FOPAT Investment Casting Patterns
FOUNDRY PROCEDURE & GUIDELINES FOR USE

PATTERN ASSEMBLY:

FOPAT foam patterns and gates have a skin that must remain intact during the assembly process. Any repairs to foam patterns can be made with gluing and red utility wax that would be used with wax patterns. If dipping foam in hot wax (198F or higher), some bubbling may occur. Allow to cool and re-dip to make sure skin of foam is sealed adequately prior to dipping in slurry.

Most foundries use same techniques to assemble foam patterns to wax gating as is typical with SLA patterns. Assemblers can use a thick layer of glue wax at the seam if necessary.

CAUTION: Keep high temperature irons away from the foam, using only low temp air guns with tips. When attaching wax patterns to foam gating, heat only the wax component.

VENTING:

Although some foundries have run FOPAT through their operations without the use of vents, we recommend locating some vents on runners and gates to release pressure and insure adequate airflow during dewax/burnout.

SHELLBUILDING PROCESS:

If trees are typically dipped in citric acid wash prior to first dip, we recommend eliminating this step to avoid picking up excess moisture in the foam material. Otherwise, follow standard procedures for building the ceramic shell. Because FOPAT is 1/3rd to 1/10th the density of wax, foam components are more buoyant than wax when dipped in slurry. Pay close attention to differences in handling to avoid breakage of patterns.

EVACUATING THE SHELL:

Preferred Method – Burnout or Flashfire Furnace: If proper burnout procedures are followed, foam components can be reliably combusted without causing the shell to crack or leaving excess residue in the shell. To achieve complete combustion, it is necessary to establish the correct balance of temperature, oxygen content and time. Although one methodology does not work for all foundries, there are some general rules that can be applied. Place shells in preheated environment (1800F or higher) and hold for 2 hours. During the burnout, at least 10% excess oxygen should flow into the shell to achieve complete combustion of FOPAT. If using a flashfire furnace to dewax/burnout, it is beneficial to drill a hole in the end of the shell opposite the cup to vent and accelerate the burn. Until a reliable procedure is established, shells should be inspected for residue prior to casting, and if necessary, blow out the ash or rinse with water in the case of titanium castings.

Autoclave—Foam components will only begin to char, not burn, at 250-300F. By limiting the amount of time in the autoclave to 5 min. or less, it's possible to dewax without shell cracking.

The remaining solid foam and wax residue must be burned out using method above.

R&R
DENTSPLY

Ransom & Randolph
3535 Briarfield Blvd.
Maumee, OH 43537 USA
USA Phone: (800)800-7496
Phone: (419)865-9497
Fax: (419)865-9997
www.ransom-randolph.com

FOPAT Investment Casting Patterns
TECHNICAL DATA SHEET

PRODUCTION DESCRIPTION:

F101 is a water blown polyurethane foam made of confidential polymeric blends. All substances used to manufacture F101 are listed on the TSCA inventory. No halogen based flame retardants or blowing agents (CFC's or HCFC's) are used in the manufacture of this foam. (From MSDS)

PHYSICAL & CHEMICAL PROPERTIES:

Form:	Cellular Solid
Flash Point:	600F (316C); will burn in presence of sufficient heat and oxygen
Specific Gravity:	0.10 to 0.60
Water Solubility:	Not soluble
Density:	5-25 pcf (but can be tailored to meet customer application)
Compressive Strength:	250 psi
Tensile Strength:	300 psi

STABILITY & REACTIVITY:

This is a stable material. Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons. Tests conducted according to AITM 3.0005 show under the Flaming and Non-Flaming conditions gas levels well below the max accepted levels. The average concentration (in parts per million, ppm) of the following gas components of smoke did not exceed the limits listed in the ABD 00031:

Hydrogen Fluoride HF	100 ppm vol
Hydrogen Chloride HCl	150 ppm vol
Hydrogen Cyanide HCN	150 ppm vol
Sulfur Dioxide SO2/H2S	100 ppm vol
Nitrous Gases NO/NO	100 ppm vol
Carbon Monoxide CO	1000 ppm vol

THERMOMECHANICAL ANALYSIS:

Coefficient Of Thermal Expansion (CTE):

(35 to 90C) = 73.5 microns/m/C

(150 to 200C) = 51.87 microns/m/C

BURNOUT PROPERTIES:

Start Burn:	473F (225C)
Complete Burn:	1800F+ (982C +); time and oxygen dependent
Ash Content after Burnout:	0.000% after 2 hrs @ 2000F (1093C)

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