

# **Efficient Performance of Annular Type Sugar Dust Collector**

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## **Abstract:**

Sugar dust separation from the hot air vented from sugar dryer is not a big issue but have made it complex at many locations. Under line paper presents the design and performance of local made annular type dust collector. The design is based on the path deflection of sugar dust at 360 degree after passing through 90 degree bend followed by hot water spray in counter flow of sugar dust. The annular design dust collector was installed at fluidized bed sugar dryer No.2 at Ranipur Sugar Mills. The performance detail in comparative with the installed unit of dust collector at fluidized bed sugar dryer No.1 is shown. Results of Annular type dust collector are very much alluring. The Annular type dust collector is maintenance free, low in weight, simple in design & fabrication and also easy in installation and operation.

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## **Introduction:**

At Ranipur Sugar Mills two sugar dryers are installed each of 20 tons/hr capacity. Normally one sugar dryer is operated and second one served as standby. In Season 2010-11 both dryers were coupled with single dust collector (No.1). Dust catching problem was observed when both dryers were operated in parallel due to capacity limitation of the single dust collector. In off season 2011, second dryer was isolated from the dust collector No.1 and made it in line with home made sugar dust collector No.2. The sketch of Sugar dust collector No.1 called as “Shower Type” and Sugar Dust Collector No.2 called as “Annular Type” are annexed as A and B.

## **Material and Methods:**

In season 2011-12, both sugar dryers operated mostly as a single unit at a time and occasionally as parallel.

- a- Table No.1, below shows the performance parameters of each dust collector for the operation of 8 hrs interval as a single unit keeping almost equal sugar flow and other operational parameters in both cases.

**Table No.1**

**Laboratory Data of Wet and Dry Sugar Moisture  
and Water circulation Pol reading at Sugar Dust  
Collectors of both Sugar Dryers**

| <b>Sugar Dryer No.1</b> |              |           |                   |
|-------------------------|--------------|-----------|-------------------|
| Dated:                  | Feb.28, 2012 |           |                   |
| Sugar Production:       |              | 120 Tons  |                   |
| Shift Hours             | Moisture %   |           | Dust Collector #1 |
|                         | Wet Sugar    | Dry Sugar | Pol Reading       |
| 0000 – 0100             | 0.19         | 0.06      | 0.90              |
| 0100 – 0200             | 0.17         | 0.04      | 2.00              |
| 0200 – 0300             | 0.18         | 0.05      | 3.80              |
| 0030 – 0040             | 0.18         | 0.05      | 8.60              |
| 0040 – 0050             | 0.19         | 0.05      | 12.30             |
| 0050 – 0060             | 0.17         | 0.04      | 15.80             |
| 0060 – 0070             | 0.19         | 0.06      | 17.20             |
| 0070 – 0080             | 0.17         | 0.05      | 19.40             |
| Avg Moist %             | 0.18         | 0.05      |                   |
| Rise in Pol Reading     |              |           | 18.50             |
| <b>Sugar Dryer No.2</b> |              |           |                   |
| Dated:                  | Feb.28, 2012 |           |                   |
| Sugar Production:       |              | 110 Tons  |                   |
| Shift Hours             | Moisture %   |           | Dust Collector #2 |
|                         | Wet Sugar    | Dry sugar | Pol Reading       |
| 1600 – 1700             | 0.19         | 0.06      | 1.10              |
| 1700 – 1800             | 0.18         | 0.05      | 1.70              |
| 1800 – 1900             | 0.17         | 0.05      | 2.40              |
| 1900 – 2000             | 0.18         | 0.05      | 3.80              |
| 2000 – 2100             | 0.17         | 0.06      | 4.20              |
| 2100 – 2200             | 0.19         | 0.06      | 5.40              |
| 2200 – 2300             | 0.19         | 0.06      | 6.70              |
| 2300 – 2400             | 0.17         | 0.05      | 8.40              |
| Avg: Moist %            | 0.18         | 0.055     |                   |
| Rise in Pol Reading     |              |           | 7.30              |

- b- Summary of electric load operation of sugar dryers and water circulation pump for dust collectors and Laboratory data for sugar moisture at the inlet and outlet of the sugar dryers and hourly pol% analysis of water circulation through the dust collectors for both sugar dryer are given in Table No.2

