FRITZ·PAK
CONCRETE ADMIXTURES

# Savings and Applications Guide for Ready Mixed Concrete

## How to Use Fritz-Pak Products for Maximize Profits

# SAVINGS OPPORTUNITIES FOR READY MIX PRODUCERS

According to the National Ready Mixed Concrete Association (NRMCA) about 5% of all concrete is returned to the plants. Some is returned because it does not meet specifications and some is returned because sometimes there are leftover partial loads after delivery. This 5% is about 20,000,000 cubic yards. At an average value of about $60 per yard, the potential loss to the industry from these returned loads is about $1.2 billion per year in material cost alone.

While the industry has accepted this as a cost of doing business up to now, times have changed radically. The economic crisis has resulted in less concrete poured, lost revenue and lost jobs. Competition has increased, and those companies smart enough to salvage the returned concrete will be more likely to weather the economic storm and remain viable in the future.

Let's analyze the options available to the ready mix producer when a load is rejected because it does not meet the specifications at the job site.

### Lose the load - the worst option

This includes the cost of the materials, labor expenses, and all costs associated with operating trucks such as fuel, repairs, tires, radios, insurance, etc. This may be the only option if the mix is truly not correctable. However, many loads are lost because there is not time to return to the plant for correction. Fritz-Pak offers many field correction options, being the industry leader in this area.

### Return to the plant for correction

If the time limits for delivery can be met, then the additional costs are the round-trip cost to the plant. The minimum cost for this is estimated at $60. This cost is significantly higher than the cost of adding admixtures at the job site.

### Redirect load to other jobs

If this is even possible it normally happens with a more expensive load having to go to a non-spec job that normally is being charged a lower price for the concrete. So on top of the transportation and labor cost of redirecting, the concrete thus sold usually brings in lower revenue.

### Build precast concrete structures with the rejected concrete

While this is a good way to dispose of unwanted concrete, the revenue from these structures is much less than the actual cost of the concrete. If it were profitable, most ready mix companies would already be in the precast business.

The NRMCA provides the following information. The average one way trip is 14.1 miles. Fuel consumption is estimated at 3.2 miles per gallon and travel time is 45-60 minutes. So the fuel consumed is 8.81 gallons and the driver's additional time is 1.5-2.0 hours. Assuming $2.80 per gallon of fuel and average hourly wage of $17.50 per hour, the minimum cost to return a truck to the plant for corrections is $60.00. It does not include tires, repairs, driver benefits, radios, water, additional time for batch personnel and increased risk of traffic accidents.

Source: 2008 Fleet Benchmarking and Cost Survey Report, Concrete Infocus, Jan/Feb 2009

Fritz-Pak offers a solution. The best option is to correct potentially rejected loads by adding appropriate admixtures at the job site so they meet specifications. Fritz-Pak admixtures are premeasured powders packed in easy-to-use water soluble bags. Add them directly to the ready mix truck and mixed for 5-10 minutes on site.
The cost of correcting a load in this way can be as little as $0.35 per yard!
The Fritz-Pak line has been successfully used by ready mix producers for nearly 20 years. Those companies who carry Fritz-Pak on their trucks are in the best position to make quick inexpensive corrections to salvage otherwise rejected loads, making them more competitive in an increasingly tough market.

In the case of unexpectedly leftover concrete, Fritz-Pak retarders carried on the truck can be added whenever needed to extend the life of the concrete. It can then be safely diverted to another site, returned to the plant for proper disposal, or even for re-batching.

### Uses for Our Products

- Correct air content
- Increase slump without adding water
- Decrease slump for proper placement
- Accelerate the set time without chlorides
- Retard set time
- Improve the pumpability of concrete

In the following pages, we give a brief overview of the applications and use of Fritz-Pak's products most useful to ready mix producers. More information a may be found in our product brochures and Product Bulletins. You can find all this information on our website fritzpak.com.

