



How to Make High Quality Low Cost Concrete



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Introduction

We are always looking for ways to be competitive in the construction industry. The UK Government pushes the mantra 'more for less'.

This e-book will give some innovative solutions to drive onsite concrete production costs down without affecting the quality of the concrete.

The concrete will always meet the performance specification whether it's a C15 or C50 design mix.

If you have any questions on any of the topics covered in the e-book text the number below and we will answer your questions.

Authors



Bob Evans

Bob will help you with your enquiry and give you best advice for your concrete production. When Bob has your concrete production information he will select the best machine for you and give you your cost savings and pay-



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Vighnesh is an expert in advanced concrete technology including fibre reinforced concrete, cement replacement and geopolymer concrete mix design. If you require a special concrete mix, Vighnesh is your man.

Money Making Batching Plants

One of the most effective ways to reduce concrete costs is to manufacture your concrete on site. With today's technology, this is very easy to do. Below you will find some examples of mobile concreting machines that can be set up and ready to go within two hours.

B120 16 m³/hr - Daily Output 130m³

Onsite Concrete Production V Readymix

C50 Concrete - 8hr shift 75% utilisation
Ready Mix 23,000 m³ @ £98 = £2.254m
Onsite 23,000 m³ @ £73 = £1.679m
SAVING £575,000 per year
Payback period 2 Months



Benefits

- Very easy to move from site to site to maximise utilisation
- Set up time 2 hours
- Concrete on demand
- No waste
- No part load fees
- 1-2% dosing accuracy
- 15-year lifespan
- High resale value
- Compact for tight sites
- Excellent for remote sites

Workout Your Savings

The table below shows the saving that manufacturing concrete onsite can deliver.

Find out how much ready-mix concrete you buy in a year.

Use this number in the left hand column and read off the savings. For example, if you spend £5m on ready-mix concrete, the saving is £1.739m

| Concrete | Volume | Utilisation | | | | | Savings | |
|-------------|--------|-------------|---------|---------|---------|---------|-----------|------------|
| | | B120 16 | B180 30 | F220 45 | F220 60 | F220 80 | Saving m3 | Annual |
| Readymix | m3 | | | | | | | |
| £100,000 | 1250 | | | | | | £ | - £ - |
| £200,000 | 2500 | | | | | | £ | - £ - |
| £300,000 | 3750 | 9% | | | | | £24.96 | £93,600 |
| £400,000 | 5000 | 13% | | | | | £24.96 | £124,800 |
| £500,000 | 6250 | 16% | | | | | £24.96 | £156,000 |
| £600,000 | 7500 | 19% | | | | | £24.96 | £187,200 |
| £700,000 | 8750 | 22% | | | | | £24.96 | £218,400 |
| £800,000 | 10000 | 25% | | | | | £24.96 | £249,600 |
| £900,000 | 11250 | 28% | 16% | | | | £26.63 | £299,588 |
| £1,000,000 | 12500 | 31% | 18% | | | | £26.63 | £332,875 |
| £1,500,000 | 18750 | 47% | 27% | 19% | | | £27.27 | £511,313 |
| £2,000,000 | 25000 | 63% | 36% | 25% | 18% | | £27.83 | £695,750 |
| £3,000,000 | 37500 | 94% | 54% | 38% | 27% | 19% | £27.83 | £1,043,625 |
| £4,000,000 | 50000 | | 71% | 50% | 36% | 25% | £27.83 | £1,391,500 |
| £5,000,000 | 62500 | | 89% | 63% | 45% | 31% | £27.83 | £1,739,375 |
| £6,000,000 | 75000 | | 107% | 75% | 54% | 38% | £27.83 | £2,087,250 |
| £7,000,000 | 87500 | | | 88% | 63% | 44% | £27.83 | £2,435,125 |
| £8,000,000 | 100000 | | | 100% | 71% | 50% | £27.83 | £2,783,000 |
| £9,000,000 | 112500 | | | | 80% | 56% | £27.83 | £3,130,875 |
| £10,000,000 | 125000 | | | | 89% | 63% | £27.83 | £3,478,750 |
| £11,000,000 | 137500 | | | | 98% | 69% | £27.83 | £3,826,625 |
| £12,000,000 | 150000 | | | | 107% | 75% | £27.83 | £4,174,500 |
| £13,000,000 | 162500 | | | | | 81% | £27.83 | £4,522,375 |
| £14,000,000 | 175000 | | | | | 88% | £27.83 | £4,870,250 |
| £15,000,000 | 187500 | | | | | 94% | £27.83 | £5,218,125 |
| £16,000,000 | 200000 | | | | | 100% | £27.83 | £5,566,000 |

