cureblends.....

accurate....consistent....
reliable....cost savings!

These are some of the words used to describe Akrochem Cureblends. In today's marketplace, the need for consistency is paramount. Consistency means operating more efficiently, saving time and money. Companies need to become lean and do so without compromising quality. To help fulfill these goals, companies are turning to the use of pre-blended, pre-weighed chemicals to help them achieve uniform batch-to-batch consistency with their rubber compounding. Providing pre-weighed cureblends in batch-inclusion bags is a perfect way to improve quality, handling and address the health and safety concerns of dealing with rubber chemicals. One bag, no weighing . . . . . just drop it in the batch and let the mixer do the rest! The benefits of using cureblends are numerous and far-ranging.

In this addition of Akrochem "Solutions", we will address some frequently asked questions concerning CUREBLENDS and show how they can be of value to your operation.

cureblends

What are Cureblends?

Cureblends are the customized, batch blending of chemicals, under controlled conditions, to create a homogeneous (single phase) blend from compatible chemicals which results in a stable product to be used in the mixing of rubber compounds. Cureblends are not only blends of curatives, but can consist of a variety of components from various chemical groups providing a variety of functions in the rubber compound. Cureblends are created from your formulations with high quality grade chemicals and certified to make sure each blend is consistent and performs to the highest quality standards per your specifications.

composition

What is the composition of Cureblends?

Cureblends are custom made. They are not restricted to accelerators and vulcanizing agents. Protective chemicals such as antioxidants / antiozonants, process aids, peptizers, activators and other chemicals can be added to a customized cureblend.

The key is making sure ALL the chemicals that are blended together to make the cureblend are compatible with each other. And, making sure any reactive chemicals are separated into another low melt bag which can then be inserted into the primary batch inclusion bag with all the other chemicals. We will discuss chemical compatibility in more detail later in this Solutions.

production

How are Cureblends made?

Cureblends are batch processed. They are made by blending compatible chemicals together, under controlled conditions, until an evenly dispersed, homogeneous (single-phased) mixture has been accomplished. A compatible, light process oil, may be added to reduce "dustiness" and "fly loss". The cureblend is then given a lot number and is tested to make sure it will:

- meet customer spec requirements,
- add to the rubber compound the qualities intended,
- ensure the compatibility of all chemicals in the final cureblend, and
- exhibit bin stability.

uses

Why are Cureblends used?

Generally, customers find it advantageous to consider a cureblend for compounds that are mixed regularly and when several batches are mixed at a time. Short runs, infrequent runs and non-repeating compounds do not lend themselves to having cureblends developed for their use.

Cureblends offer:

- convenience,
- cost savings,
- batch-to-batch consistency, and
- address health and safety concerns.

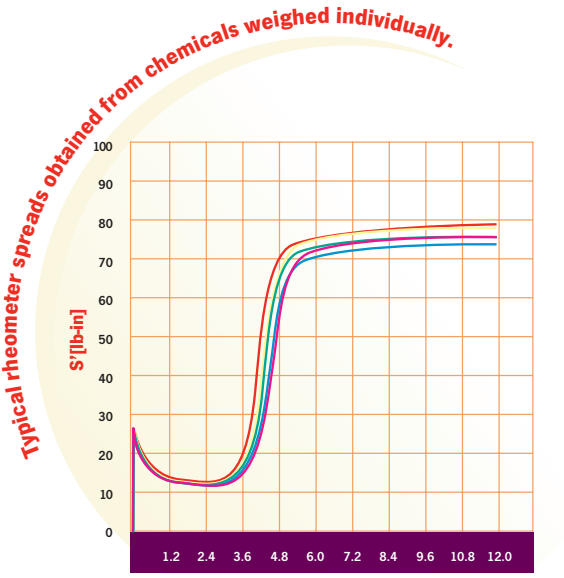
effectiveness

How effective are Cureblends?

