Concrete Batch Plant

CAE 577

Construction Equipment and Management

IIT,Chicago.Date-04/07/2015

Instructor: Dr.D.Arditi

SUBMITTED BY

Anshul Patil

Table of Content

INTRODUCTION

Emergence of modern technology in every field of life has made critical tasks and life much easier. As a result the advancement in Building construction due to emergence of new equipment's has made the industry life much easier and faster. Now we can create tall buildings in few days. Concrete batching plant is one of the technological advancement or a gift to the construction industry. It speedup the whole construction process by providing ready mixed concrete on time and in bulk.

A Batch plant/batching plant or in simple terms concrete plant is a device that mixes various ingredients required to make concrete. As concrete in general consists of cement, sand, aggregate and water in spite of general ingredients it also mixes fly ash, potash etc kind of other ingredients to prepare required concrete mix. Concrete was mixed manually before the invention of concrete mixers; in 20th century self loaded mixers were introduced to increases concrete productivity. As the production increases need of large concrete batching plant came. These plants have advanced features like computerized control, improved mixing and many more.

A concrete batching plant has variety of parts like mixers(tilt up or horizontal or both),cement batchers, aggregate batchers,conveyors,aggregate bins, cement bins, heaters, chillers, cement silos, control room and dust collector. The models of concrete batch plant are continuously improving with the growing demand of required customers.

(Batch plant)

TYPES OF BATCHING PLANT

In general there are four types of batching plant

1. Transit mix plant
2. Central mix plant.
3. Stationary Batch Plant
4. Mobile Batch Palnt

Transit Mixed Plant = A Transit mix plant or “dry mix” is that plant in which all ingredients’ cement aggregate is mixed dry and water is added when it is transferred to transit trucks ,this result in precise mix..

Central mix concrete = In central mix plants all the ingredients required to make concrete is mixed in plant along with water. Then the product is transported to the job site. The only difference between ready mix plant and central mix is that they offer end user more consistent product, since all mixing is done in centralized location using computer system hence product is uniform.

Mobile and Stationary Batch Plant= Both of the above batch plants can either be stationary or mobile, in mobile plants the formwork is portable and it can be built onto truck trails .While a stationary one can be a solid building and open formwork. Mobile batch plants and stationary batch plant. As the name suggests the mobile plants can be transported to the new location as required by the user while the stationary plants are bulk ones that cannot be transported frequently as the demand of user.

MOBILE BATCH PLANT

PARTS OR BATCHING PLANT

Cement Batchers=A cement batcher is that part of batching plant in which cement is first fed and measured and combined into batches before discharging it to concrete mixer.

Aggregate batcher = It is that part of batching plant in which aggregates are fed and measured into batches before discharging to concrete mixer.

CEMENT AND AGREGGATE BATCHERS

Conveyors = It is a mechanical apparatus that is used to transport cement, aggregates into the mixing unit through there batching area, it is mostly belt type conveyor used in batching plant.

Radial Stackers = The work of radial stacker is to transport ingredients and finished product.

CONVEYOR RADIAL STACKER

Aggregate and Cement Bins = These as the name suggests are the bins used to stack raw materials like cement and aggregate that are further used in concrete making process.

AGGREGATE AND CEMENT BINS

Cement Silo = Cement silos are on-site storage containers used for the storage and distribution of various types of cement mixtures. Silos of this type come in a variety of sizes, making them ideal for use at many kinds of construction sites. A cement silo can be a permanent structure, or a portable model that can be relocated when necessary. Like many other types of silos, the cement silo usually is equipped with some type of blower to help expel the stored contents into a truck or other receptacle.

CEMENT SILOS

Batch Plant controls = Now this makes a batching plant even more popular, its control system that is combination of electrical and computerized unit that controls and plans the batches. This is a programmed system which gives command to make desired quality and quantity of concrete. This is most important part of batch plant and operator should have sound knowledge to operate the system. Different stages of work are easily seen in the system, like how weight is took how mixing is done and where is work going.

Heaters Chillers and dust collectors are also parts of batching plant which help in controlling temperature of mixer and dust collectors collects the dusts and dump it outside.

BATCHING PLANT CONTROL SYSTEM

Transit Truck = These are the trucks that carry mixed concrete to job site; they are installed with a water pump inside them if transit mix is prepared by plant.

Above are the general and main parts of a concrete batch plant, but according to customer demand few parts are enhanced and installed in the equipment. If a batching plant is mobile then a truck system is along with the equipment to transport it from one place to other.

HOW IT WORKS

Working of a concrete batching plant is very simple if someone is easy with control system operation.

Here is step wise brief description of a normal concrete batch plant operation.