Why buy Readymix? Our Mobile Batching Plant is fast to move and set up giving flexibility and high utilisation.



*I can help you
select the right
plant for your site*

Cement Replacement

Introduction

The next method to reduce concrete costs is to look at the input costs of cement, sand and aggregate.

Ensuring you are using the correct quantities of each material is critical for strength and cement reduction.

This is best done by an experienced concrete technician who can carry out a sieve analysis and blend aggregate, sand and cement correctly.

Pulverised Fuel Ash (PFA)

PFA is a by-product of coal-burning power stations. As part of the combustion process, coal is pulverised into a powder before being burned. About 18% of the fuel forms fine glass spheres, about 75% of which rise with the flue gases from the combustion.

The 'ash' is recovered from the gases and used, amongst other functions, as a cement substitute.

PFA is always used in conjunction with Portland Cement. It is employed in ratios ranging from 80% Pc and 20% PFA - 60% Pc and 40% PFA according to the ultimate function of the cement.

PFA can't be used completely as a substitute for cement, because it relies on the water and lime from the cement to hydrate as part of the overall chemical reaction.



Ground Granulated Blast-Furnace Slag

Ground Granulated Blast-furnace Slag (GGBS) as a cement substitute

GGBS is a by-product of the iron and steel industry. In the blast furnace, slag floats to the top of the iron and removed. GGBS is produced through quenching the molten slag in water and then grinding it into a fine powder.

Chemically it is similar to, but less reactive than, Portland cement (Pc).

When mixed with water it will hydrate in a similar way to Portland cement. It is always used in combination with Portland cement, typically in the range 60% Pc and 40% GGBS - 30% Pc and 70% GGBS, according to the ultimate function of the cement. Very occasionally, it can be found up to a ratio of 90% GGBS and 10% Pc.

Concrete made with GGBS cement sets more slowly than concrete made with ordinary Portland cement, depending on the amount of GGBS in the cement mix, but also continues to gain strength over a longer period leading to improved overall durability and life expectancy.



Silica Fume

Silica fume is a by-product from the manufacture of silicon. It is an extremely fine powder (as fine as smoke) and therefore it is used in concrete production in either a densified or slurry form.

Due to economic considerations, the use of silica fume is generally limited to high strength concretes or concretes in aggressive environmental conditions.

The most commonly used proportion of silica fume in the UK - produced combinations is 10% by mass of total cementitious content.

Limestone Fines

Limestone fines can be used as a constituent of cement to produce Portland limestone cement.

BS 7979 [12] provides additional information on the specification of limestone fines for use with Portland cement.

The most commonly used proportions of limestone fines in UK-produced combinations is 6-10% by mass of total cementitious content.



*I can design
concrete mixes to
reduce input
costs and add
strength*

Concrete Made From Spoil



The Fibo Recycling Machine

Concrete can be made from excavated spoil and soil. This reduces haulage and tipping fees to remove spoil off-site. It also reduces haulage and aggregate costs of importing concrete material to the site.

Fibo Intercon manufactures a machine that converts the spoil into aggregate and sand with a 70% usage of the excavated material. Only 30% needs to be removed from the site.

The machine adds cement and water to the converted spoil to produce a weak mix concrete. The concrete can be used as pipe surrounds in drainage and service trenches. Blinding concrete for slabs and rafts.

The most efficient projects are large drainage project where the excavated spoil is dug out one end and converted into concrete to fill the trench the opposite end of the drain laying process.