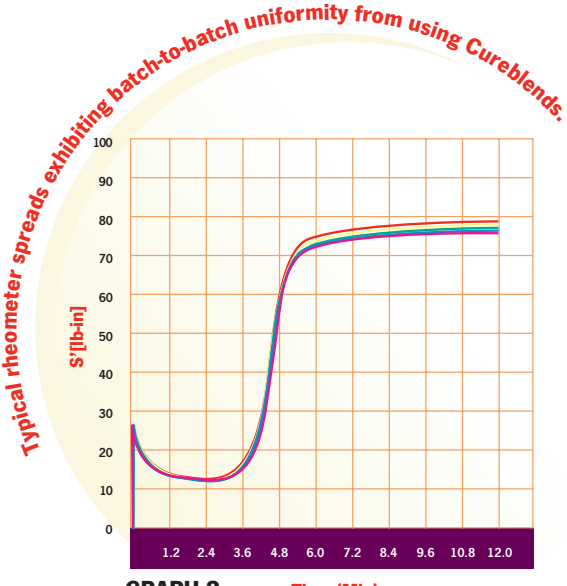
Cureblends can reduce the variation in weighing individual chemicals by more than 50%. This helps eliminate variation in compounding due to the individual weighing of critical chemicals. The rheometer charts to the right show the increased consistency from batch-to-batch mixing using cureblends vs. individually weighed chemicals. Uniformity and batch-to-batch consistency not only makes a great looking rheometer chart, but it also:

- increases productivity,
- reduces downtime resulting from making batch-to-batch cure adjustments in the press room,
- improves consistency with press cures,
- increases efficiency in the press room,
- reduces scrap in the mill room and final product, and
- reduces overall cost.

Akrochem Cureblends provide batch-to-batch consistency exhibited by the rheometer cure curves below. Cureblends can provide a 50% reduction in rheometer cure spreads due to more consistent weights and blending of critical chemicals.



GRAPH 1



GRAPH 2

compounding solutions

Why should I use cureblends?

Cureblends are a cost effective approach to improving productivity. Cureblends:

- Provide fewer process variations due to the pre-weighing of multiple chemicals.
- Eliminates contamination of chemicals.
- Reduces "fly-loss" to the dust collector and into the atmosphere.
- Ensures that critical chemicals are weighed accurately and are not left out of the rubber compound.
- Increases productivity by reducing mixing cycle time.
- Reduces set-up times at the mixer, calendar, mill, extruder and/or injection press.
- Pre-weighed, batch inclusion bags eliminate:
  - weighing,
  - contamination, and
  - helps minimize health and safety concerns.

Cureblends can be added to the mixing cycle by means of a low-melt, batch inclusion bag or as a "single-weigh" chemical from a bulk container.

health and safety concerns

Cureblends address health and safety concerns by:

- reducing exposure to hazardous chemicals
- minimizing airborne dust, which reduces the risk of chemical entry into the body through:
  - inhalation
  - ingestion
  - eyes, or
  - skin
- minimize physical contact with chemicals by using low melt, batch inclusion bags,
- reducing or eliminating physical contact with hazardous chemicals will reduce health concerns,
- creating positive life-long results.

chemical compatibility

What about chemicals that react with each other?

When a cureblend is being developed for a customer, the components of that cureblend are checked for compatibility. A lab size blend is made and tested. If there are chemical components that react with each other, they are identified and removed from the primary cureblend. This process continues until a stable cureblend is produced. Chemical(s) that are omitted from the primary cureblend are then placed into a smaller batch inclusion bag. This bag is then included in the primary batch inclusion bag containing the other cureblend components.

When developing cureblends, the most important thing to remember is not to take anything for granted. Chemicals that you think will not react . . . do, and chemicals that you are absolutely sure will . . . don't. That's why, when developing a customized cureblend, it is important to use good scientific principles of testing. Plan your experimental matrix and follow it step by step.

development process

How are Cureblends developed?

The process for developing a cureblend generally means taking a customer's formulation and working with the customer to identify the chemicals to be included in the cureblend. Sometimes the customer already knows the chemicals they want customized into a cureblend. When these chemicals are identified and the project is written up, the components of the potential cureblend are reviewed to identify possible compatibility issues between chemicals. The experienced chemist will be able to identify some of the chemicals that are potential "bad apples" and develop an experimental design directed toward developing a stable, customized cureblend.

Generally, the "lab scale" process begins by mixing two ingredients together and testing for compatibility (see table to the right). Then taking a portion of that blend and adding another component and, again testing for compatibility. Then taking a portion of that blend and adding another component. Repeating this process until either there is a reaction or all of the chemical components are incorporated into the cureblend.

