



CEMENT, ENERGY and ENVIRONMENT

EDITORIAL



I am happy to present to you the January–June 2018 issue of the *CMA CEMENT, ENERGY AND ENVIRONMENT* Journal.

The months of May and June 2018 saw CMA prepare for its environment sustainability showcase as part of the *World Environment Day* 2018 (WED) celebrations held in New Delhi. CMA actively participated in the initiatives organised by the Ministry of Environment, Forest and Climate Change (MoEFCC) on the occasion of *World Environment Day* (WED) celebrations in India from June 1 to 5, 2018, in partnership with UNEP to be the global host for the event. CMA's presence and partnership with the initiatives provided us various opportunities to showcase the uniqueness of the Cement Industry, our achievements across areas of environment management, and more importantly, the proactive role being played by

our Member Companies in contributing towards environment conservation. The CMA pavilion at the exhibition provided a platform to engage with wider audiences. We had tremendous footfalls from a cross section of industry and society, NGOs, international organisations, schools, colleges and, of course, officials from the decision making Ministries, a glimpse of which is available at the CMA website (www.cmaindia.org). On this occasion, CMA was amongst the select and the only Association that received an opportunity from the Government of India to reaffirm its commitments to common cause with the MoEFCC by way of a pledge, which Dr S Chouksey, President, CMA, took in the presence of Hon'ble Prime Minister at the Plenary Session on June 5, 2018, at Vigyan Bhawan, New Delhi.

I am glad to inform that CMA would be organising its First National Conference on Cement Industry on November 29-30, 2018, at ITC Maurya in New Delhi. This is a much advance intimation for our readers to mark the dates in the agenda to be part of this Event. Details on the Conference would shortly be rolled out by CMA.

In the meantime, in line with a renewed thinking on Sustainability and innovations, a number of thought provoking articles and case studies across an array of topics ranging from Limestone Resource Conservation, Process Optimisation and Plant & Machinery Performance Improvements to finding the Applicability of Nanomaterials in Cement Concrete Construction, have been put together in this issue to cater to the the varied interests of our Member Cement Companies. I hope you enjoy the read and we of course value your feedback to make the Journal more responsive to your expectations.

Best

(Aparna Dutt Sharma)
Secretary General

Consulting Editor: K K Roy Chowdhury (kk.roy@cmaindia.org)

Contact: Cement Manufacturers' Association, CMA Tower, A-2E, Sector 24, Noida -201301 (U.P.), India
Tel: 91 120 2411955/ 57/ 58 Fax: 91 120 2411956 E-mail: cmand@cmaindia.org Website: www.cmaindia.org

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ENERGY SAVINGS THROUGH FALSE AIR REDUCTION

Ketan Goel & Girdhar Mishra
INVOTECH SOLUTIONS & SYSTEMS

ABSTRACT

The cement industry is reckoned the most energy consumed industry in terms of consumption. The energy cost forms about 35 to 45 % of the total cost of production. Out of this, thermal energy constitutes around 70 %, where as electrical energy about 30 %, which may vary from plant to plant. Owing to this, efficient energy utilization has always been a focus point in the cement industry. If we improve energy efficiency, we may be able to reduce the cost of production of cement. In the product like cement, which is primarily a low value product, with high incidence of taxes and duties, high energy costs, the avenues available to a plant for reducing the costs are limited. In the present environment due to the energy crisis and steep increase in the cost of energy and other input materials, it has become imperative to give a serious thought on how to make operations and equipment efficient towards use of energy and adoption of latest technology equipments to retain the requisite competitive edge in the market.

INTRODUCTION

India is the second-largest cement producer in the world in terms of cement capacity. Therefore, one can easily assume the amount of energy being consumed in cement production facilities and its wastage attributed to non-availability of proper technology to plug the leakages. We can find hundreds of research papers / case studies discussing the effect of different factors on energy consumption in cement manufacturing facilities. Some researchers also discuss this issue with the help of mathematical models. However, all the researchers more or less agree to the fact that 'FALSE AIR' not only but may be one of the factors for more energy consumption in cement industry. Further, based on the several studies in the field of operational audit, it has been observed and is proven that production level can be improved and energy consumption can be reduced by reduction of "FALSE AIR".

amount of false air is difficult to measure. However, an indicator of false air can be increase of % oxygen between two points (usable for gas stream containing less than 21% of oxygen). Due to unwanted air, the power consumption increases and system's temperature decreases. Therefore, to maintain the same temperature fuel consumption has to be increased.

