Transit Mixers

That Vital Component
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India has bid goodbye to manual concrete mixing, a procedure once so prevalent in all fields of construction. A switchover to machine mixing at small projects and concrete batching and mixing at big projects, has been found to be both economical as well as qualitative. Even for small constructions such as individual housing, Ready Mixed Concrete (RMC) is preferred wherever available. Now, the project developers find it easier to place orders for the supply of concrete of desired mix at their sites instead of setting up their own production units and hiring staff for management and control of these units. However, the main equipment behind the successful use and popularity of RMC are the transit mixers that supply the concrete to desired locations in the plastic stage. With the increased use of RMC, the demand for supply of efficient transit mixers has also increased. The purpose of producing well mixed concrete is lost if concrete loses its strength during transportation. Therefore, efficient transit mixers constitute an integral part of the RMC plants as well as concrete batching plant units.

Simple operation
Measured quantities of concrete gradients are fed by the dry batching plant into the transit mixers in dry form. While the transit mixer transports these materials to the site, the required quantity of water is added by it to the ingredients to mix them and produce concrete. Spiral blades inside the drum push the concrete deep into it. The process is called charging the transit mixer. The concrete is unloaded at site by rotating the drum in reverse direction and at the same time, lowering the open end; this is called discharging the transit mixer.

Components of mixers
The main components of a transit mixer unit are the mixer drum, water pump, mixer hopper, gear system, oil cooler, control levers, chutes and the chassis for their mounting. Their desirable features are explained here.

Mixer drum
The transit mixers are made of sturdy, high wear resistance grade steel. Normally, the chrome and nickel content of steel should be more than normal. It will increase the wear resistance of the drum and its life. The thickness of drum should be more at the bottom than at the sides. A bottom thickness of 6 mm and shell thickness of 4 mm can be considered normal. The mixing spiral in the drum should be of cast steel for full resistance to wear. For proper and homogeneous mixing of concrete ingredients, there should be more number of spirals per metre length. These days, sets of outer spirals and inner spirals are provided in the mixers for better mixing of ingredients. Additional protection on the upper edge of the spiral is a preferred feature. Angle of inclination of the drum plays an important role in its easy filling. Therefore, increased angle of inclination is preferable. Supporting arms need to be stronger and designed corresponding to the strain curve. The drum is supposed to have a low centre of gravity for increased stability and safety. It can be raised or lowered at one end even while revolving. Suitable access ladder with platform should also be available on the transit mixers.

The geometrical volume of a 4 cum capacity mixer is around 8,000 litre and 10,500 litre for a 6
cum capacity mixer. Therefore, a 5 cum capacity mixer should have about 8,700 litre capacity. Filling volumes vary from 50 per cent to 60 per cent.

**Water Pump**
The mixer should have a three-way pump for pumping water into the water tank, into the mixer drum for cleaning purposes, and for pressure cleaning of the outer surface of the transit mixer and the truck. The water supply to the drum is metered so that measured quantity can be added and designed water cement ratio could be maintained. The capacity of the water tank varies with the capacity of the mixer. Water tanks are provided with water level indicators. The tank is located in between the mixer drum and the driver's cabin.

**Mixer Hopper**
The mixer hopper should be lined with a hard lining made of chilled cast steel to make it wear resistant. The hopper size is kept large for easy charging and is provided with a springboard effect. The drop angle of discharge hoppers is kept around 45 degrees for easy discharge of concrete. Their size is also being increased in the latest design for easier cleaning of mixers.

**Gear system**
Special attention should be paid to the gear system of transit mixers as the mixers need to work at full efficiency even while negotiating rough terrain and acute curves. The gear box with deep reduction drive has the gear kept submerged in oil for continuous lubrication and the bearings are designed to absorb severest forces.

**Oil cooler**
The transit mixers should have a separate oil cooler fitted on them to ensure that the hydraulic oil is not overheated and consequently, the hydraulic pump and motor are not overloaded. This should be given special attention as mostly, the hydraulic system is an imported one and its repair or replacement is costly. A thermostatic control is desirable for the hydraulic oil cooler. The oil requirements of the hydraulic system and its cooler should be low and the replacement period for hydraulic oil should be large, to the tune of 2,500 hours of operation.

**Control levers**
Transit mixers should be provided with all control levers at one place itself, clearly indicating the purpose of each lever. This arrangement helps in easy operation of the mixer. The lever material should be corrosion proof. Ample linear and rotational adjustments should be available through them. The control panel should also be placed near the levers to provide a complete control mechanism to the operator.

**Chutes**
Chutes of varying lengths should be provided with the transit mixers for easy pouring. These are to be horizontally and vertically adjustable for smooth concrete discharge. Lightweight, highly wear resistant, extendable chutes made of plastic help the mixer operator work without getting fatigued. Now the manufacturers provide foldable chutes with an option to line them. The chutes can be locked at different positions.

**Ladders**
Foldable ladders, designed to fold out at angle than vertically to allow easy movement of the driver, are preferred for provision.

**Power supply for mixers**
The power supply for the transit mixer is made available either from the truck engine, or a separate engine is provided. Whenever the power supply is made from the truck engine, the mixer drum is kept lighter in weight. When a separate engine to drive the mixer is provided on the truck, the drum
may be heavier.

**Painting work**
The mixer drum and other components should be well coated with primer and anti-corrosion paint coats. Shot blasting should be preferred over sand blasting. Polyurethane top coatings are now adopted for the mixers.

