

BENCHMARK REPORT

Benchmarked Experiment Data

GOAL - 25% increase fast hardener cure gel rate for Rudder Assembly
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design

ASSUMPTION

Adding a fast cure speed hardener (INF-210) to replace 25% of the medium cure hardener (INF-211) will instigate a more rapid saturation of fiberglass laminate to facilitate gelling within 2-3 hour time-frame.

OBJECTIVE

Test flow rate of infusion epoxy resin mixture to discern optimal proportion of fast and medium hardener to increase gel point for rudder port and starboard parts, while maintaining, at least, a 72°F temperature during the infusion process. Optimal aim is to achieve a one inch/minute infusion flow rate at a temperature of 77°F (25°C).

MATERIALS

Infusion Epoxy Resin/Hardener

INF-114

INF-211

INF-210

trials

TRIAL 1	TRIAL 2	NOTES
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DATE | 11/8/18

Infusion Epoxy Resin/Hardener
(Weight)

INF-114 | 3000 g
INF-211 | 616 g
INF-210 | 222 g

DATE | 11/9/18

Infusion Epoxy Resin/Hardener
(Weight)

INF-114 | 3000g (2 x 1500 g)
INF-211 | 616g (2 x 308 g)
INF-210 | 222g (2 x 111 g)

NB: Feedstock constituents were split in half for Trial 2.

procedure trial 2

Two, equal batches of the infusion epoxy resin feedstock were produced in two separate containers.

The first Infusion mixture temperature readings from the first container were taken at one-minute intervals for five minutes.

Thermometer laser aimed at ~6" from the top at the center and top surface of the feedstock for temperature readings.

Readings were taken at onset of infusion and during one minute intervals during the infusion process.

At approximately three minutes into the infusion process, the second batch of the infusion feedstock was combined with the first batch.

Method for Recording Reading

Highest elevation distance on the starboard part was selected as the point of interest to take flow readings and mark flow progression. The lowest elevation distance on the port part was selected as the point of interest to take flow readings and mark flow progression. Hash marks earmarking flow location were created using a Sharpie Pen.

Trial No.	Temp (°F)	Timestamp	Port resin travel time, cm (in)	Starboard resin travel time, cm (in)	Notes
0	76.2	3:32:30	0	0	
1	76.4	3:33:30	6.0 (2.36)	4.5 (1.77)	
2	76.7	3:34:30	3.5 (1.38)	6.8 (2.68)	Flow traveling down (starboard)
3	76.9	3:35:30	4.9 (1.93)	6.1 (2.40)	Flow traveling up (starboard)
4	77.5	3:36:30	4.9 (1.93)	6.6 (2.60)	
5	77.7	3:37:30	5.3 (2.09)	6.6 (2.60)	No elevation changes on starboard

observations summary

Care was taken to keep feedstock stirred well.

There was no formation of crystals observed during the entire infusion process.

More feedstock remained than expected at end of infusion process, suggesting less resource will be needed in the future—a final reading of feedstock taken ~2 tick marks above container bottom.