





Properties Guide

Typical Cast Mechanical Properties (1/8-inch specimen)

Property	Units	Vicast® A830 resin	Standard Marble Resin	Test Method
Tensile Strength	psi	9,850	10,000	ASTM D638
Tensile Modulus	psi	550,000	600,000	ASTM D638
Tensile Elongation	psi	2.0	2.1	ASTM D638
Flexural Strength	psi	15,800	17,500	ASTM D790
Flexural Modulus	%	560,000	600,000	ASTM D790
Heat Distortion Temperature	°F	170	142	ASTM D648

Liquid Properties

Property	Units	Vicast® A830-CMA-40	Standard Marble Resin	Test Method
Styrene	%	29 - 32	29-32	C 377.01
Viscosity	cps	200 - 300 (LV # 1 @ 12 rpm)	1100 - 1200 (RV # 2 @ 20 rpm)	V227.04
Gel Test, 25° C 100 g resin + 1.25% MEKP9				
Gel Time	minutes	40*	40	G116.01
Gel to Peak	minutes	10 - 14	10 - 14	G116.01
Peak Exo	°F	330 - 360	275 - 310	G116.01

*Available in Gel Times of 10, 20, 30, 40 & 55 minutes.

The information in this publication has been gathered by AOC's Technical Team and is based on field trials, and observations in cast marble manufacturing shops. The data presented were gathered using generally accepted industry practices and equipment. However, AOC assumes no liability for accuracy or completeness of the information and data. The user of this publication is solely responsible for determining the suitability of this publication to the user's particular operation or end-use application. Questions or requests for more information should be directed to an AOC Technical Service Representative. In the discussion of mold releases and initiators, specific manufacturer names are provided as examples and do not constitute an endorsement by AOC.

Vicast® A830 Series Marble Casting Resins



For Manufacturers Who Want to Lower Costs

Vicast® A830 resin series from AOC is for cast polymer manufacturers who want to lower material costs by at least 11 percent. Users save money because this technology is designed to work when there is more filler and less resin in the finished marble composite product.



AOC polymer chemists designed A830 series resins for higher filler loadings.

When tested to industry standards, the performance of products made with Vicast A830 technology is similar to products made the traditional, more expensive way. Reaping the generous rewards of Vicast A830 technology requires a few key process variations that are covered in the Field Guide section of this publication.

Description

Vicast A830 series polyester casting resins are non-thixotropic, low-shrink materials. They are pre-promoted for room temperature cure using methyl ethyl ketone peroxide (MEKP) initiator. The unique resins are engineered to allow significantly higher filler loadings at the same styrene monomer content as traditional cultured marble casting resins. Vicast A830 casting resins yield robust physical properties at very low viscosities.





Vicast® A830 Series Marble Casting Resins

Applications

End-use tests show that Vicast A830 resins are suitable for automated mixing and casting processes, as well as “custom” operations where hand-mix equipment is used. When resin, filler, and catalyst are weighed properly, A830 can be used to successfully manufacture a myriad of cultured marble parts, including flat panels, vanity sinks, tubs, and shower pans.

The A830 resin series is engineered to be used with marble-quality calcium carbonate or specific lightweight fillers. The low viscosity (150-250 cps) of A830 resins not only allows for, but actually requires a 10-20% reduction in the resin content when compared to traditional casting techniques. That translates into significant cost savings for cultured marble manufacturers.

Thermocycling results for vanities manufactured with Vicast A830 are comparable to results for parts made with traditional marble resins. For testing purposes, gel coat type and thicknesses were held constant, as were filler types – although filler percentage was much higher with parts made with Vicast A830. Resin contents below 18% (by mass) are not recommended with calcium carbonate filler.



Vicast® A830 resins meet the same end-use standards of performance as traditional resins.

Vicast® A830 Series Material Cost Reduction Calculator



Use photocopies of this page to create worksheets for calculating cost savings by using Vicast® A830 series resins. Users with questions or needing assistance should contact an AOC representative.