Testing during the developmental phase of a cureblend generally consists of aging the blended chemical components, in a lab oven at elevated temperatures, for several hours. The aging conditions are determined by the different chemistry's involved. If a reaction occurs, the cureblend will become wet and pasty, have a strong odor and/or become exothermic.

Any sign of chemical reaction will be cause for the chemist to stop the developmental process and back up to the previous blend of chemicals thereby omitting the reacting chemical and resuming the experimental process by adding the next chemical on the list until all the chemicals have been incorporated into the cureblend without exhibiting any further reactive behavior.

When you have identified all the chemical components that are not compatible with the primary cureblend, they are tested for chemical compatibility using the same criteria as before. If they are compatible, they are placed in a separate batch inclusion bag which is then placed in the primary batch inclusion bag.

If you end up with a secondary low melt bag which exhibits chemical reactivity, then 1) separating out the incompatible chemical(s) into another low melt bag is an option, or 2) the customer may opt to leave that chemical out of the cureblend and choose to weigh it out separately.

The bag-in-bag system allows us to take reactive chemicals, place them in a separate bag and then place that bag in the larger batch inclusion bag with the other chemicals that are customized for that cureblend creating 1) a stable cureblend and 2) only one bag to handle.

"Bad Apples" - As examples, we know that CBTS (N, cyclohexyl benzothiazole), DPTT (dipentamethylene thiuram tetra/hexasulfide), Accelerator R (4, 4'dithiodimorpholine) and/or Antioxidant DQ (2,2,4-trimethyl-1,2-hydroquinoline) are very reactive chemicals and they can be bad apples causing unfavorable behavior if added to a cureblend. When asked to develop a cureblend containing any of these chemicals, we will be very cautious about mixing them in with other chemicals. More than likely, they will have to be separated out into their own low melt bag or added independent of the cureblend.

With literally hundreds of chemicals to choose from in the development of cureblends, chemical interaction is always the number one precaution. It would be impossible to list all the "bad apples" because each cureblend is a CUSTOM BLENDING OF CHEMICALS FROM YOUR RUBBER COMPOUND. Thus, cureblends are as unique and numerous as the rubber compound they are developed from. Think of all the tens of thousands of rubber compounds that exist. . . . that is the number of possible cureblends that could be developed! Combine this with the number of chemicals available and you can quickly understand why caution is the key ingredient in developing any cureblend.

At times, producing some cureblends can become very "dusty" and "fly-loss" becomes an issue. To resolve this health and safety issue and to insure the quality of the product, a light coating of process oil can be blended into the cureblend to reduce dusting. This is done with the approval of the customer. Care is taken to ensure the compatibility of the process oil with both the cureblend and the rubber compound for which the cureblend is being developed.

Cureblends do not have to contain just curatives. Almost any chemical can be used as a component of a cureblend. A cureblend can consist of waxes, peptizers, antioxidants, antiozonants, stearates, ZnO, MgO, activators, etc.

Almost always cureblends consist of 1) ingredients that are light in weight in the rubber compound and/or 2) react, critically altering the properties of the rubber compound if weighed incorrectly.

The final step in determining if a newly developed cureblend is a viable product, lies in testing it in a rubber compound. A cure meter is employed to measure the sigma between the new cureblend and carefully weighing each chemical separately.

When the cureblend is finalized and accepted by the customer,

- a "fingerprint" is developed of that customized blend of chemicals by FTIR (Fourier Transmitted Infrared Spectroscopy),
- an MSDS is created, and
- a database is started.

Every time this cureblend is produced, it has to conform within pre-determined specifications before it can be accepted, a C of A written and the product shipped to the customer.

Typical Cureblend Design Matrix

primary cureblend package

Cureblend Components	%	Chemical Reaction										Final Cureblend
			Result		Result		Result		Result		Result	
R.M. Sulfur	26.7	add										R.M. Sulfur
ZDBC	8.3	add	Neg.									ZDBC
DPG	8.3			add	Neg.							DPG
CBTS	23.3					add	Pos.					Separate out
A.O. 235	16.7							add	Neg.			A.O. 235
St. Acid	16.7									add	Neg.	St. Acid

secondary cureblend package

Cureblend Components	Chemical Reaction		Final Cureblend
		Result	
CBTS	Add	Neg.	CBTS

quality assurance

What about Cureblend lot-to-lot consistency?

