS LIMITED (A Wholly Owned Subsidiary of Larsen & Toubro Ltd.)			
CUSTOMER: Ankit Metal & Power Ltd			INDUSTRY: Steel & Iron		
ADDRESS : Jorehira, Dist-Bankura					
DEPARTMENT: Sponge Iron Division			PERSON CONCERNED: Mr. Arvind Kumar (9903967803)		DESIGNATION: GM
MACHINE: 350TPD Kiln	COMPONENT: Kiln Shell		BASE METAL: Boiler Quality Steel		WEIGHT:
HEIGHT/THICKNESS : 25 mm	LENGTH: 5.6m (Total)		WIDTH :		DIAMETER: 4.2m
NATURE OF PROBLEM: 2.8m shell crack from man hole area in semi-circular way. The man hole adaptor area also cracked.					
			PRODUCT & PROCESS USED : CPHFD 011 (Size: 3.15mm & 4 mm), MMAW		
			ORIGINAL / EARLIER LIFE: 2 Years.		
			EXTENDED LIFE :		
			SAVINGS, IF ANY:		
			REPAIR / TEROCOAT COST: Rs. 85,000(Alloy Cost)		
			DOWNTIME , IF ANY: 5 days (Shutdown campaign)		
			REDUCTION IN INVENTORY COST, IF ANY:		
SAVINGS, IF ANY:					
CUSTOMER REMARKS / OBSERVATION ON COMPLETION OF WORK : <i>Supervision of L&T Engineer satisfactory</i> 11/10/2015					
CUSTOMER REMARKS / OBSERVATION WHILE IN PROGRESS : <i>On inspection after three months the welding is still found ok!</i>					
SIGNATURE & DATE: 01/10/2015			CUSTOMER SIGNATURE:		
NAME OF APPLICATION SPECIALIST: ARGHOJYOTI DEY			DATE & STAMP:		



THANK YOU