Traditional Resin Part

$$\begin{aligned} & \frac{\text{pounds of resin/filler} \square}{\text{matrix to fill the mold}} \\ & \times \frac{\% \text{ of resin by wt.} \square}{\text{(e.g. 24\% is .24)}} \\ & = \text{lbs. of resin per part} \\ & \times \$ \frac{\text{resin price per lb.}}{\text{resin price per lb.}} \\ & = \$ \frac{\text{resin cost per part}}{\text{resin cost per part}} \end{aligned}$$

$$\begin{aligned} & \frac{\text{pounds of resin/filler} \square}{\text{matrix to fill the mold}} \\ & \times \frac{\% \text{ of filler by wt.} \square}{\text{(e.g. 76\% is .76)}} \\ & = \text{lbs. of filler per part} \\ & \times \$ \frac{\text{filler price per lb.}}{\text{filler price per lb.}} \\ & = \$ \frac{\text{filler cost per part}}{\text{filler cost per part}} \end{aligned}$$

$$\begin{aligned} & \$ \frac{\text{resin cost per part}}{\text{resin cost per part}} + \$ \frac{\text{filler cost per part}}{\text{filler cost per part}} = \$ \frac{\text{Total per traditional part}}{\text{Total per traditional part}} \end{aligned}$$

A830 Series Resin Part

$$\begin{aligned} & \frac{\text{pounds of resin/filler} \square}{\text{matrix to fill the mold}} \\ & \times \frac{\% \text{ of resin by wt.} \square}{\text{(e.g. 24\% is .24)}} \\ & = \text{lbs. of resin per part} \\ & \times \$ \frac{\text{resin price per lb.}}{\text{resin price per lb.}} \\ & = \$ \frac{\text{resin cost per part}}{\text{resin cost per part}} \end{aligned}$$

$$\begin{aligned} & \frac{\text{pounds of resin/filler} \square}{\text{matrix to fill the mold}} \\ & \times \frac{\% \text{ of filler by wt.} \square}{\text{(e.g. 76\% is .76)}} \\ & = \text{lbs. of filler per part} \\ & \times \$ \frac{\text{filler price per lb.}}{\text{filler price per lb.}} \\ & = \$ \frac{\text{filler cost per part}}{\text{filler cost per part}} \end{aligned}$$

$$\begin{aligned} & \$ \frac{\text{resin cost per part}}{\text{resin cost per part}} + \$ \frac{\text{filler cost per part}}{\text{filler cost per part}} = \$ \frac{\text{Total per A830 part}}{\text{Total per A830 part}} \end{aligned}$$

$$\begin{aligned} & \$ \frac{\text{Total per traditional part}}{\text{Total per traditional part}} \\ & - \\ & \$ \frac{\text{Total per A830 part}}{\text{Total per A830 part}} \\ & = \\ & \$ \frac{\text{cost savings per part}}{\text{cost savings per part}} \end{aligned}$$

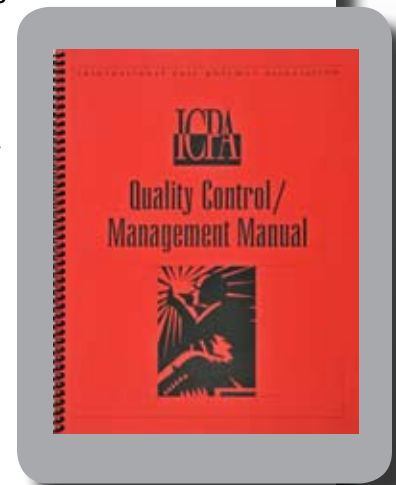
The formulas above are presented to establish estimated material cost savings when comparing a part made using traditional resin with the same part made using A830 series resin. Depending on shop practices, mix formulations, manufacturing techniques and manufacturing conditions, precise cost savings may vary.



Field Guide for A830 Marble Casting Resins

Vicast A830 series resins incorporate DCPD (dicyclopentadiene) chemistry. DCPD marble resins, sometimes referred to as “hybrids,” are generally considered to be not as “forgiving” as their traditional orthophthalic counterparts. Some of these differences were identified during A830 product development and field product trials. This document will point out some of the “lessons learned” during A830’s introduction. It is not possible to capture all process and manufacturing variables from every culture marble fabricator. However, based on years of experience, this guide hopes to impart meaningful knowledge to customers interested in using A830.

The first, and perhaps most important, component to successful marble fabrication is adherence to a documented process control mechanism. To that end, AOC recommends to any cast polymer manufacturer the purchase of the International Cast Polymer Alliance (ICPA) Quality Control/Management Manual. This publication can be helpful regardless of the resin type used. The ICPA can be found on the Internet at www.icpa-hq.org.



Mold Release

Manufacturers need to pay special attention to application of mold release on the female tool or “hat.” DCPD resins have remarkable adhesion to glass, metal, and gel-coat tooling when not protected with a thorough application of the proper mold release. DCPD resins also contain small amounts of diluents that act like a solvent on many waxes and mold release agents. Three different options are offered as recommended practices.