## NRMCA Sustainability Initiatives

Fritz-Pak products can help concrete producers meet concrete manufacturing goals laid out in the NRMCA Sustainability Initiatives.

| Key performance Indicators | Reduction by 2030 |
|---|---|
| Potable water used | 20% |
| Waste per unit of concrete | 50% |
| Energy used per unit of concrete | 30% |
| Carbon footprint per unit of concrete | 30% |

Source: National Ready Mixed Concrete Association Sustainability Initiatives: Draft 4:12-28-08

# Water Soluble Packaging

The use of water soluble bags for dispensing admixtures into ready-mix trucks dates back to the late 1980's. Fritz-Pak is the pioneer of this method of admixture delivery, which allows admixtures to be added to the ready-mix truck in concentrated powdered form. Every year, more than one million bags are produced and sold worldwide.

Fritz-Pak packages using polyvinyl alcohol which will dissolve at low and high water temperatures. Most bags will dissolve completely in less than one minute. The film has no effect on the concrete, especially since its concentration in the concrete is less than one part per million.

**Advantages of Water Soluble Bags**

- Allows control of concrete properties at the job site or the plant
- Not affected by freezing temperatures
- Concentrated materials not diluted with water
- Savings in transportation costs and storage space
- No spoilage concerns: Material stored away from moisture remains good for years
- Easy to dose since bags are premeasured
- No material wasted in tanks, dispensers or delivery lines
- Non-hazardous materials
- Safe and easy to handle by employees
- No need of dispensers

## Powdered vs. Liquid Admixtures

Most producers today are used to seeing admixtures dispensed as liquids in plants, however, historically, most admixtures were originally powders. There were problems in consistently and accurately measuring the amounts to be added because of the small dosages required. Because liquids are easier to measure and dose than loose powders, the industry switched from powders to liquids. The use of water soluble bags and accurate measuring and packaging eliminates this issue. Fritz-Pak offers the industry all the advantages of using lightweight powders without the old problems. The quality of our admixtures is equal to or better than alternative liquids.

Some ready mix producers use only Fritz-Pak powdered admixtures for the convenience they offer. Many more use Fritz-Pak products for special needs such as adjusting slump, air, or set time at the job site, which is easy to do, since Fritz-Pak products are compatible with most other admixtures. Others use Fritz-Pak admixtures in extreme conditions such as freezing temperatures or remote locations. Small or specialized jobs are often much better served by using Fritz-Pak products rather than recalibrating dispensing equipment or upgrading it to allow for an extra admixture in the system.

## Quality and Certification

The standards of performance for admixtures in the United States are specified by the American Society for

Testing and Materials (ASTM). Fritz-Pak admixtures meet or exceed the applicable ASTM specifications. For data or product bulletins on each product refer to our website fritzpak.com.

We are careful to comply with all these standards. Our products are periodically reviewed, retested and re-certified by independent laboratories to ensure our products are up to date.

There are some products for which no ASTM standards have been developed or finalized. These are the only ones which do not show ASTM numbers in our literature.

## Successful Implementation of Fritz-Pak Products In Ready Mix Operations

Fritz-Pak products can be used very easily in ready mix operations to correct loads, and also as primary admixtures. Proper training in their use and applications is necessary for a successful implementation. It has been Fritz-Pak's experience that ready mix companies need to consider the following points for proper implementation.

1. Develop internal criteria for when to use each product.

2. Identify the person to become fully familiar with product applications, dosage rates and limitations.

3. Identify a person to be an information resource, having MSDS, product bulletins and other information readily available.

4. Determine which persons can authorize the use of each product.

5. Train drivers or field personnel on correct product usage, emphasizing the importance of proper mixing – especially using a timepiece to measure the mixing time according to product directions.

6. Notify customers and inspectors your intention to use the products. Include the products in your spec submittal at the beginning of a new project.

7. Have a method for inventory monitoring to avoid running out of supplies.

8. Designate a dry storage place for products.

9. Have a method to keep track of material use, and the circumstances of its use to provide feedback to the quality control department. Fritz-Pak products should not be used as a replacement for good manufacturing practices.

10. Determine your own selling price of the product for situations when you need to charge a customer for their use.

11. Train people in anticipating when the products might be needed to ensure that product is available (on the truck or otherwise accessible).

