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Part 3

ASH AND SLAG HANDLING

3.2. Ash and slag handling systems at TPPs

3.2.2. Ash removal

3.2.2.2. Experience of implementing Clyde Bergemann technologies of ash removal and transportation at power units of 300 & 500 MW at coal-fired TPPs

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ABSTRACT

Environmental regulations demand great efforts from energy utilities to reduce the polluting load from power generation. Till now, many efforts have been dedicated to reduce particularly gaseous emissions. In the same time, the privatised energy markets are demanding ever higher cost-effectiveness and utilisation of ashes produced.

Application of effective fly ash removal systems is able to conciliate these often conflicting interests. In the paper *Clyde Bergemann* technology of fly ash removal and transportation is presented. Brief description of the various configurations of the Clyde Bergemann fly ash removal and transportation systems is given.

INTRODUCTION

Increasingly stringent environmental regulations have become a concern for many power engineering companies. In this regard power engineering companies which, include coal fired thermal power plants (TPPs) are examining how to reduce the emission levels from TPPs in the form of fly ash escaping up the stacks along with the flue gases, and also reducing the cost of using vast amounts of water to dispose of the ashes. To accomplish this they are looking to install modern ash removal and handling equipment and to achieve as close to a zero water usage as possible in all areas.

An answer to both these issues can be found in application of the Clyde Bergemann ash handling and transportation technologies. These technologies provide reliable removal of fly ash particles falling from the hoppers of fly ash extraction technologies such as ESP's (electrostatic Precipitators) or bag filters of TPPs burning coal and other fossil fuels, strongly increasing reliability and profitability of the ash extraction and disposal system, whilst also providing reduction of the environmental impact of the plant. The pneumatic fly ash handling system is designed to transport the fly ash in a totally enclosed manner utilising standard mild steel conveying pipes, completely eliminating dust emissions, whilst, in most cases, retaining the existing method of hydraulic ash transportation as a required option, with the use of drop chutes and diverter valves. Additional benefits include a higher reliability and dependability of the ash handling system in comparison with traditional lean slurry methods, resulting in decrease of forced emptying of ESP hoppers and reduced maintenance required.

The *Clyde Bergemann* technology is developed and patented since 1974.

1. DESCRIPTION OF THE *CLYDE BERGEMANN* ASH HANDLING AND DISPOSAL SYSTEM

1.1. Typical fly ash handling system configuration

Basic equipment of the *Clyde Bergemann* ash handling system consists of pneumatic conveying vessels, mild steel conveying pipes, silo termination equipment, conveying air systems and PLC control systems in varying forms and configurations. A typical Configuration of the *Clyde Bergemann* ash handling system is shown in the fig. 1.