IMPACT OF FALSE AIR IN CEMENT PLANT

1. Increase of power consumption
2. Increase of fuel consumption
3. Unstable operation
4. Reduction in productivity
5. Higher wear of fans

FALSE AIR INTRUSION POINTS

Generally false air intrudes in Kiln section through Kiln outlet, inlet seal, TAD slide gate, inspection doors and flap box. Similarly, in mill section false air intrudes through

WHAT IS FALSE AIR?

False air is any unwanted air entering into the process system. The exact

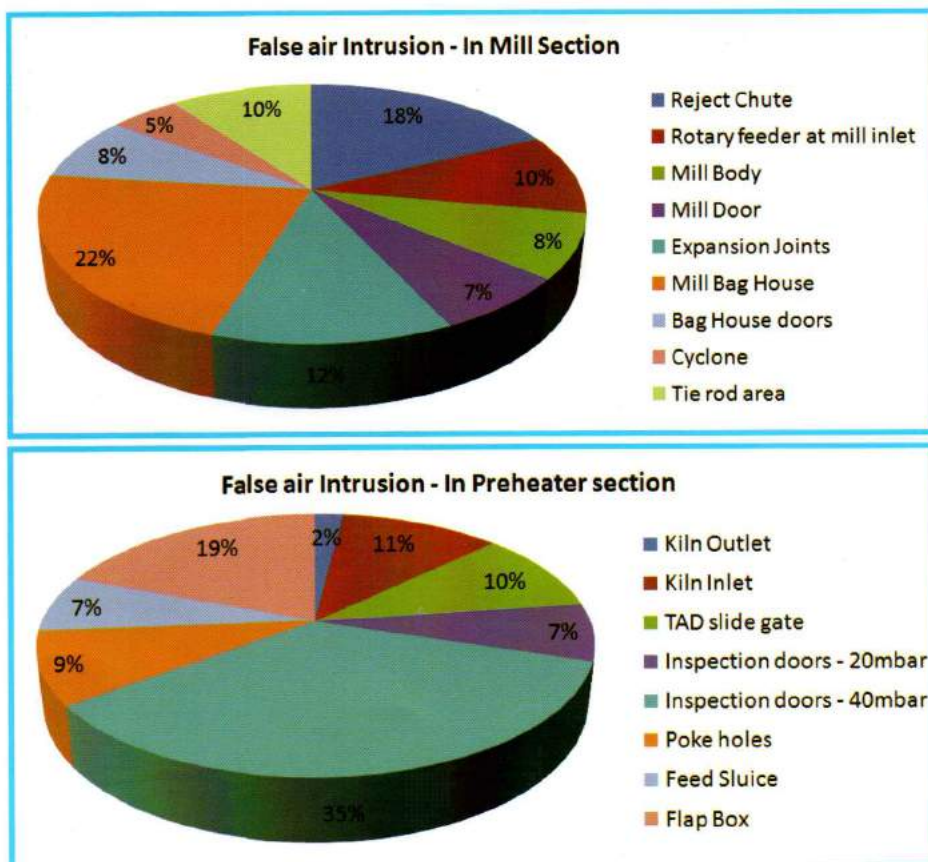


Fig.1 False air intrusion points in Kiln & Mill section



rotary feeder at mill inlet, Mill body, Mill door, flaps, expansion joints, holes of ducts and tie rod entry point.

HOW TO MEASURE FALSE AIR

The formula used for measuring "FALSE AIR", as under:-

$$\% \text{ of False Air} = \frac{\% \text{ Outlet O}_2 - \% \text{ Inlet O}_2}{20.99 - \% \text{ Outlet O}_2} \times 100$$

Atmospheric air normally has a content of 0% CO and 20.99 % O₂.

HOW TO MEASURE FALSE AIR ACROSS PRE-HEATER AND MILL

Based on the oxygen content and flow measurement at particular location, we can find out amount of false air across the Pre-heater and mill circuit. For this purpose, measure the % O₂ at different locations i.e Pre-heater inlet and outlet, cyclone Inlet and Outlet, Mill inlet and outlet, mill outlet to fan inlet, across Bag-house or ESP.

FALSE AIR DETECTION THROUGH ULTRASONIC LEAK DETECTOR

Ultrasonic Leak detectors often called sniffer, especially designed to find small leaks, are also being used in enclosed gas systems. Since ultrasonic gas detectors search for the sounds of leaks rather than escaping gases, they are able to detect leaks of any gas type. Though the device is unable to measure gas concentration, it is able to determine the leak rate of an escaping gas because the ultrasonic sound level depends on the gas pressure and size of the leak.