12. Understand that when a load needs correction in the field, the exact cause of the problem may not be known. Fritz-Pak products may not be able to correct every problem in every situation.

# Applications for Air Entrainers

A small amount of air entrained in concrete has been found to greatly increase the durability of concrete subject to freeze-thaw weather conditions. Air bubbles within the concrete allow for expansion of this water within the concrete during freezing conditions, which keeps the concrete from cracking. The air entrained in concrete made without admixtures is usually not sufficient to protect it from freeze-thaw conditions over time. In order to increase the air content of concrete, air entraining admixtures are used. Most jobs where concrete will be exposed to freeze-thaw conditions will specify air content that requires the use of air entraining admixtures to comply.

Getting the air content right can be difficult to achieve; often the air content measured at the plant will change by the time concrete is ready to be placed at the job site. Factors like distance and time from the plant, water content, temperature, cement type, use of fly ash, and other admixtures all play a role in the final air content. Best practice is to measure the air content at the job site immediately before placing. If too much air is present, strength will be reduced. If not enough air is entrained, durability will be reduced.

Fritz-Pak's Super Air Plus and Air Plus are air entraining admixtures that can be used at the plant as the primary air entrainment. They have a very useful application at the job site to quickly


and reliably add more air if the load is found to be too low in air content. The cost is very reasonable cost. Super Air Plus and Air Plus are made with modified Vinsol resin, which is a natural resin that has proven to be effective for many years in increasing air content.

### What is the difference between Air Plus and Super Air Plus?

The only difference between the two products is the concentration of active ingredient. Super Air Plus has twice the concentration of Air Plus.

Air Plus is recommended in plants where the number of mixes is small and the variation in raw materials, i.e. sand, cement and aggregates, is very small. Thus the variation in air content is small.

Super Air Plus is recommended in plants with a large number of mixes or variations in their sources of raw materials.

## Applications for Air Detrainers

Sometimes it is necessary to remove entrained air from concrete or keep it at a low concentration to meet specifications. Air Minus is a product which reduces the superficial tension of water (its ability to form bubbles). Certain admixtures like water reducers and superplasticizers tend to increase the entrained air content in concrete. Air Minus can be used to counteract the effects of these materials. It is easier to prevent the formation of bubbles than to remove them after they have already formed. Air Minus works best when its use is planned to keep air low, and to prevent the air entraining effects of water reducers and superplasticizers.

The effect of Air Minus is less predictable in counteracting the addition of too much air entraining admixture, although it can be useful in this application. In this case, it is important to understand that Air Minus does not react with the air itself. Thorough mixing of the load allows bubbles to reach the surface where they can break, and then their reformation is stopped by the presence of Air Minus. Testing with Air Minus prior to its successful use is strongly recommended. It has been commercially available since 1999.

## Product Information


### Air Plus

- Our basic air entraining admixture.
- One 8-oz bag will increase air content by about 1%.
- Meets the following standards: ASTM C-260, AASHTO M-154, & CRD C-13.

### Super Air Plus

- The more concentrated version of our air entraining admixture.
- One 8-oz bag will increase air content by about 2%.
- Meets the following standards: ASTM C-260, AASHTO M-154, & CRD C-13.

### Air Minus

- Air detraining admixture.
- Polyalcohol based product.
- Can be re-dosed if needed.
- There are no ASTM standards for air detraining admixtures.

# Applications for Superplasticizers


- provide high early strengths.
- To increase slump.
- To improve workability.
- To improve finishing.
- To reduce shrinkage & cracks.
- To allow concrete placement in highly reinforced areas.

When water is added to cement, the cement particles tend to agglomerate (lump together). Increasing the water will keep the particles separate, but means using more than the water required for proper hydration reaction (just enough in order to set). This is called water of convenience. If concrete were made with just enough water for hydration, it would be too stiff to place. Unfortunately, increasing water content has negative effects on concrete.

Instead of adding this water of convenience, superplasticizers can be used. These products chemically disperse the cement particles (keep them from agglomerating), without any of the problems of extra water. Superplasticizers are also called water reducers because they reduce the amount of water needed to make the concrete flowable.