With cureblends, quality rubber compounding is assured because:

- You can achieve more accurate and consistent weights and more thorough chemical incorporation which results in more consistent rheometer cure curves. This translates to more consistent use in the press room.
- You'll gain full traceability on all raw materials.
- SPC data is available, and
- Quality Control record keeping is reduced.

cost savings

Can I save money by using Cureblends?

On paper, it is hard to calculate and quantify just how much of a cost savings your company can achieve by using cureblends. This is mainly because of the intrinsic value placed on using cureblends. While there's concrete evidence based on the reduction of scrap, rework and landfill costs, the intrinsic value placed in saving time weighing out chemicals, going through scrapped product, dealing with health and safety concerns and etc. is much harder to calculate. The bottom line is that cureblends offer your company significant long-term savings by providing reduced:

- labor costs in weigh-up, material handling and ordering chemicals,
- waste disposal,
- inventory of raw materials,
- testing of incoming raw materials,
- scrap in both raw stock and finished goods, and
- health and safety concerns.

packaging

How are cureblends packaged and shipped?

- For convenience, pre-weighed, cureblends are packaged with the following batch inclusion bag options:
  - cure compatible, low-melt PBD resin COMPATIBAGS®.
  - low-melt point EMA or EVA bags.
- These pre-weighed cureblends are shipped in the following options:
  - heavy duty Gaylords.
  - returnable plastic Gaylords.
- Bulk packaging is available in the following options:
  - boxes, bags, drums, Gaylords and Supersacks.

storage and shelf-life

How can I keep my cureblends from becoming less active?

You can expect the shelf-life of cureblends to be approximately six (6) months. Beyond the shelf-life, cureblends tend to loose strength, become massed and/or chemically react. It is strongly recommended that cureblend inventories be controlled and cureblends that have outlasted their intended shelf-life be re-qualified by lab evaluation before it is used in production.

It is not recommended to leave bulk cureblends weighed out on the production line for extended periods of time. Heat and humidity can attack a cureblend causing deactivation.

Precautions should be made to store cureblends in air-tight containers. Also, it is recommended that cureblends be stored in a temperature controlled environment and out of direct sunlight. Cold-rooms are preferred. Freezers and refrigerators should be avoided because of increased water vapor in the air. Air conditioning helps to remove humidity from the air and works well for ensuring the shelf-life of cureblends.

customized cureblends

How about my specific needs?

Cureblends are custom designed from your proprietary formulation. They can be produced in large or small quantities. This flexibility allows Akrochem to work with a customer in developing the appropriate cureblend(s) to suit your needs.

- A computer-controlled weigh-up system will not allow weights outside of tolerances to be packaged. Typically +/- 1.0 percent by weight is the spec limit for cureblends.
- Akrochem has a program in place to provide full traceability of all raw materials used in every cureblend.
- Our Quality Assurance Lab tests each cureblend produced to previously agreed upon specifications.
  - The cureblend formulation is evaluated prior to production to separate reactive chemicals.
  - Incoming raw materials are certified, and
  - Finished cureblends are certified by rheometer testing and FTIR fingerprint verification.

conclusion

Cureblends are ideal for rubber compounds that are mixed often or where several batches of the same compound are mixed one after the other (long-runs). They are a perfect way to incorporate certain chemicals in internal mixers and are often used when mixing or finishing a batch of rubber on a two-roll mill.

Cureblends are custom made from a specific compound formulation from high quality raw materials to: 1) ensure inclusion of critical chemical components in the rubber compound, 2) reduce “fly loss”, 3) reduce variability of weighing chemicals, 4) reduce variation in cure time from batch-to-batch, 5) save time, 6) reduce energy costs, 7) reduce scrap rate of raw materials and finished products, 8) reduce waste disposal, 9) reduce health and safety concerns. Cureblends are a great way to reduce cost and improve efficiency with the mixing and curing of rubber articles.

AKROCHEM CORPORATION

SEVEN DECADES OF SUPERIOR SERVICE