Tai & Chyun Special Edition 2017

Strategic Trend of Cement Industry in South East Asia P.1

ESP for Dust Emission in Cement Production Process P.2

Taking Action towards ESP for enhancing dust collecting efficiency P.3

Case Studies

I Case Study Quick Recovery of Control Room's Burnt Panel P. 4

II Case Study Mechanical Revamping at Raw Mill ESP P. 5-6

III Case Study ESP Upgrade project at Raw Mill ESP P. 7-8

December Issue : Cement Industry

Strategic Trend of Cement Industry in South East Asia

The Southeast Asia cement industry is entering a new phase in its history in order to move forward and displace the international majors with an aim to become forefront player of the cement industry.

With a booming of construction industry across the emerging ASEAN countries for the past few years; especially among those new frontier markets such as Myanmar and Laos, where there are still plenty of room for the government to investment in fundamental infrastructure projects to develop the country, has recently resulted in a high demand for materials like cement .

Therefore, in order to pursue the new market opportunity and to solve the problem of sluggish cement demand in the domestic market, it can be observed that many locally-based companies in ASEAN countries have been considering to expand from the home bases into complementary markets in order to establish coherent networks across the region, as the main driving force to reach an objective for capacity addition and to stabilize its position in the cement market.

With regard to the statistic from the global cement directory, it showed that Myanmar and Laos were ranked as countries with the highest growth in cement production. By being a target, where many cement companies have been keeping an eye on and looking forward for investment opportunity regarding on building the new cement plants there, Myanmar and Laos has become the affluent destination for cement growth.

On the other hands, in more established markets such as Cambodia and Vietnam that already have many players been taking part in; however with their ongoing infrastructure and construction projects, it cannot be denied that this would still make these two countries being perceived as valuable market, attracting many cement companies to continue growing the cement production and expand more and more facilities there in addition to an existing production capacity.

At the same time, with higher cement production levels across the region, it is also being labelled as the leading cause of air pollution, in which it has been increasing with each passing year, bringing harmful effect to the earth and human health. Consequently, among many priorities of the cement industry, one of them is to minimize the increase in dust particulate emission, caused by aggressive expansion of cement production across the region.

Dust particle emission control is especially critical among those long established cement plants, where their cement production demand have been increasing for more and more from year by year, while the existing air pollution control equipment is unable to handle with an increasing amount of dust properly or can no longer be compatible with more stringent air pollution regulation since its cleaning capability already exceeded the original design value.

ESP for Dust Emission in Cement Production Process

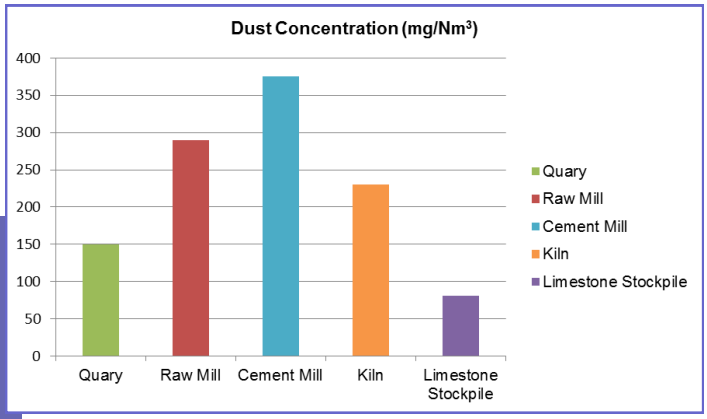
Dust emissions in cement plant originate mainly from raw mills, coolers, coal mills and cement mills. A general feature of these processes is that hot exhaust gas will pass through grinded material, resulting in an intimately dispersed mixture of gas and particulates. However, the characteristics of dust from different operations depend upon various factors such as the material being processed, type of processing, temperature, moisture content, particle size and dust resistivity, etc.