Fritz-Pak manufactures a variety of superplasticizers to meet the different needs of the concrete producer. They can be added at the job site to correct the following problems:
For simplicity, we categorize our products as Standard Superplasticizers and Premium Superplasticizers.

**The Most Expensive Ingredient in Concrete - WATER**

Add 1 Gallon to 1 Cubic Yard of a 3000 PSI Mix Design:

- Increases the slump about one inch.
- Decreases the compressive strength about 200 PSI.
- Increases the shrinkage potential about 10%.
- Increases bleeding about 50%.
- Decreases freeze-thaw resistance about 20%.
- Is one gallon of water worth all this expense?

# Product Information

## Standard Superplasticizers

### Supercizer 1

- Our basic superplasticizer.
- Provides up to 20% water reduction or 6” slump increase.
- Meets the following standards: ASTM C-494 Type F, AASHTOM-194, & CRD C-87.

### Supercizer 2

- Our extended life superplasticizer (60-90 minutes).
- Specifically designed for warm weather, extended deliveries, and difficult placements.
- Provides up to 20% water reduction or 7” slump increase.
- Meets the following standards: ASTM C-494 Type B & D, AASHTO M-194, & CRD C-87.

## Premium Superplasticizers

### Supercizer 5

- Provides up to 25% water reduction or 6” slump increase.
- Recommended for shotcrete applications.
- Meets the following standards: ASTM C-494 Type F, AASHTO M-194, & CRD C-87.

**Supercizer 7** Our high-performance and most popular superplasticizer.

- Provides up to 40% water reduction.
- Meets the following standards: ASTM C-494 Type D & G, AASHTO M-194, & CRD C-87.

### Supercizer PCE

- Provides up to 40% water reduction
- Recommended for precast & prestressed concrete.
- Meets the following standards: ASTM C-494 Type F, AASHTO M-194, & CRD c-87.

# Frequently Asked Questions

**Q** How long will the slump change in the concrete last?

**A** With the exception of Supercizer 2, about 30-45 minutes. Supercizer 2 will last twice as long, about 60-90 minutes.

**Q** Will it change the set time?

**A** Supercizer 1, 2, and 7 have retarding properties and will increase the set time. Supercizer 3, 5, and 6 will have no or little effect on the set time.

**Q** Will it discolor my concrete?

**A** Supercizer 1, 2, 3, 5, and 7 will have NO effect on concrete color. Supercizer 6 has a red tint and will affect concrete coloration.

**Q** Will it affect air content?

**A** Supercizer 1, 2 & 7 may increase air content up to 2%. Supercizer 3, 5, and 6 will not increase air content at the recommended dosage rates.

**Q** Can the concrete be re-dosed?

**A** Yes, you may re-dose as needed to maintain the required slump.

# Applications for Set Delay Admixtures

Extended Set Time: Many times jobs take longer than anticipated to reach the stage of actually placing the concrete. Delays often occur due to variables not in the control of the ready mix producer: trucks may break down, traffic may be congested, contractors may have unforeseen problems with pumps and placement equipment, inspectors may arrive late, etc., Without a set retarder, many loads would be lost because they must be dumped before they begin to set while in the truck.

Fritz-Pak set retarders have saved ready mix producers money time and again when such delays occur. For a very modest cost, Fritz-Pak's Standard Delayed Set and Mini Delayed Set can be carried on all trucks to be used only when needed.

### Leftover Concrete

If a contractor has ordered ten yards, but only eight actually are used in the pour, something must be done with the leftover two yards. Since dumping is highly regulated, retarding the leftover concrete allows the producer to safely return the concrete to the plant for proper disposal, or reuse if possible in another batch.

### Slowly Discharged Concrete

Sometimes a slow discharge is required, for example when it is pumped through a small pump, in ICF use, or slip-forming of curbs. When concrete is discharged slowly, there may not be enough time to properly finish the last part of the pour before set begins. A retarder may be added at any point in the discharge process to delay the set as required.

