What is admixture

Admixture is a **chemical and natural** substance. It’s used in concrete for changing or modifying the **concrete properties**and Admixture is one of the main materials that is used in the concrete.

Why admixture used in concrete

The admixture is not a **mandatory material** in concrete. The concrete is a mixture of cement, fine aggregate (sand), coarse aggregate (stone) and water. Admixture is used only **for the requirement** to increase or decreases the concrete setting time and etc… Admixtures are mostly used in the Ready mix concrete plant (**RMC**), implant Rmc and construction site. The admixtures are adding before the batch or batching process running.

 Types of admixtures

They are two categories of admixtures

1. chemical
2. mineral

Chemical admixtures

1. Plasticizers
2. Superplasticizer
3. Retarders and Retarding plasticizer
4. Accelerators and Accelerating plasticizer
5. Air-entraining Admixtures
6. Damp-proofing and Waterproofing Admixtures
7. Water retaining
8. Dual function or Multiple admixtures
9. Specially admixtures
10. Corrosion inhibitors
11. Shrinkage reducing admixture
12. Alkali (Aggregate reaction inhibiting admixture)
13. Pozzolanic
14. Gas forming admixtures
15. Grouting admixtures
16. Workability admixtures
17. Bonding admixtures
18. Fungicidal, Germicidal, Insecticidal admixtures

Mineral admixtures

1. Fly ash
2. Silica fume
3. Blended hydraulic cement
4. Metakaolin
5. Rice Husk
6. Volcanic ash
7. GGBFS

Chemical admixtures are

Plasticizers Admixture

* The plasticizer is used to reduce the **water content** in concrete without **affecting the workability** of the concrete. It achieves high strength by decrease the water-cement ratio at the same workability. That enable approximately **15 to 20%** less water content in the production of concrete.
* This chemical is commonly used in PVC (polyvinyl chloride), polymers like plastics and rubber. Because it makes it softer and more flexible, plasticity increases, viscosity and friction decrease its handling in manufacturing.

Superplasticizers Admixture

* Superplasticizers, this admixture is the **next level of**plasticizers. The reduction of water content in concrete is higher, compared to plasticizers and makes high strength.
* This admixture used concrete is a low slump in slump cone test into a flowing and pourable. This concrete is easily placed.
* This concrete is to improve the workability, increase the strength, conserve cement, speed finishing and it helps to reduce shrinkage and thermal cracking.
* This chemical enables approximately **30% or more** to allow a reduction in water content.

Retarder and Retarding plasticizer

* Retarder and Retarding plasticizer admixture is used in concrete to **slow down** the rate of setting time process in the concrete, by slowing the **initial setting time**. Also to increase the workability of concrete
* Concrete is set easily in hot weather and concrete also is a high-temperature component, so this admixture is used in concrete
* Retarder admixture is mostly used to transport the concrete from one place to another place (if its need). Otherwise, the uses of this chemical are low.
* This chemical is not used in **cold weather**
* The **water-cement ratio** is only affected by using retarders. Complex concrete placement of grouting.

Did you know?

Sugar is a well-known “retarder” of concrete and it’s often used to help adjust the setting times, **especially in emergencies**

Accelerators and Accelerating plasticizer

* The accelerator admixture process is the opposite of retarder admixture
* This chemical is used to increase the setting time of concrete by increase the initial setting time
* Increase the rate of  hydration value of hydraulic cement and shorten the time
* Calcium chloride is a well-known accelerator chemical
* A calcium chloride of **2% by volume** is a standard calcium amount to increase the setting time of the concrete. (the volume of calcium is **changed** by the requirements)
* Used in winter time and to prevent **frost damage** in concrete.

Air-entraining admixture

* Air-entraining admixture, the chemical creates the **microscopic air bubble** during the mixture of cement paste and to prevent the air from entraining the concrete
* The air bubble is tightly bonded so the water also struggle to enter the concrete
* The bubble usually increase its resistance to freeze**-thaw** and also improve the workability

Damp proof and Waterproofing

* Damp proof and waterproofing admixture is preventing the **water from entering** into the concrete
* This admixture is widely used in the damp course in the building at the above **plinth level surface** and the waterproofing structures, like a dam and etc…
* Also used in the substructure of the building and the structure

Water retaining

* Water retaining admixture used to increase the **strength and workability** of concrete and to reduce the cost
* Improve the stability of concrete mix ratio made with poor **quality aggregate**
* The durability of concrete is to increase and reduce the separation of water (**bleeding**)
* The surface of the concrete is improved and architectural quality

Dual function or Multifunction

* Dual function or Multifunction admixture, the single admixture can do the multiple functions.
* The adding of two or more admixtures or single admixtures can do the dual or multiple functions.
* Like, the conflict**bond retarder** is improving both mixing water efficiency and delay the initial setting time of concrete

Corrosion inhibitors

* Corrosion inhibitors are mostly used in **reinforced cement concrete**
* to prevent the **corrosion** of steel in the structure

Shrinkage reducing

* Shrinkage reducing admixture is used to reduce the level of shrinkage in concrete
* They are used in a rather large amount in contrast to other concrete admixture
* Shrinkage is reduced and it also directly follows the less energy is available for deformation

Pozzolana admixture

* Pozzolana is an admixture for the **replacement** of the cement
* Pozzolana is a broad class of **siliceous and luminous**material
* Adding to the existing concrete mix without removing an equivalent amount of cement increases the paste content and decrease the water-cement**ratio**. Adding more pozzolana to a mix changes the mix proportions

Gas forming

* Gas-forming admixture is preventing the **settlement** and **bleeding** by creating the **bubbles** in mix, like water entraining admixture
* The admixture help maintain concrete initial volume, And it’s also lightweight concrete
* Hydrogen peroxide, aluminium powder or activated carbon is used to make**lightweight concrete**

Mineral admixtures are

Fly ash

* Fly ash is a **replacement** material for cement in some volume
* Fly ash is a **coal waste** product that acts a lot like cement
* Improve the workability of  concrete and the strength and durability of hardened concrete
* The adding of Fly ash, some amount of cement may be reduced

Silica Fume

* Silica fume is also known as **micro silica**, is an amorphous polymorph of silica dioxide.
* A sufficient quantity of silica helps for the formation of **di-calcium and tri-calcium silicates**
* improve the strength of cement and decrease the setting  time of cement

Blended hydraulic cement

* Blended hydraulic cement consist of an intimate and uniform blend of **ordinary portland cement and fine pozzolanic material**
* The cement in which part of the clinker is substituted with other materials

Metakaolin

* Metakaolin is a DE hydroxylated form of the clay mineral **kaolinite**
* metakaolin has a smaller particle size and higher surface area compared to portland cement, but a larger than silica fume
* Metakaolin is a pozzolan. the most effective pozzolan material for use in cement

Rice husk and volcanic ash

* Rice husk is used in a fine state and adding the additional product of concrete. Rice husk is a by-product of rice
* Volcanic ash is used as fly ash, but the properties are changed for both ash

GGBFS

* GGBFS (**Ground granulated blast-furnace slag**)
* This is a cementitious material whose mail use in concrete and is a by-product from the **blast furnaces** used to make iron
* Blast-furnaces operate at temperatures of about **1500 degrees Celsius** and are fed with a carefully controlled mixture of iron ore, coal, and limestone.

NOTE

1. All admixtures are used for the unique purpose
2. The volume of admixture and need of admixture is based on the requirement