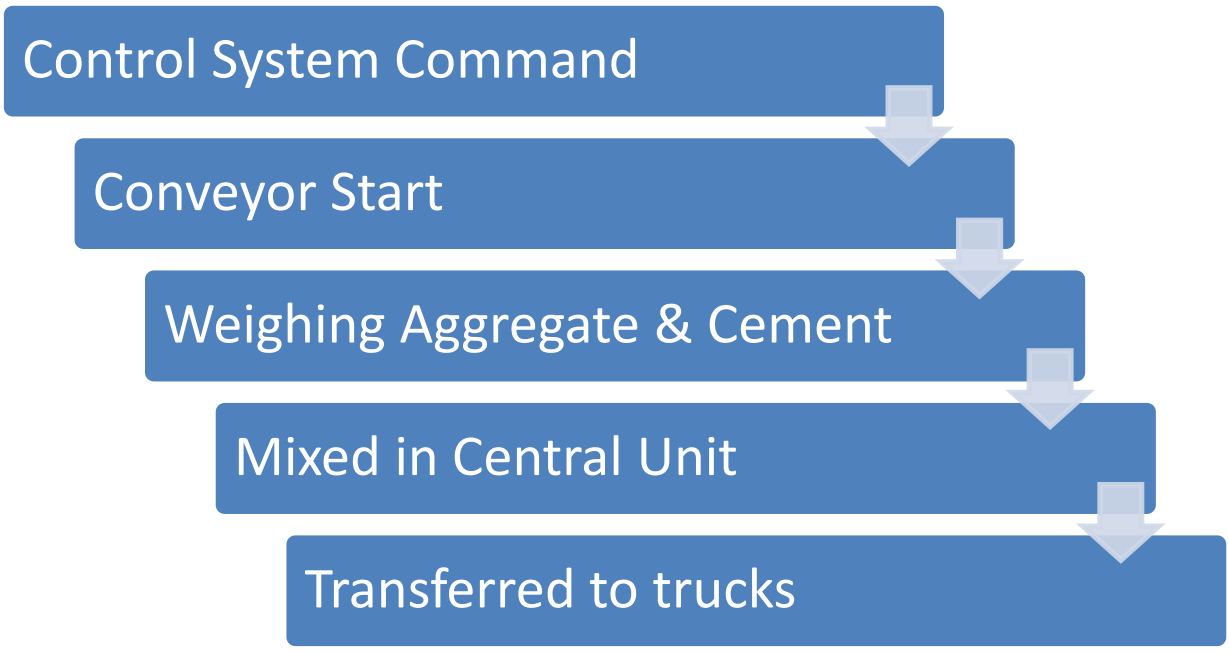
1. When the electricity is supplied to the control system a human and machine interface starts working in coordination, computerized system is set of formulas, quantity figures and programmed according to different ratios and proportions of concrete.

2. As the control system starts and a command is given to the system regarding the ratio of different ingredients' used in making concrete, then the conveyor starts and take aggregates to the weighing Hooper.

3. After this weights of water and other ingredients are taken by opening their respective doors.

4. As the weighing part completes next the mixing of all ingredients is done in central mix.

5. After the mix is done it is transferred to the trucks that take the concrete batch to the work site.



WASTE FROM BATCH PLANT-

As a Batching Plant is very big Unit and Produces tons of concrete then there is few Environmental aspects are related to the Plant. After the studies it is found that a batching plant produces so many wastes and pollutant to the outside world, Few of them are discussed below.

1. Fugitive Emission-When the loading and unloading of aggregates and sand are done it generate a wind erosion that is fugitive in nature , these dust is one of the pollution source around the batch plant. But this kind of emission is not taken into account while building a batch plant as its very low.

2. Silos emission-Unloading of cement and cemented material in silos comes in this category, as cement mix contain moisture it is kept in enclosed system. The emission generated by this process is generally passed through a bag house located at the top of the storage tank, hence silos are designed accordingly.

3. Transfer to elevated storage bins-Emissions are generated when aggregate and sand fall from conveyor or from buckets into the elevated storage bins. It is sometime suggested to partially enclose this to reduce this emission. This emission is taken as volume source and reduction may be applied accordingly.

4. Cement Weigh Hooper loading-The emission is observed while cement is weighed from hoper. The exhaust from this source is usually vented through a cartridge filter or a bag house fitted next to it.

5. Truck Mix-When the cement, aggregate supplements are loaded in truck it generate few emission that is to be taken care, for that a bag filter is installed. Measure is taken to calculate the source and accordingly design of batch house is done.

6. Boiler-In few seasons when weather is very cold we need boiler to heat the water needed for concrete preparation, this will produce vapors and that contains pollutants that should be reduced by proper modeling the source.

7. Generator-A power plant require generator to run its conveyor and other systems that will produce heat and other emissions.

ADVANTAGES OF BATCH PLANT

1. Batching plant is useful when concrete is needed in bulk at a site.
2. It helps in preparing same quality concrete.
3. As it is computerized program, so we can make different ratios.
4. It can prepare both Ready mixed and Central Mix Concrete.
5. It is a Mechanized operation therefore reduces labor, Site supervising cost.
6. Using a Batch plant in site helps in reducing Project time that is very great for project managers.

REFERENCES

1. Construction magazine

2. http://www.nationalconcrete.com/

3. http://www.nrmca.org/

4. Paper on Modeling Guide of Batch plant, Iowa Department of natural recourses

5. Wikipedia

6. Google Images