FUNCTIONING OF ULTRASONIC LEAK DETECTOR

When gas escapes a pressurized line, it generates a sound in the range of 25 kHz to 10 MHz, well above the frequencies, the human ear is sensitive to but in a range

easily identifiable to ultrasonic sensors. When the detector senses ultrasonic frequencies, they are isolated from normal background noise, amplified, and converted to a frequency audible to humans.

DETECTION PRINCIPLE

When a gas passes through a restricted orifice under pressure, it goes from a pressurized laminar flow to low pressure turbulent flow. The turbulence generates a broad spectrum of sound called "white noise". There are ultrasonic components in this white noise. Since the ultrasound is loudest at the leak site, it can be detected very easily.

FALSE AIR ARRESTING

Usually Cement plants use

conventional methods to arrest false air but these conventional methods are not reliable or permanent in nature. Infact, it works like a silencer just after few days it's gets damaged. Therefore, **Invotech Solution & Systems**, a Rajasthan based company have come up with a unique product range after their years of research, which are being used in many Cement manufacturing facilities. Their client list figures renowned names like- JK Cement Group, Dalmia Group, Jaypee Group and many more in pipe line.

Invotech Solutions & Systems provides Innovative & Cost-effective Industrial solution for arresting False Air in cement plants i.e.

Pyro-Process, Raw Mill, Coal Mill,



Fig. 2 False air detection by Ultrasonic Leak detector

Average and Best Practice Energy Consumption Values of cement industries

Section	Unit	India (Average values)	World Best Practice
Coal Mill	KWh/t clinker	8	2.4
Crushing	KWh/t clinker	2	1
Raw Mill	KWh/t clinker	28	27
Clinker Production			
Heat Consumption	K cal/Kg of Clk		
Kiln & Cooler	KWh/t clinker	28	22
Cement Mill	KWh/t cement	30	25
Utilities : Mining etc	KWh/t clinker	1.6	1.5
Packing Plant	KWh/t cement	1.9	1.5
Utilities : Misc.	KWh/t cement	2	1.5



Cement Mill section & Bag-House.
The 'Arrest Master' (Product Name)
is user friendly and safe to use.

Product Range: False Air Arresting Compound

1. Arrest Master 1001 (For Upper Cyclones, VRM's & Power Plant. Temp. resistant upto 180°C)

2. Arrest Master 1002: (For Bag-House & Bag-Filters)

3. Arrest Master 1003: (Temp. resistant upto 500°C)

4. Arrest Master 1004: (Temp. resistant upto 800°C)

5. Arrest Master 2001: (For areas having vibrations)

Properties of "Arrest Master":

1. Gets further strong with heat.
2. High compressive strength & impact resistant.
3. Non Shrinkable properties & No tools required for application.
4. Once cured, Arrest Master becomes rock hard ensuring no leaks.
5. Can only be removed by hammering.

Application of 'Arrest Master 1001 to 1004' brings down the level of false air and it is useful in all cement and power plants. It hugely impacts plant productivity and contributes towards better housekeeping. As a matter of fact, during March, 2018 **Invotech Solution & Systems** carried out complete false air arresting work in M/S Dalmia Cement Bharat Limited - Kapilas cement Manufacturing Works (A Unit of OCL India Ltd.) Cuttack. After completion of work, 4% of false air could be reduced, which was applauded by Technical head and their entire team.

CASE STUDIES

Some of the case studies are also given below for better appreciation of effectiveness of product:-

Case Study- 1

Invotech Solutions & Systems			
IMPACT of 1% FALSE AIR REDUCTION			
S No	Particulars	Plant Details	
1	Type Of plant	Single string ILC	
1.1	Kiln length	65 Mtrs	
1.2	Kiln Dia	4.2 Mtrs	
1.3	Heat Consumption	750 K Cal/Kg-Clinker	
1.4	Type of Cooler	Grate cooler	
1.5	Calcliner Type	ILC	
1.6	PH Make	KHD Humbolt	
1.7	PH Stages	5	
S No	Particulars	Unit	Values
2	Plant Data		
2.1	Kiln Feed	TPH	315
2.2	Clinker Factor		1.62
2.3	Barometric Pressure at site	mmWg	10036
2.4	Ambient Trmp	Deg C	25
2.5	Power Cost	Rs/Unit	3.2
2.6	Coal CV	K Cal/Kg Coal	7800
2.7	Coal Cost	Rs/Kg	8
2.8	PH Out let pressure	mmWg	800
	Pressure at PH fan Inlet	mmWg	850
2.9	PH Out let temp.	Deg C	300
2.1	Flow at PH Out Let	m3/Hrs	731000
2.11	Flow at PH Out Let	Nm3/Hrs	311333
3	False air 1%		
3.1	False air Volume	m3/Hrs	7310
3.2	False air Volume	Nm3/Hrs	3113
4	LOSS in Power		
4.1	Loss on account of PH Fan	KwH	20.96
4.2	Loss in money	Rs/Hr	67.06
4.3	Annual Loss due Power	In Lacs	5.31
5	Loss in Heat		
5.1	Loss on account of heat	Kcal/hr	312500
5.2	Loss in money	Rs./hr	321
5.3	Annual Loss due to Heat	In Lacs	25.38
5.4	Total Loss in money	Lacs per annum	30.70
5.5	Arrest Master 1001 Cost	Lacs	2.5
5.6 Payback period		In one month	
Note: Considring 330 days run plant in a year			
Conclusion: Arrest Master 1001- Cost-effective Industrial Solution			