### When to Add Retarders

Retarders are like parachute jumping; the sooner the parachute is opened after jumping, the longer it takes to reach the ground. Of course, this may be too long a time to spend. If the parachute is opened halfway down the descent, you can only slow down the second half of the jump. If you wait too long to open the parachute, you may not be able to slow down at all, with dire consequences. In concrete, adding the retarder immediately after batching will provide for the longest set retardation. Once cement hydration (a part of concrete setting) has started a retarder is not capable of reversing the chemical processes that have already begun. Therefore, it is recommended that retarders be added as soon as you know they will be needed. It is less costly to wait for concrete to set than to remove concrete that is not placed and finished properly because of fast setting. It is up to the experience and knowledge of the producer to make the final decision on when and how much to retard concrete.

### No Cleanup Discharge Allowed

Increasingly, urban or environmentally sensitive areas require no wash water to be discharged at job sites. Adding retarder to the wash water allows safe return to the plant for proper cleanup and disposal.

### Wash Water Stabilization

There are increasing regulations on the disposal of cleanup water, and the use of water itself in drought-prone areas. All this increases cost to the producer. An environmentally sound and low-water use method of handling most wash water is to add Mini Delayed Set to the wash water in the drum. It can then be held overnight, and used in the next day's batch without ever having to discharge it.

### Stamped Concrete

In stamped and other decorative concrete, the proper time for working and stamping the concrete is limited. If stamped too late, impressions may be poor. Contractors may not have enough people or stamps to properly finish the whole job. Ready mix producers can help their customers by offering them the service of step retardation. Half of the concrete is discharged for working while retarder is added to the second half, which is also immediately placed. By the time the contractor gets to the second portion, it is still ideal for working.

### Product Information

**Standard Delayed Set**

- Standard set delay admixture.
- Delay concrete set for 1 - 7 hours.
- Can be redosed up to 3 times.
- Meets the following standards:
- ASTM C-494, AASHTO M-94, & CRD C-87.

**Mini Delayed Set**

- Same admixture, in an 8 oz. bag.
- **1 bag will delay the set of 1 yard of concrete about 1 hour**
- Can be redosed up to 3 times.
- Meets the following standards:
- ASTM C-494, AASHTO M-94, & CRD C-87.

## Applications for Fill Flow

Flowable fill, or controlled low strength material (CLSM), has important uses in construction. Traditionally it has been made with water, sand and small amounts of cement. Traditionally made material is difficult to pump, has large volumes of bleed water and is slow in developing strength. Fill Flow is a high-strength, air-entraining admixture used for the production of flowable fill.

The millions of bubbles generated by the admixture makes the mix flowable, requiring only about half of the water to be used compared to traditional mixes, and eliminating the problem of bleed water. This also makes it more pumpable since there is no problem with settling in the lines while pumping. Because of the lower water content, cement develops strength faster. Ultimate strengths are similar in both.

With Fill Flow you can get 20 – 30% air in the mix. This replacement of volume allows the ready mix producer to make flowable fill that meets specifications using less materials than the traditional method, thus saving money.

### Product Information

**Fill Flow**

- Produces flowable fill.
- 20 - 30% air increase.
- There are no ASTM standards.


## Frequently Asked Questions

**Q** How does Fill Flow work?

**A** It creates billions of air bubbles that serve as “ball bearings” within the flowable fill and increase the flow properties.

**Q** What kind of unit weight can I expect with Fill Flow?

**A** Unit weight is dependent on mix design and size of sands. Typically you should expect a unit weight of 90-120 lbs/cu.ft.

**Q** What is the recommended addition procedure for Fill Flow?

**A** It should be added at the job site. Fill Flow will increase the volume and flowing properties of the flowable fill. If added at the plant, the possibility of spills during transport are increased.

**Q** Compared with flowable fill without any admixtures, do I need more or less water to produce flowable fill with Fill Flow?

**A** You will need less water. Typically you’ll use 25-30 gallons of water per cubic yard of flowable fill.

# Applications for Viscosity Modifiers

There are some applications in concrete construction where the slump of the concrete needs to be low for proper placement. In slip forming and curb making, concrete must be very stiff to hold its shape before it sets. In placement on hillsides or slopes, slump must be low enough to keep the concrete from sliding out of place. If concrete placed with laser screeds is too wet, the screed is not able to properly level it.