**Dimensions**
Obviously, dimensions of transit mixers will vary with the capacity of mixers. For a 6 cum per hour capacity mixer, diameter of a mixer drum should be about 2.3 m. The length, breadth and height of mixer shall be about 6 m, 2.5 m and 2.6 m, respectively. The total weight of the mixer unit excluding chassis varies from 4 tonne for a 4 cum capacity mixer to 5.5 tonne for a 6 cum capacity mixer. Truck chassis should have a minimum pay load capacity of 15 tonne for 4 cum capacity mixer to 20 tonne for 6 cum capacity mixer. The size of the truck chassis depends upon the size of the mixer drum. Generally, 3 axle chassis is preferred in transit mixers. However, for small capacity mixers, 2 axle chassis can be used.

**Truck agitators**
These are different from mixers as they don't mix concrete ingredients while transporting them, they simply transport already mixed concrete by keeping it in a plastic state through continuous agitation of the drum. These, therefore, don't require a water supply arrangement to the drum for the mixing of concrete. A water supply arrangement for cleaning of the drum at the end of concreting operation may be there.
Pump coupled mixers

These transit mixers have concrete pumps and placer booms mounted on the same truck chassis. They are suitable for transportation and placement of small quantities of concrete. These mixers can place concrete up to 90 feet height. Such a transit mixer needs support from simple transit mixers for the continuous feeding of concrete to the pump as the pump output is more than a single mixer's capacity.

**Precautions during use**
Whenever concrete is transported through transit mixers, the workers should be advised not to add any additional water to the mixer. This tendency may result in lowering the quality of concrete. If required, a suitable mix design with use of super plasticisers may be evolved and super plasticisers should be added to the concrete; this will take care of any stiffness that occurs during transportation and pourable concrete will be available at pouring point. The number of revolutions of the drum per hour should also be studied and fixed.

**Manufacturers**
Construction equipment giant Schwing Stetter entered India in 1999 with sales as their major aim, with a pilot production unit as trial. Today, this German firm has separate production units for batching plants, concrete pumps and transit mixers with its sales rising from Rs 9 crore in 1999 to Rs 600 crore, today. Producing most efficient transit mixers of varying capacities, it has supplied more than 2,500 mixers to various sites. The mixers produced by it are of 4, 6, 7, 8, 9, 10 and 12 cubic m capacity. Now it plans to set up workshops to create skilled manpower for the operation of equipment produced by it. While Kirloskar engines are used in the Schwing Stetter mixers, the drive to the mixer drum is from the truck engine.

AM6SHC, the 6 cum capacity transit mixers of Schwing Stetter are easy to operate, can be cleaned up fast, convenient to charge and discharge and have low service costs. Their one-arm swivel chute with two extensions available, allows the operator to work without getting tired. AM10SHAN, the semi trailer transit mixers, allows reduced transportation cost as more volume gets transported in
one round. These mixers have an independent engine and mixer which can be operated independent of the truck operation.

Greaves India is producing highly efficient and sturdy transit mixers. It recently opened its second unit in Chennai for the production of over 200 transit mixers per month. Greaves claims to control 38 per cent of the Indian market for transit mixers. Vectra offers transit mixers of 6 cum and 7 cum capacity. Their mixers, built on Tatra T815 chassis, can be hydraulically or mechanically driven. Vectra also offers mixer superstructure with independent engine for mounting on 3-axle chassis other than that of Vectra. Shirke Structurals of Pune also has transit mixers in its equipment kitty. Ajax Fiori, the Indian company working in collaboration with Italian company Fiori, offers the Argo range of self-loading mixers that can scoop, weigh, load, mix, transport and place concrete independently, needing only one operator for all operations.

Cost component
A Schwing Stetter 6 cum per hour capacity transit mixer will cost around Rs. 8 lakh plus taxes. As most of the components of these mixers are imported except the engine, the cost of indigenously produced mixers may be much less. Greaves transit mixers of 6 cum capacity mounted on three axle Indian chassis with drum and spirals made of special grade, wear and corrosion resistant steel are quite popular. Both Schwing Stetter and Greaves have spares and after sales service shops available all over India. Shirke India produces transit mixers of 4 to 6 cum capacity each with drum speed of 0-14 rpm, 3-axis chassis and water tanks of 600 litres capacity.

Hiring mixers
Whenever transit mixers are required for short duration, Indian construction companies prefer to get these on a rental basis. The equipment rental business is growing in India and the rents may see a downward trend in the future with increased competition amongst equipment rental firms. Wherever an RMC plant is to be set up, it is economical to have one's own fleet of transit mixers for the supply of concrete to different destinations. Infrastructure development groups also have their own batching plants and mixers for use at one site and for shifting to new sites. Sometimes, the concrete supply to a particular site may have to be supplemented to enable large-sized pours. In such cases, hiring of transit mixers to carry additional volumes proves economical.

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Technical Data:
While selecting transit mixers for adding to your fleet, the following technical data should be demanded from the manufacturer and studied:

- Capacity of the mixer (in litres or cubic metres).
- Power requirement (in Kw or HP).
- Drum speed (rpm).
- Weight of mixer (tonnes).
- Height of mixer frame (mm).
- Size or capacity of water tank (litres).
- Engine capacity.
- Type of drive (driven by a separate engine or vehicle engine).
- Type of water pump.
- Type of water connection.
Advantages of mixers
Biggest advantage of transit mixers is that these do not allow segregation of concrete because of continuous rotation. Unloading of concrete batch can be done at will in full or partially. Drum of concrete mixer doesn’t allow any foreign material to enter the concrete load. Concrete can be unloaded to a conveyor belt, a concrete pump or into the chutes. As the capacity of available transit mixers varies from 4 cum to 12 cum, choice is available as per site requirements and concrete production rate.