Case Study-2

Invotech Solutions & Systems					
S No	Particulars	Plant Details			
1	Type Of plant	Double string ILC			
1.1	Kiln length	55.8 Mtrs			
1.2	Kiln Dia	3.8 Mtrs			
1.3	Heat Consumption	815 K Cal/ Kg - Clinker			
1.4	Type of Cooler	Grate Cooler with IKN KIDS			
1.5	Calcliner Type	ILC			
1.6	PH Make	KHD Humboldt			
1.7	PH Stages	5			
S No	Parameters	Unit	Values		
2	Plant Data				
2.1	Kiln Feed	TPH	210		
2.2	Clinker Factor		1.64		
2.3	Clinker production	TPH	3073		
2.4	Barometric Pressure at site	mmWg	10017		
2.5	Barometric Pressure at sea level	mmWg	10336		
2.6	Ambient Temperature	Deg C	35		
2.7	Power Cost	Rs/Unit	3.2		
2.8	Coal CV	K Cal/Kg Coal	7800		
2.9	Coal Cost	Rs/Kg	8		
3	Reduction in False air after using "ARREST MASTER 1001"				
3.1	Reduction in False air	%	2.11		
	Parameters	Unit	Kiln string	Pyro string	Total
4	Preheater outlet				
4.1	Temperature	deg c	391	395	
4.2	Draft	mmWG	-625	-815	
4.3	Flow	M3/h	228000	325000	
4.5	Flow	Nm3/h	85179	118249	203429
5	False air = 2%				
5.1	False air volume	Nm3/h	1797	2495	4292
5.2	False air = 2%	M3/h	4938	7043	
6	LOSS				
6.1	Loss on account of Power in SG fan	kwh	11	20	31
6.2	Loss in money	Rs./hr	35	65	101
6.3	Loss on account of heat	Kcal/hr	231620	325157	556777
6.4	Loss in money	Rs./hr	174	244	418
6.5	Total Loss in money	Lacs per annum	17	24	41
6.6	Cost of Arrest Master 1001	Lacs	4.2		
6.7	Payback period	Month	1.13		
Note: Considing 330 days run plant in a year					
Conclusion: Arrest Master 1001- Cost-effective Industrial Solution					

CONCLUSION

Substantial potential for energy efficiency improvement exists in the cement industry and in individual plants. Persistent efforts are also being made to continue to improve energy efficiency and reduce the energy cost for the cement industry for survival and growth. Our baby step towards arresting "FALSE AIR" can contribute immensely towards cost cutting of cement manufacturing and improving energy efficiency. It is needless to mention that our efforts to improve energy efficiency will also minimize greenhouse gas and mitigate the environmental problems associated with cement production.

Invotech Solutions & Systems keep itself abreast of latest development in Cement Industry so as to cater the need of the Industry using latest technology and quality systems. Also, with a view to retain the requisite competitive edge in the market, Invotech Solutions & Systems participated in 15th NCB International seminar on cement, concrete & building materials 5th to 8th Dec, 2017 at Manekshaw Center, New Delhi. Subsequently, also participated in "National workshop cum technology exhibition for

promoting energy efficient & cleaner production for sustainable industrial growth", 8th to 9th March, 2018, at India Habitat Center, New Delhi, where presented a technical paper on "SIGNIFICANT SAVINGS IN ENERGY THROUGH FALSE AIR REDUCTION" and got award for "UPCOMING ENTREPRENEUR IN THE FIELD OF ENERGY EFFICIENCY". In the near future, Invotech Solutions & Systems will also be participating in 14th Green Cementech 2018 to be held on 17th to 18th May, 2018 at International Convention Center, Hyderabad.