Outlet Dust Emission during Cement Production Process

Cement Process	Dust Emission (in mg/Nm^3)
Raw Mill ESP	50-75 mg/Nm^3
Cooler ESP	40-65 mg/Nm^3
Coal Mill ESP	25-60 mg/Nm^3
Cement Mill ESP	50-100 mg/Nm^3

Source: The Indian Cement Industry - A Perspective of Environment Friendliness, Cement Manufacturer's Association

The table illustrates the average amount of dust emission that can be discovered in each cement production process, measured from the sampling plant, showing that the dust proportion is high in raw mill and cement mill.



Source: Assessment of CO, CO2 and Suspended Particulate Matter Emissions, Electronic Journal of Practices and Technologies

It can be observed that the highest dust concentration was recorded at cement mill ESP, where the majority of dust emissions in the cement factory occur in this area. About 7 - 10 % of cement is normally lost due to uncontrolled emissions from the cement mill.

Accordingly, electrostatic precipitator (ESP) is an efficient pollution control device to remove dust particulate matter from a flow gas using the force of an induced electrostatic charge. ESP is used for gas cleaning in almost every section in the cement production process.

With increasing public concern over reduction of the industrial air pollution over the past few years, there is explicit demand for the cement plants to retain dust emission within the acceptable value under more tightening government regulation.

Aging or underperformed ESP is subject to the requirement for retrofitting or replacement by up-to-date technology since ESP failure will force the plant to confront with unnecessary emergency shutdown, causing production process to be suspended temporarily with significant financial loss.

Taking Action towards ESP for Enhancing Dust Collecting Efficiency

It can be observed that ESP applied in each cement production process will have to deal with different dust condition, where ESP operation must be adjusted accordingly. Therefore, the lifetime of ESP component parts will be dependent on proper deployment of ESP for the various applications.

ESP Application in Cement Plant	Dust Condition
Raw Mill ESP	- Have the largest size of dust particle - Excess dust loading during operation
Cooler ESP	- Contain the highest operating temperature - High dust resistivity
Cement Mill ESP	- Have moist and sticky dust
Coal Mill ESP	- Have moist and sticky dust

ESP in Cement Plant

Tai & Chyun has experience of troubleshooting and inspection in various cement production process; therefore, the experience has brought us the know-how in design.

When considering about taking action towards ESP performance, there are basically two possible alternatives, in which end user must weigh whether to go for ESP renewal or ESP upgrade.

An existing ESP can be renewed to the extent where ESP performance can be brought back to the original design value. On the other hand, end user can also choose to enhance ESP efficiency with the prevalent ESP upgrade technologies to be compatible with increasing production rate or to comply with more stringent government regulation.

At the same time, with obsolete ESP technologies being used since the ESP was first installed is also another reason that forces the operator to look for more advanced technology to upgrade ESP for enhancing dust collecting efficiency.

Either ESP renewal or ESP upgrade, both alternatives can be implemented field by field, starting from inlet field, where there is the highest dust concentration through to the outlet field with the least dust concentration during each maintenance period of the plant in order to harmonize with limited outage duration of the plant.

In order to have extensive understanding of ESP operation and some idea about the possible ESP problems encountered by the cement plants, our case studies sharing in the next topic will help end user to have better perception regarding how to properly take action towards different conditions of ESP.

I. Case Study

Quick Recovery of Control Room's Burnt Panel

Application

Cooler ESP of a cement plant located in Indonesia with capacity of 1.2 million tons per year

Problem

The control panel inside the cooler MCC room was totally burned out due to the short circuit that happened in the cable trench between cooler and raw mill. The power cables on the tray were also burned.