**Table No.2**

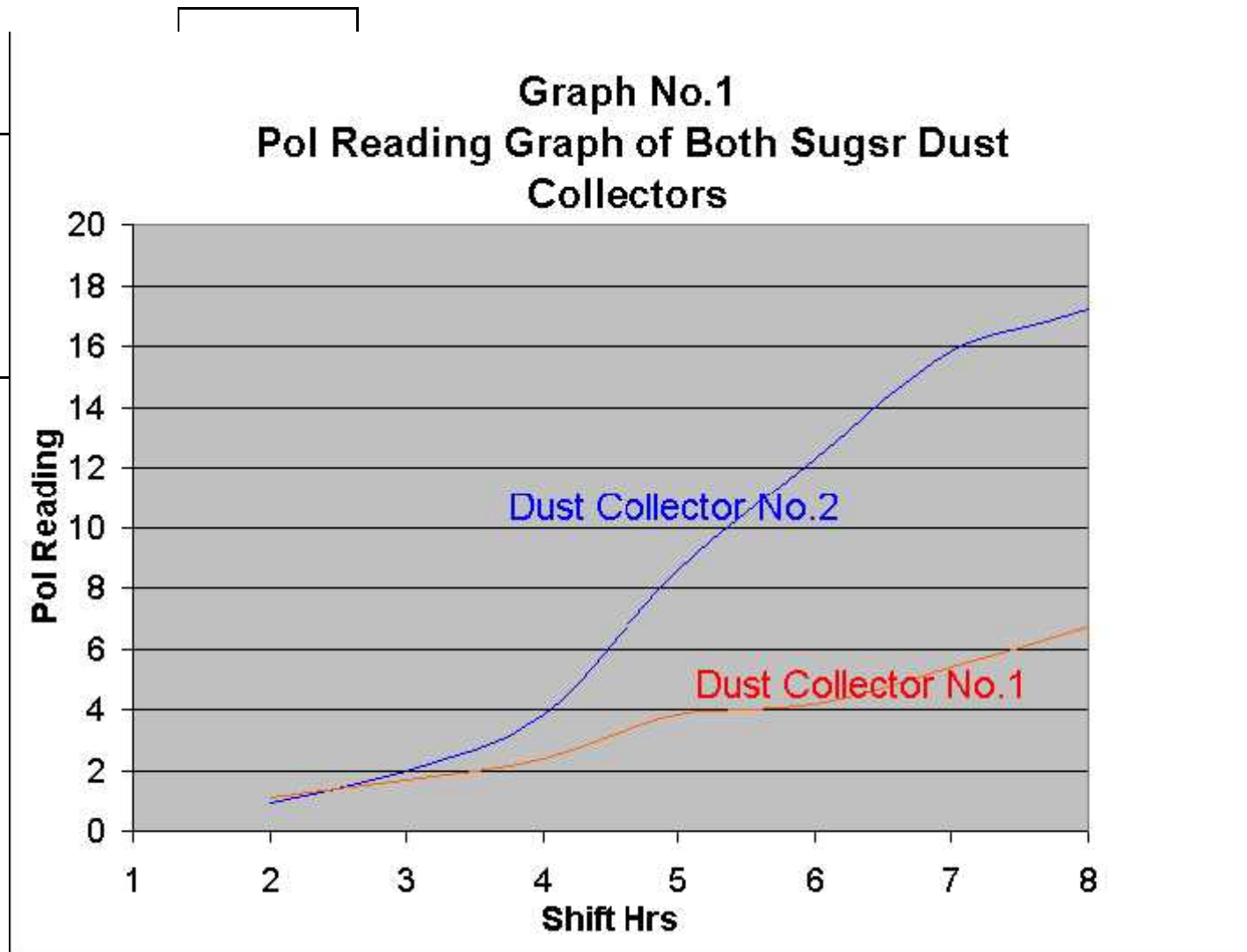
**Technical details of the both Sugar Dryers (Identical Units)**

|           |                                                          |
|-----------|----------------------------------------------------------|
| Type:     | Fluidized bed with Induced draft sugar dust catching Fan |
| Capacity: | 20 Tons/hr                                               |

**Electric Load detail:**

| Description          | Installed Load |        | Running Ampere | Rpm      |
|----------------------|----------------|--------|----------------|----------|
|                      | Hp             | Ampere |                |          |
| Drive unit           | 10             | 15.6   | 11 - 12        | 1450/356 |
| Hot Air Blower No.1  | 3              | 4.5    | 2 - 3          | 2900     |
| Hot Air Blower No.2  | 3              | 4.5    | 2 - 3          | 2900     |
| Hot Air Blower No.3  | 3              | 4.5    | 2 - 3          | 2900     |
| Cold Air Blower No.1 | 3              | 4.5    | 2 - 3          | 2900     |
| Cold Air Blower No.2 | 3              | 4.5    | 2 - 3          | 2900     |
| Dust Catching ID Fan | 10             | 15.6   | 13 - 14        | 1450     |

- c- Graph No.1 Shows below the pol reading rising curves of Sugar Dust Collectors No.1 and No.2 with respective to leading time of shift hours for 8 hours.



### **Principal Operation of Annular Type Dust Collector No.2**

Principal operation of annular type dust collector based on the path deflection of sugar dust and hot water spraying in counter flow of the dusty air. As shown in the sketch # (annexure – B), the air carrying sugar dust particulars 1<sup>st</sup> strike with the deflection plate which break the velocity of dust particulars and heavy particulars could not return back at 360 degree due to gravitational forces. The remaining lighter particulars arrested in water spray during counter flow of the dusty air while leaving the dust collector. Spraying water dissolved the heavy and light dust particulars at the surface of deflection plate and flowed out with out going sweet water stream from the dust collector. The degree of the deflection plate also helps to flash out the semi dissolved sugar particulars with out going sweet water solution. The loop valve installed in out let water line serves to control the water level in the bottom of the sugar dust collector and also provide check to flash out dusty air with out flow water from the dust collector.

## **Results and Discussion:**

- 1- Pol Graph shows;
  - a- Leading pol reading of the annular type home made dust collector in 8 hrs in comparative with Shower type sugar collector.
  - b- In other words annular type dust collector recycles the more sugar to process house than Shower type dust collector, hence it is more efficient than Shower type sugar dust collector.
- 2- Annular type dust collector is simple in design, erection, installation and operation.
- 3- Annular type Sugar Dust Collector requires no inside manual cleaning

## **Conclusion:**

The Laboratory results indicate best performance of the annular type home made sugar dust collector. More over this is less weight, cost economic, build in line maintenance and trouble free in operation.