



Eco-Friendly Ginning Technology for the Processing of Seed Cotton

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Abstract: Globally agriculture processing operation uses Cyclones as the most common type of emissions control device. Their efficiency, reliability, low-cost, and very little maintenance is what makes them use the most. Depending upon the correct and effective use, cyclones separate particulate matter from air streams, making sure that Environmental Protection Agency (EPA) of the province and centre stays satisfied according to the rules of air pollution regulations.

Keywords: Ginning, Eco-Friendly, Nuisance Emission, Cyclones.

1.

INTRODUCTION

Ginning is a prime subject of textile engineering also integral part and research subject of agricultural machinery engineering (Green, *et al.*, 2008). In Pakistan, ginning factories are not producing a medically safe, environment because a nuisance at dust in their operations (Wang, *et al.*, 2002) From sowing of cotton up to ginning in Pakistan is carried over eight to nine month span every year (Funk, 2000) Picking of cotton can be done by three methods; manual, spindle picker and a stripper harvester (Paul, *et al.*, 2000) In Pakistan most of picking of cotton is manual, and the machinery being used for ginning is generally very old (Baker *et al.*, 1996). During the ginning cotton lint attached to cotton seed is separated primarily, the second function is to partially remove foreign matter (like dirt, dust, leaves and stalk) to the level achievable without damaging the cotton fibre (Hughes, *et al.*, 1994) . During this process cotton lint together with the foreign matter is passed through an air stream at a speed of about 3000 feet per minute (Mihalski, *et al.*, 1993) .(Mihalski, *et al.*, 1992) At this stage the cotton seed is separated from the lint and the cotton lint is separated from the remaining foreign matter downstream. The actual problem starts at this stage. Afterwards, cotton is pushed into the bale press for compression and consignment. Now the dust has to be collected and because the residual matter is so fine, no reasonably economical system currently exist that has the ability of catching all of the dust. Since the dust escapes from the gin, it falls in the vicinity of houses, roads, cars, etc. As mentioned already this dust is medically dangerous, however it is an irritant to the neighbours. Poor neighbours never ever bother to lodge any complaint to Environmental Protection Agency (EPA) in Pakistan.

2.

MATERIAL AND METHOD

The ginning process of cotton fibre separates the lint from cotton seed during the disposal of the waste of raw cotton and lint fibbers. The materials in this system are manually / pneumatic flow processing and numerous conveyor discharge points. As seen in general the cotton gins are stationary emission source but they are not severely synchronized under the nuisance standard of EPA (Environmental Protection Authority) in Pakistan. As all ginning factories need to have equipments for air pollution control to comply with Environmental Protection Authority`s rules and regulations.

In Pakistan, the dusty whirlwind has never been used as a control material of the air pollution in cotton ginning industry. China has recently developed low-pressure cyclones for its cotton ginning industry. These cyclones are designed to give inexpensive substitute control for all the exhaust places. During the current days, this technology seems as best available for the collection of the emitting dust from the ginning factories. It is seen as the technology that will be very useful in near future.

The hypothesis of this research study is for the use of cyclones used for different process streams in a cotton ginning system to minimize the total particulate matter emissions.

The overall goal of this hypothesis research study is to emphasis on the necessary use of cyclones at our ginning industry to control fly ash, fine or large trash the other coarse gin trash as to maintain an eco-friendly ginning technology for the processing of seed cotton.

3.

RESULT AND DISCUSSION

According to Environmental Protection Authority, the maximum limit for the release of nuisance is 2.24

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pounds per bale. The normal weight of a bale is about 170 kg. According to the Pakistani ginners, gin operates at about 3-4 bales per hour. Gin stands are required to have nearly 100,000 ft³ per minute of air flow. This air stream must also be cleaned as per the EPA to normal standards.

The devices in China for the separation of dust from the air stream of a cyclone are a bag house system. These devices use a cyclone system of 8-10 pre-separators or cyclone systems. Each of these devices is especially designed for the particular ginning factory where the system has to be installed. The design of cyclones is such that they have a tapered conical shape (the tip is pointed downward) and need an entry air velocity of 3000 linear feet per minute. Efficiency of the cyclone depends upon the size of the contaminants particles in the stream of air. The efficiency of cyclone is given by the following equation:

$$\eta = \frac{1}{1 + (P_1 / P_2)^2}$$

Where P_1 is the smallest particle size and P_2 is the average particle size in mm. This efficiency depicts the percentage of waste exiting from the cyclone over the waste fed to the cyclone.

4. MEASURES FOR POLLUTION CONTROL

The major pollution problem in ginning is relates to dust. In this context, the source of this pollutant can be controlled with installation of cyclones which are the most desirable methods for pollution control and environmental improvement. (Fig.1-2) Pneumatic and mechanical conduct of the raw and ginned material has proved to be very useful in China for the control of escaping emission of the ginning factories. These include over head hood and covered ducts which are connected to the exhaust through cyclones.

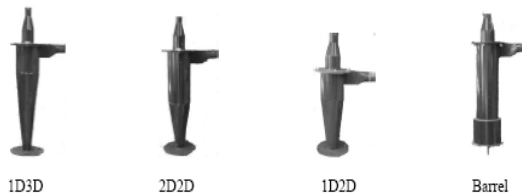


Fig.1 Configuration of the cyclone designs

Cyclones are best for the air pollution control to minimize the particulate matter emission concentrations.

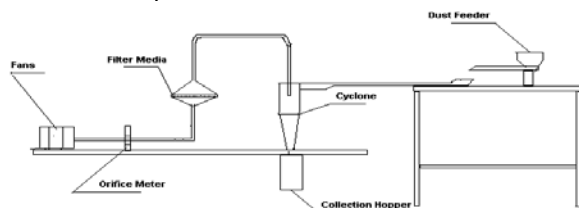


Fig. 2 Schematic of the system used for cyclone testing

5. CONCLUSIONS

Pakistan cotton contains high amount of trash, which is about 3%. The manual handling contributes to such high level of impurities. The study reveals the environmental conditions of the ginning industry of Pakistan.

It is concluded that cyclones are very essential units for ginning industry; these cyclone units provide a high working efficiency for the collection of fine dust and large trash. On the other hand use of different designs of the cyclone in the processing air stream of the ginning factories depends upon the trash characteristics in the stream.

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