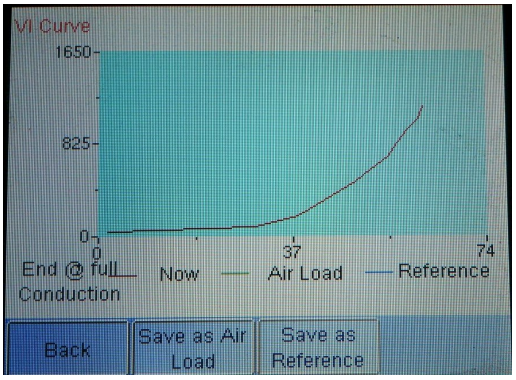
Burnt Control Panels and Wiring Cables removed from the Control Room

Solution

After the fire accident, Tai & Chyun's engineers immediately went on site for survey and measurement for new control panel. New control panels were requested to be designed, fabricated and transported to site within 8 weeks. Tai & Chyun sent electrical engineers for the installation and commissioning of the panels & controllers. The emergent recovery project was completed within three months, from on-site measurement, design, fabrication and 4 weeks for installation to commissioning in order to mitigate the plant's loss as much as possible. Other than the installation of the new control panels, maintenance jobs for auxiliary panel and PLC re-programming were also carried out.

Installed Control Panels

Benefit



VI Curve (After Installation)- 60kV/1200mA

- Emergency service of control panel design, fabrication and delivery within 8 weeks to support the plant's immediate recovery plan.
- Highly efficiency in installation/commissioning and on-site PLC programming/test service, thus reducing the downtime of the ESP and thereby meets the plant's target of minimizing the loss from downtime
- Stable performance of the ESP after recovery project
- Maximize transformer capacity to its set value

II.Case Study

Mechanical Revamping at Raw Mill ESP

Application

Raw mill ESP at cement plant in Vietnam with production capacity of 15,000 TPD

Problem

This ESP has been operated for about 7 years. Customer faced the serious problems with mechanical parts inside ESP such as falling down and bending parts, which caused a reduction in ESP collecting efficiency. This can lead further to the emission problem. Therefore, ESP mechanical revamping was implemented in order to improve ESP performance.

Bent CP

Detached GD Screen

Missing Hammer

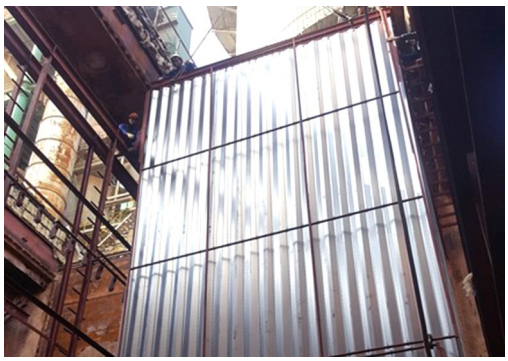
Missing CP

Solution

Tai & Chyun was awarded a contract to execute the ESP mechanical revamping project. We provided the mechanical parts, together with supervision for the whole installation process.

Accordingly, because of the poor mechanical condition inside ESP, we recommended customer to replace all the mechanical parts in all three fields of raw mill ESP in order to bring ESP back to normal condition.

Lifting Up CP



Installing CP

Inserting DE into Frame

II.Case Study

Mechanical Revamping at Raw Mill ESP

Installing Hammer

Installing GD Screen

Lifting DE into ESP

Benefits

After the completion of ESP mechanical revamping project, it helped ESP to regain back to its normal condition with newly installed mechanical parts including CP, DE, GD screen & rapping assemblies.

No load test on all fields showed no spark and arc with full load in primary current (Maximum rating: 380V,406A).

	Field 1	Field 2	Field 3
Primary amps (A)	402	406	406
Primary volt (V)	300	303	303

Newly Installed GD Screen

Newly Installed Hammer

Newly Installed DE

Newly Installed CP

III.Case Study

ESP Upgrade project at Raw Mill ESP

Application

Raw Mill ESP at cement plant, Thailand with production capacity of 38,500 TPD

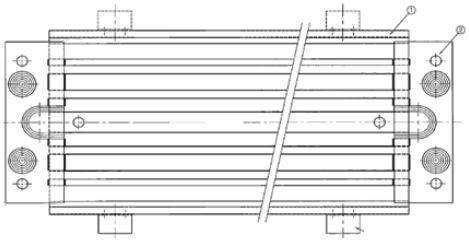
Problem

The Raw Mill ESP has been operated for more than 20 years. Some mechanical parts inside ESP have never been replaced since installation. Plant also planned to increase the current production around 16% from the present value. Moreover, customer expected to maintain emission limit at 50 mg/Nm^3.

