Benefits of Volumetric Mixers

There are a number of factors that must be addressed when producing concrete. The most important aspects to any project can be grouped into 3 categories:

I. Application – What application will the concrete be needed for?
II. Quantity – How many cubic yards of concrete will be needed?
III. Quality – Are there specifications or mix designs that must be met?

A volumetric mixer, or mobile concrete mixer as it is sometimes also called, is an on-demand concrete production solution. A mobile concrete mixer is a batch plant mounted on a chassis–usually a truck or trailer–and carries unmixed material (sand, cement, coarse aggregates, water and any other materials or chemicals needed for more specialty applications) to a job site and mixed on a continuous or intermittent basis as required for fresh maximum strength concrete.

Volumetric proportioning is based on volume not weight so through an easy calibration process it is possible to produce concrete that will consistently meet or exceed the tolerances set in ASTM C685 and AASHTO M-241 standards as well as DOT requirements. Mix designs can be changed or altered without moving the machine; the operator can make adjustments at any time as required for the job site.

This document will be used to highlight the benefits of using a volumetric mixer over alternative methods of production.

I. Application

VMMB Certified volumetric mixers are designed to give customers more control over their concrete. As opposed to rotary drum mixers, mobile volumetric concrete mixers allow for an efficient and more environmentally friendly method of producing and pouring concrete. Our solution produces the exact amount and slump of concrete needed at the precise time, eliminating scenarios of under or over-ordering concrete that will ultimately be wasted. As a result of mixing on-site, our solutions require less water, generate less waste and consume less fossil fuels lowering our carbon foot print.

These mixers have been used for a wide range of applications over the past 50 years. Any amount of concrete can be produced from a yard to 400 yards or greater per day for continuous pouring as long as the unit is re-loaded with materials at the job site. Due to material being stored in separate compartments, a single volumetric mixer can change mix designs on the fly without ever returning to a batch plant or dumping unused material. An operator could easily pour 5,000 PSI concrete, select a different mix design through the control panel and a few seconds later pour a low strength flowable fill.

- Application list:
    - Infrastructure, municipality, precast, remote jobsites, shotcrete/gunite, military, utility, mining, airports, bridge decks, foundations, pervious, soil stabilization
    - Fast setting applications – when time is critical to reopen roads, bridges and airport runways volumetric mixers are the only type that work with fast or rapid setting cements.

II. Quantity

Compared to traditional drum mixing, mobile volumetric mixing offers the construction world complete control of their concrete. Volumetric mixers are mounted on trucks or trailers and contain all the necessary ingredients to produce and deliver concrete. These concrete mixers are called volumetric mixers due to their ability to measure raw materials using volume rather than weight. There is not a minimum amount that needs to be produced. Ingredients are mixed on site and only to the specific amount that's required. Material can be delivered to different locations, on one trip from the plant, each which may only require one, two or less than a yard of concrete. If needed volumetric mixers can carry up to 12 cubic yards of capacity; however, if material is stockpiled, the unit can be reloaded continuously on the site, extending the amount of concrete produced to whatever amount is needed. A volumetric mixer is the most flexible method for handling construction projects. With material ingredients stored in separate containers and bins, project delays can be easily managed with no waste, overmixed or hot loads.

III. Quality

VMMB Certified volumetric mixers meet all of the requirements for certification as detailed in ASTM C685, AASHTO 241M and the VMMB standards. These documents were written and adopted to ensure that concrete produced in a volumetric mixer is of the exact quality as produced in a certified Ready Mix plant. The material produced by either a plant or a volumetric mixer must meet the same tolerances and pass the same tests. The Volumetric Mixer Manufacturer Bureau (VMMB), was originally organized in November, 1999 with the assistance of the National Ready Mixed Concrete Association (NRMCA). The VMMB states the Bureau was founded for several reasons to 1) to develop, in conjunction with ASTM and ACI, a standard for which this equipment can be rated; 2) to promote the use of this equipment through education and awareness; and 3) to improve the professionalism of both the manufacturers and operators of mobile mixers. In February of 2001 the first edition of VMMB 100-01, the Volumetric Mixer Standards were published. As with the other Bureaus, only units that are built to these Standards, and pass all the required tests, are eligible to receive and display the VMMB registered rating plate. Each of these is numbered, and cannot be transferred to another unit. This plate is a guarantee that the unit it represents met all of the requirements for capacity, accuracy, and consistency that have been established for the industry at the time of manufacture.

Concrete produced at a batch plant must be transported to the job site, which is the reason for restrictions that are written in documents such as ASTM C94 regarding material acceptance that is more than 90 minutes old, or has been subjected to a specified number of drum revolutions. The hydration process begins once water contacts cement, and continues until the available water is gone. Additionally, as material tumbles in a drum, it undergoes a forming and breaking of bonds between aggregate particles. This process degrades the final material and generates heat, ultimately reducing the final strength of the concrete. A volumetric mixer offers a timeless advantage. With the concrete being produced as needed, fresh, on site, there is no time restriction or loss of strength due to extended mix times.

The Terracon Report, Volumetric versus Drum Truck, Revision 1 – Volumetric Mixer Manufacturing Bureau (VMMB) Project No. 92101448 demonstrates that concrete produced from a volumetric mixer is higher in PSI strength as a result of avoiding drum mixer fatigue.

The most important factor of concrete quality is the water to cement ratio. These two ingredients, water and cement, are responsible for binding everything together. The water to cement ratio largely determines the strength, durability, workability and finishing quality of the concrete. Many specifications consider this ratio the foundation for building and approving mix designs. The more water added, the more the strength of the resulting concrete is reduced. Too little water, the more difficult the concrete will be to place and finish. The difference between too little and too much water can be 1 gallon per cubic yard. Adding 1 gallon of water to a cubic yard of a given mix design will lower the final strength 200 – 300 PSI, and increase the slump of the material 1 inch. Simply put, adding 1 gallon of water to a cubic yard of a given mix design will effectively eliminate 25lbs of the cementitious material. This is the reason ASTM C94 and other related specifications call for restrictions on the addition of water to a mix, once it has been batched.

A volumetric mixer allows the operator to control the precise amount of water being added to any mixture. Because the concrete mix we are producing is fresh, typically 10-15 seconds old before it hits the ground, there is no need to add water above the designed amount. We are not impacted by slump loss or hot loads that require additional water.