Option 1

The female tool (“hat”) may be gel coated in similar fashion to that of the finished surface. The gel coat needs to cover the entire surface of the female tool “hat.”

Option 2

Some semi-permanent mold releases can be used with DCPD composite resins. When contacting their mold release representative, cast polymer manufacturers interested in semi-permanent releases should specify a release that works well with DCPD resins.

Option 3

Common wax-type mold releases, such as Partall®, work well with A830 marble resins. Mold releases work best when applied in generous amounts over the entire mold surface. When not enough waxed is used, parts can stick in the mold. When parts stick demolding is difficult.



Processing Attributes

Compared to traditional casting resins, A830 technology is more reactive. This attribute imparts higher exothermic temperatures at the same resin content. However, the high filler levels required for A830 resins lower the casting's exotherms to typical levels. A830 resins have outstanding "green strength" properties, which impart greater stiffness earlier in the cure cycle. If the A830 matrix is too resin-rich, then the exotherm will be too high, which may cause thick parts like shower bases or tubs to crack.

A830 works well with "lightweight" fillers, as long as the resin ratio is below 30% by weight. With typical 15% weight-reduction lightweight filler, A830 resin ratios need to be in the 20-22% range. Likewise, for 25% weight-reduction lightweight filler, A830 resin ratios should be in the 22-25% range. Manufacturers should always use a calibrated scale to weigh the resin and fillers.

Because resin content decreases when A830 is used, the volume of the mix decreases and the weight of parts made will increase slightly. As a result, slightly larger batches will be necessary to properly fill the mold. By how much? It depends on the type of fillers used (lightweight versus calcium carbonate). Shops which commonly have leftover mix can leave batch recipes unchanged and manage the batch size based on the volume of the molds. An AOC Technical Service Representative can assist with volume calculations.

The Dry Look Is Wet

For all casting methods, A830 marble resins "look" and process differently than traditional orthophthalic marble resins during the mixing and casting steps. A830 "wets" the filler better than traditional orthophthalic resin systems, except it takes longer to do so. After all, there is significantly more filler with A830 marble composites than with traditional marble systems.

However, fabricators have noticed that A830 "looks dry" during the mix phase. But the resin is not "dry" at all. In fact, if the mix consistency looks correct using standards based on traditional resin experience, then the mix is probably too wet. If that is the case, the mix needs more filler to prevent the matrix from sliding from the mold as it continues to wet-out before gellation. A830 needs to have a dry appearance in the matrix. Eventually, it will wet-out the fillers before gellation.

Patience Pays Off

It is suggested to mix the pot for 6 to 8 minutes so that the resin thoroughly "wets out" the filler. Matrix viscosity decreases the longer you mix the materials, although the phenomenon ceases at about 10 minutes – after which viscosity stabi-



Field Guide for A830 Marble Casting Resins

lizes. Because many marble fabricators mix for only 3 to 5 minutes, 7 minutes may seem long at first. When using Vicast A830 resins, the mix will look “drier” than a traditional mix. The matrix will wet-out -- it just takes longer.

Using too much resin may result in separation, which leads to warping and poor veining. Of course, using less resin in the matrix means more savings for the fabricator. For example, when used with typical straight “marble dust” (calcium carbonate) marble applications, the resin to calcium carbonate ratio is approximately 20:80 when both components are 70-85°F.

Matrix Casting

A830 marble resins are designed to work with all three typical casting methods: hand batch mixing, auto-dispensing method (machine delivery of resin, filler and catalyst by volume based on a mass conversion), and continuous metering and dispensing method (commonly referred to as autocasting).

Hand-Batch Method

To successfully use A830 marble resin, it is critical to weigh the resin and fillers prior to mixing. Volume measurements like “X gallons of resin to Y bags of filler” are simply not precise enough – especially in the manufacture of tubs. Manufacturers should use a scale that is calibrated on a regular basis using the scale manufacturer’s calibration procedures to ensure accuracy

Auto-Dispensing with Batch Mixing

A830 is ideal for the manufacturer that uses automated dispensing with batch mixing (spin pots), because these manufacturers already weigh their resin, filler, and initiator (catalyst). As important as the measurement itself, is the fact that the machine is calibrated regularly, although when doing so it is best to run at least 100 pounds of resin or filler when calibrating into the bucket; cross check the weights on a calibrated scale. Always follow the respective machine manufacturer’s calibration procedures to ensure accuracy.