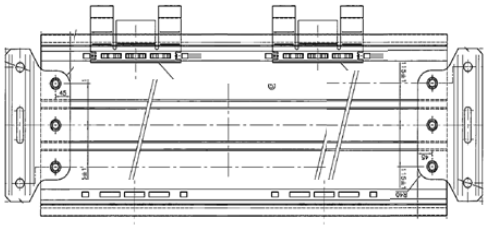
Solution

Tai & Chyun analyzed plant's data such as ESP original design against production increase, and then came up with the most economical ESP upgrade plan for improving ESP collecting efficiency to handle the increase in particulate emissions.

Tai & Chyun was awarded a contract to supply 2 fields of RDE and 4 fields of newly modified design of CP that is compatible with the old type, but with stronger interlock, together with two units of high frequency transformer (HFTR) installed at the ground level for 3rd and 4th field of ESP in order to improve the efficiency of high voltage output.



Old CP Design



New CP Design

Installing HFTR

Installing Controller (As part of HFTR Installation)

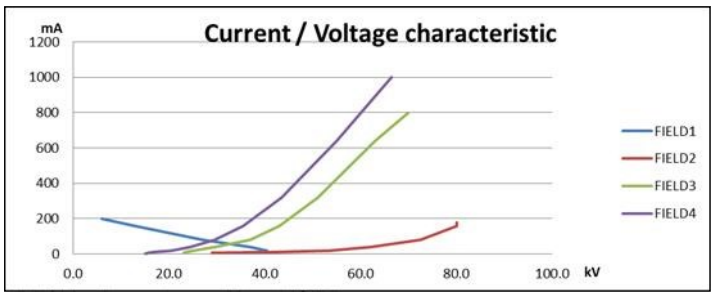
Installing CP

III.Case Study

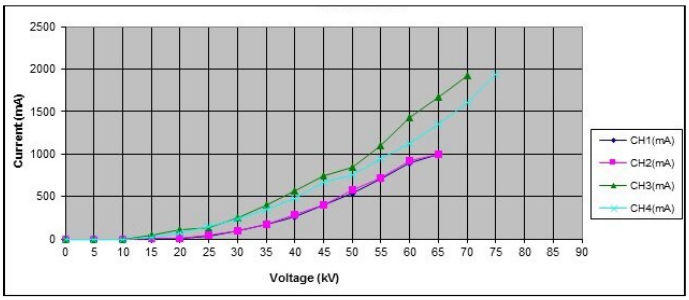
ESP Upgrade project at Raw Mill ESP

Benefit

After upgrade, new RDE and CP together with HFTR can operate with better power input into the ESP at a higher voltage level, providing more kW into the ESP. VI curve before and after replacement is shown as below.



VI Curve - Before

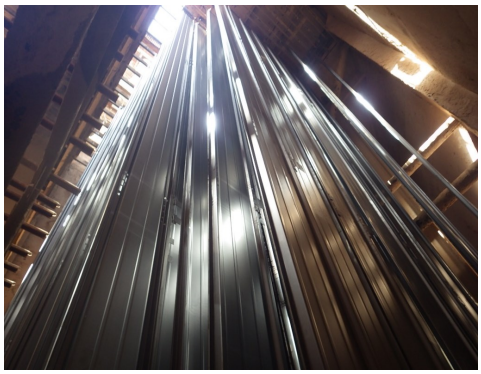


VI Curve - After

Installed HFTR in 3rd and 4th Field of ESP

Installed HFTR

Installed Controller



Installed CP

In addition, the emission result also showed the value below 35 mg/Nm^3, successfully fulfilling customer's requirement. Moreover, HFTR can be placed on the ground according to the current location of transformers, reducing the installation difficulty and bring convenient service to customer.

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