In order to lower the slump of concrete, the viscosity-modifying admixture Super Slump Buster can be used. Super Slump Buster thickens the water in the concrete. The thickened water is able to hold the cement and sand together, and this paste in turn holds the aggregates in place, thus reducing the slump.

Super Slump Buster is used as an aid in placement of concrete only. It WILL NOT change the strength of the concrete. If a load has too much water for the strength specified, the use of Super Slump Buster will NOT increase the strength, although it may give the required slump for the job specifications. This product has been in commercial use since 1992.

## Product Information

### Super Slump Buster

- Viscosity modifying admixture for aid in concrete placement.
- Decreases slump by up to 4”.
- Can be redosed if needed
- There are no ASTM standards.


# Applications for Set Accelerators

The time it takes for concrete to set depends on temperature. At low temperatures, it may take as long as 10 hours for concrete to set, while in warm temperatures, it may take as few as two hours. Some finishing can only be done near or after the time concrete begins to set. It is very inconvenient for contractors to wait long periods of time for finishing. Heating of aggregates and water to accelerate set times is much more expensive than adding an accelerator to the concrete.


One of the oldest admixtures used in the concrete industry is calcium chloride for set acceleration, in use for about a hundred years. It is effective in speeding up set, widely available and relatively inexpensive. However, it has some major drawbacks: most important, the chloride ion promotes the corrosion of reinforcing steel in concrete, causing failure of structures over time.

Today, in practically all concrete construction using reinforcing steel, the use of calcium chloride is forbidden. Other issues are an increase in efflorescence, darkening of the concrete in general, reaction with iron oxide pigments in decorative concrete, and lower ultimate compressive strengths.

Fritz-Pak manufactures a powdered accelerator which has none of the above problems, because it contains no chlorides. Fritz-Pak NCA is based on the chemical Calcium Formate, a non-hazardous material. Most liquid non-chloride accelerators currently available are based on Calcium Nitrate or Calcium Nitrite, which are hazardous materials requiring special handling, storage, disposal and reporting to the EPA for their use.

Fritz-Pak NCA can be used to accelerate set times by as much as 5 hours, depending on temperature and dosage. It also reduces the time needed to protect freshly placed concrete from freezing from 3 days to 2 days.

## Product Information

### Non-Chlorine Accelerator

- Set accelerating admixture
- Contains no chlorine
- Non-hazardous materials
- Meets the following standards:
- ASTM C-494 Types C & E, AASHTO M-194

# Applications for Pumping Aids

Today more than 25% of concrete in the United States is pumped. For a concrete mix to be pumpable, the aggregates need to be well-graded, with no gaps in the grading, a relatively high amount of cement is needed to keep the mix together. In many cases, the amount of cement required for pumping is higher than the amount necessary to reach specified strengths. So a balance between costs needs to be maintained.


While concrete pumps have improved and become more powerful over the past 20 years, there is variation in equipment age and size in the field. The ready mix producer may discover that a mix that was pumpable by one company or piece of machinery may not be with another. Another factor that affects pumpability is the origin of and type of aggregates. Natural aggregates tend to be rounded, smooth and easier to pump, while crushed aggregates with more jagged edges are generally harder to pump. When pressure is applied to concrete in pumping, the water and the paste tend to separate from the aggregates, causing plugs in the line.

Fritz-Pak's Slick-Pak II is designed to be added directly to concrete in the ready mix truck to improve pumpability. It keeps the mix from segregating, by thickening the water and binding the cement thus making it much easier to pump. Slick-Pak II also has lubricating properties which help the mix slide better through the pipe and hoses. The formulation of Slick-Pak II is patented, and has been used commercially since the early 1990's.

## Product Information

**Slick-Pak II**

- Concrete pumping aid.
- Patented formulation.
- Non-hazardous material
- Does not affect concrete strength
- There are no ASTM standards for pumping aids.


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