When equipped with a resin heater, the resin content of the mix can be further reduced, which could allow a fabricator to go as low as 18% resin by weight when used with calcium carbonate – or even in conjunction with some light-weight fillers. **NOTE:** Mix temperatures above 95°F are not necessary. A830 is developed to give a 30-35 minute matrix gel time (80:20 calcium carbonate-to-resin ratio) at 95°F using 1.25% methyl ethyl ketone peroxide initiator based on resin weight.



Field Guide for A830 Marble Casting Resins



Continuous Metering and Dispensing

A830 series marble resins are ideal for high output marble fabricators who use auto-casting machines to manufacture cultured marble parts. Very low resin ratios (AOC recommends resin content as low as 18% by weight) combined with rapid gel and cure times offer the fabricator a low cost alternative to traditional marble resins. Parts made with A830 have minimal shrink and can be demolded rapidly. Gel time versions as low as 5 minutes are available with A830 marble resins. A830 is compatible with Chroma-Tek® liquid pigment dispersions.



Initiator (Catalyst)

Proper resin selection and accurate catalyst amount (by weight) are critical to managing marble matrix's gel time and exotherms. When the recommended gel time resin is properly combined with the filler and manufacturing environment (ambient temps, matrix temps, mold temps), the operating range for the methyl ethyl ketone peroxide should be 1.0% -1.5% by weight.

Due to its tendency to increase exothermic temperatures, acetyl acetone peroxide (such as Norox® Azox, Lupersol® 224, Trigonox® 44B) is not recommended for use with A830.



Field Guide for A830 Marble Casting Resins

Typical Resin and Marble Matrix Properties

Resin Type	Ortho	Hybrid	DCPD	DCPD	DCPD	DCPD
Cured Color, Neat	Light Pink	Rose	Amber	Amber	Amber	Amber
% Styrene	31	31	31	31	31	31
Viscosity, RV#2 @20rpm	1140	550	250	250	250	250
Gel test, 100 gms, 77°F, MEKP-9 catalyst						
% Catalyst	1.25	1.25	1.25	1.25	1.25	1.25
Gel time, minutes	25	30	30	40	55	30
GTP, minutes	12	13	13	12	15	13
Total, minutes	37	47	43	52	70	43
Peak temperature , °F	290	308	358	362	355	358
Filled Matrix Testing, 600 g in 400 mL beaker, MEKP-9 catalyst						
% Catalyst	1.25	1.00	1.00	1.25	1.00	1.25
% Resin	25	22	19	19	19	23
% RJ Marshall Marfill 40	75	78	81	81	81	77
Matrix Temperature, °F	77	77	77	93	93	95
Matrix Gel Time, minutes	45	40	34	24	37	15
Start Time to Peak, minutes	140	80	90	75	107	25
Peak, degrees F	115	117	116	115	107	160

In hot weather it is acceptable to make tubs and shower pans with 1.25% diluted MEKP, such as Luperox® MEKP-30, Luperox DDM-30, or Butanox® M-30. The recommended operational range for MEKP is 1 to 1.5%. A830 is offered in many gel time ranges, including 10, 20, 30, 40, and 55 minutes. If it is necessary to lower catalyst percentage below 1% to achieve proper working time, then a longer gel time version of A830 is required.

Field Guide for A830 Marble Casting Resins



Back Pours and Demolding

Like all DCPD resins, A830 has air-dry properties. Therefore, it is recommended for fabricators to back pour as soon as possible after the initial pour gels – and always on the same day. Parts made with A830 can be demolded shortly after peak exotherms are generated. Parts may be left overnight if the clamps and hat are removed; the part should not be locked down onto the mold.

A830 imparts outstanding “green strength” characteristics, which is particularly useful when handling flat stock parts that generally do not achieve high exothermic temperatures. ANSI Z124.3 thermal shock testing results for properly catalyzed sinks made with A830 resin and quality fillers show little difference when compared to similarly made parts with orthophthalic marble resins.

Shelf Life

Vicast A830 marble casting resins have a shelf life of 90 days.

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The World of AOC

AOC is a leading global supplier of resins, gel coats, colorants, additives and synergistic systems for composites and cast polymers. AOC products are manufactured in facilities strategically located in North America, Europe and Asia. AOC-owned manufacturing plants are ISO 9001:2000-certified, use proprietary technology to ensure resin batch-to-batch consistency, and follow Six Sigma-Lean principles for improved efficiency and quality. Whatever you are making or the manufacturing processes you use, discover AOC's innovative technology, process expertise and commitment to service by going to www.aoc-resins.com on the Internet.

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