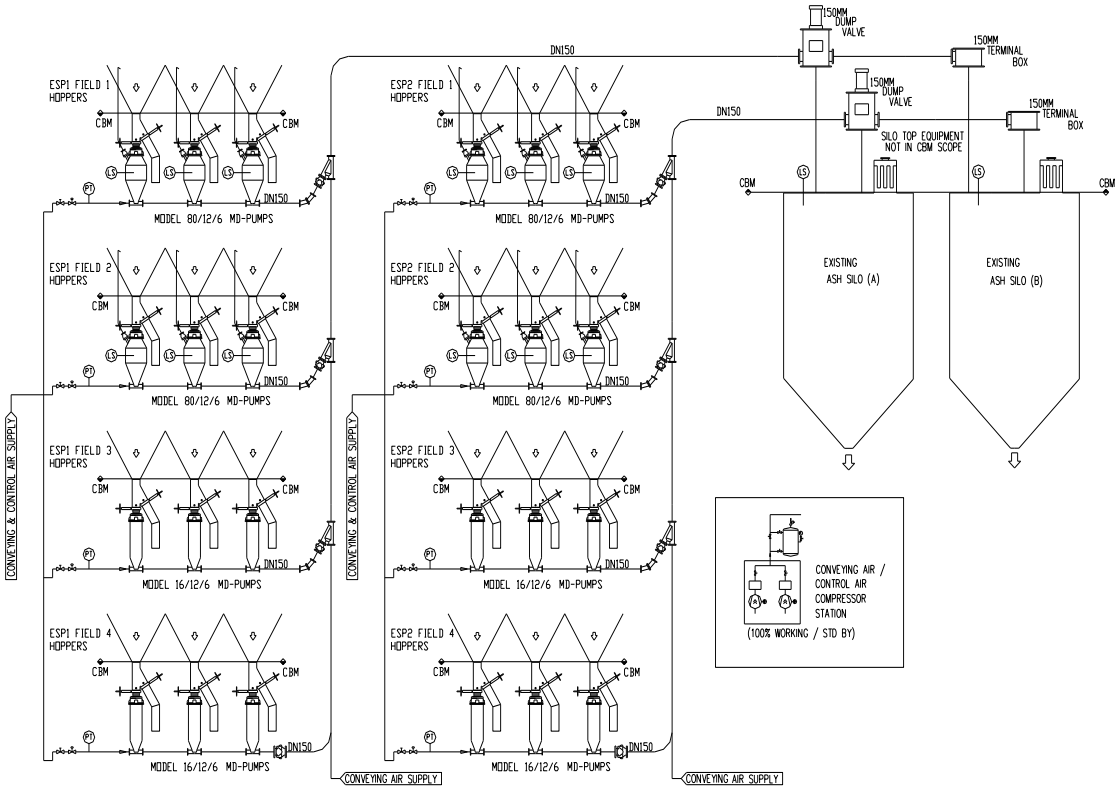

Fig. 1. Typical Configuration of Ash Handling equipment for a 2 x ESP system

1.2. Dome Valve®

The *Clyde Bergemann* Dome Valve® is incorporated into every *Clyde Bergemann* Fly Ash Handling system and is used in the most crucial area for pneumatic conveying systems, the air - material interface. A Dome Valve® typically used on the inlet of each conveying vessel is shown in Fig. 2.

The Dome Valve is unique in that it allows for unobstructed material flow through the valve when in the open position, resulting in virtually zero wear on the internal components of the valve. When in the closed position the valve is pneumatically sealed closed, completely isolating the ESP process from the conveying medium during the conveying cycle.

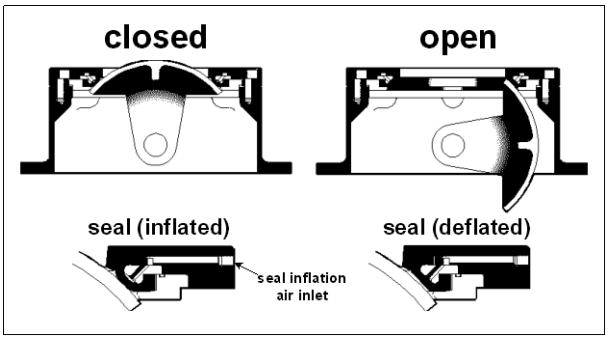

Fig. 2. Typical inlet Dome Valve in both closed & open states®

1.3. The *Clyde Bergemann* Dense Phase Conveying Process

Clyde Bergemann pneumatic conveying technology is based around the positive pressure type of conveying as opposed to negative pressure systems. Positive pressure systems can be further divided into three categories: Lean phase, medium phase and dense phase. *Clyde Bergemann* technology operates in the Dense-phase mode, this is the most energy efficient of all three modes, having the highest ash: air ratio and lowest conveying air consumption.

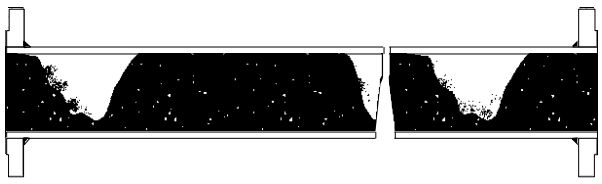

Fig. 3. Conveying pipe cross-section during dense-phase conveying.

The velocity of the material in the pipeline typically ranges between 1,5…10,0 m/sec resulting in the least

amount of system wear and maintenance. This type of conveying can handle a wide range of both wet and dry materials and can typically transfer fly ash over distances in excess of 1000 metres without the need for intermediate transfer stations.

2 Advantages OF THE CLYDE BERGEMANN FLY ASH REMOVAL AND transportation SYSTEM INTRODUCTION

Energy saving aspects

- Low conveying air consumption
- Low energy consumption
- Zero water consumption

Ecological aspects

- Pipelines can be laid underground
- Low noise emission

Financial aspects

- Low investment cost
- Low operating and maintenance costs
- Standard ‘off the shelf’ mild steel pipework utilised for pneumatic conveying system

CONCLUSIONS

Introduction of *CLYDE BERGEMANN* fly ash removal and transportation system instead of traditional hydraulic transportation systems allows the following:

- Increased dependability and reliability for both ash removal and transportation system and TPP;
- Lowering the cost of energy production in real terms;
- Considerably improving ecological parameters of TPPs;
- Emissions reduction;
- Bringing the TPP’s in line with stricter environmental regulations.