Benefits

- Can reuse up to 70% of the excavated material
- Can operate even in very tight places
- Low deposit and transport costs
- No costs for filling materials
- The end product is self-compacting
- High quality and flexibility
- Easy to erect and make ready for production
- An integrated operating system with a dosing accuracy of +/- 1-2 %
- The operating system requires no previous knowledge and can be delivered in the language version desired
- Easy to clean, maintain and service



*I can help you
with your
recycling
requirements*

Remote Sites



Nothing is Impossible

Constructing large foundations for windfarm up mountains can be a challenge.

A great solution is to manufacture the concrete onsite or a location close by. This is not viable for a ready-mix supplier.

Fibo mobile batching plants are manufacture high-quality concrete to any mix.

Type in the mix details into the software and the plant will produce the mix to an acuracy of 1 to 2%



*I can help you
with your site
establishment
requirements*

Recycling Mixes

Concrete can be recycled and reused in many ways. The best method often depends on the size and shape of the concrete to be recycled. Reusing concrete is a good way to reduce construction costs while providing some benefits to the environment.

Recycled concrete not only stays out of the landfill, it also replaces other materials, such as gravel, that must also be mined and transported for use.

Uses for Old Concrete

Recycled concrete can be used in many of the same ways as new materials, like gravel, paving materials, and aggregates.

Paving for walkways, driveways, and other outdoor hard surfaces. Broken concrete creates a stable traffic surface that is permeable so that rainwater can filter through. This reduces the amount of runoff water that must be managed by storm sewer systems and helps to replenish groundwater.

The base for new asphalt paving. Through a process called rubblization, old concrete pavement can be broken in place and used as a base layer for asphalt pavement

Bed foundation material for trenches containing underground utility lines.

Aggregate for mixing new concrete. Crushed recycled concrete can replace some of the virgin (new) aggregate used in ready-mix concrete.

Benefits of Concrete Recycling

Recycling concrete helps reduce construction waste and extend the life of landfills as well as saving builders disposal or tipping fees.

It also reduces transportation costs because concrete can often be recycled in areas near the demolition or construction site.

If builders are seeking LEED Green Building certification, they can receive points for using recycled concrete. In some instances, employment opportunities arise in the recycling industry that would not otherwise exist in other sectors.

How Concrete is Recycled

Concrete is recycled by using industrial crushing equipment with jaws and large impactors. After the concrete is broken up, it is usually run through a secondary impactor and then is screened to remove dirt and particles and to separate the large and small aggregate.

Additional processes, such as water flotation, separators, and magnets may also be used to remove specific elements from the concrete. An alternative method is to pulverize the concrete, but this is not always the best option, as it makes it harder to complete the separation process and may leave more contamination from smaller byproducts.

Equipment Used to Recycle Concrete

When considering the option to recycle concrete, you will also need to evaluate the options available to crush the concrete. The most practical solution can be a portable crusher that can be moved to different locations or projects.

Often it works best to set up a portable crusher at a centralized location, near where the concrete is being demolished but in an area that will not impact site traffic. Factors to consider when choosing processing equipment include:

Equipment should have a powerful electromagnet or water flotation or an air separator system that can pull steel from concrete.

Separate hydraulic stands allow for a faster setup.

Control systems may be automatic, manual, or remote.



*I can design
recycling
concrete and
advise you where
you can use it*

Popular Products



B1200

Compact, mobile batching plant assembled on a joint twin-axle bogie trailer. Capacity between 10-16 M³/h.



B1800

Mobile batching plant assembled on a joint triple-axle bogie trailer with a turnable front axle. Capacity between 20-30 M³/h.



F2200

Mobile batching plant assembled on a common twin-axle step frame semi-trailer. Capacity between 45-80 M³/h.



Horizontal Cement Silos

Horizontal cement silos mounted on a frame, bogie trailer or a flat rack trailer.



Dosing Plant

This dosing station doses aggregates at temperatures as high as 30-60 degrees Celsius. It is ideal for areas where climate and infrastructure make special demands.