

## AMALGA COMPOSITES, INC.

Reinforced composite structures have a long history of superior performance in various chemical environments. The resin matrix is the composite component that dominates the structure's chemical resistance capability. The chemical resistance of a given resin system is determined by its molecular architecture and by its chemical composition.

Amalga Composites offers several solutions to your chemical resistance problems. The anhydride cured epoxy system that binds the reinforcing fibers offers excellent resistance to all but the strongest acids and bases. The vinyl ester inner coating available from Amalga on most products offers even greater resistance to chemical degradation.

The following table lists various chemical environments. The listing includes the concentration of the chemical in the environment. The temperature cited is the limit for the specific chemical concentration when in continuous contact with either the anhydride epoxy or the vinyl ester coating.

| CHEMICAL ENVIRONMENT       | INNER SURFACE |    | ANHYDRIDE CURED EPOXY |    |
|----------------------------|---------------|----|-----------------------|----|
|                            | °F            | °C | °F                    | °C |
| ACETALDEHYDE               | NR            | NR | NR                    | NR |
| ACETIC ACID, 10%           | 200           | 93 | 175                   | 79 |
| ACETIC ACID, 20%           | 200           | 93 | 125                   | 52 |
| ACETIC ACID, 50%           | 150           | 66 | NR                    | NR |
| ACETIC ACID, 75%           | 130           | 54 | NR                    | NR |
| ACETIC ACID, GLACIAL       | 75            | 23 | NR                    | NR |
| ACETONE, 1%                | NR            | NR | 100                   | 38 |
| ACETONE, 10%               | NR            | NR | NR                    | NR |
| ACRYLIC ACID, 25%          | 75            | 24 | NR                    | NR |
| AIR, WET OR DRY            | 200           | 93 | 200                   | 93 |
| ALUMINUM CHLORIDE, 1%      | 200           | 93 | 200                   | 93 |
| ALUMINUM NITRATE, 25%      | 160           | 71 | 150                   | 66 |
| ALUMINUM SULFATE, 25%      | 200           | 93 | 150                   | 68 |
| ALUM, ALL                  | 200           | 93 | 150                   | 68 |
| AMMONIUM CHLORIDE, 25%     | 200           | 93 | 150                   | 66 |
| AMMONIUM HYDROXIDE, 30%    | 100           | 38 | NR                    | NR |
| AMMONIUM NITRATE, 25%      | 200           | 93 | 150                   | 66 |
| AMMONIUM PHOSPHATE, 25%    | 200           | 93 | 150                   | 66 |
| AMMONIUM SULFATE, 25%      | 200           | 93 | 150                   | 66 |
| AMYL ACETATE, 1%           | 125           | 52 | 75                    | 24 |
| AMYL ACETATE, 10%          | NR            | NR | NR                    | NR |
| ANILINE, ALL               | NR            | NR | NR                    | NR |
| BARIUM CHLORIDE, 25X%      | 200           | 93 | 150                   | 66 |
| BARIUM HYDROXIDE, 5%       | 150           | 66 | 70                    | 21 |
| BARIUM TETRASULFIDE, 25%   | 170           | 77 | NR                    | NR |
| BEER                       | 90            | 32 | 140                   | 60 |
| BENZENE, 1%                | 100           | 38 | 125                   | 52 |
| BENZENE, 10%               | NR            | NR | 70                    | 21 |
| BENZENE SULFONIC ACID, 50% | NR            | NR | NR                    | NR |
| BENZOIC ACID, ALL          | 200           | 93 | 140                   | 60 |
| BLACK LIQUOR (PULP MILL)   | 200           | 93 | 100                   | 38 |
| BORIC ACID (ORTHO), 5%     | 200           | 93 | 150                   | 66 |
| BROMINE, 5%                | 170           | 77 | NR                    | NR |
| BROMINE, 10%               | NR            | NR | NR                    | NR |
| BUTANE, 100%               | NR            | NR | 75                    | 24 |
| BUTANOL, ALL               | 90            | 32 | 75                    | 24 |
| BUTYL ACETATE, 100%        | NR            | NR | 75                    | 24 |
| BUTYL CALLOSOLVE           | 150           | 66 | 75                    | 24 |
| BUTYRIC ACID, 25%          | 200           | 93 | 75                    | 24 |
| CALCIUM BISULFITE, ALL     | 150           | 66 | 100                   | 38 |
| CALCIUM CHLORIDE, 37%      | 200           | 93 | 150                   | 66 |
| CALCIUM HYPOCHLORITE, 5%   | 150           | 66 | 100                   | 38 |
| CALCIUM NITRATE, 25%       | 200           | 93 | 150                   | 66 |
| CARBON DIOXIDE, DRY        | 200           | 93 | 200                   | 93 |
| CARBON DIOXIDE, WET        | 150           | 66 | 150                   | 66 |
| CARBON TETRACHLORIDE, 100% | 90            | 32 | NR                    | NR |
| CASTOR OIL, 100%           | 200           | 93 | 200                   | 93 |
| CHLORACETIC ACID, 10%      | 150           | 66 | NR                    | NR |
| CHLORINE GAS, WET          | NR            | NR | NR                    | NR |
| CHLORINATED WATER, 1000ppm | 175           | 79 | 150                   | 66 |
| CHLOROBENZENE, 100%        | NR            | NR | NR                    | NR |
| CHLOROFORM, 1%             | 100           | 38 | 75                    | 24 |
| CHLOROFORM, 10%            | NR            | NR | NR                    | NR |
| CITRIC ACID, 25%           | 200           | 93 | 150                   | 66 |
| COPPER CHLORIDE, 25%       | 200           | 93 | 200                   | 93 |
| COPPER NITRATE, 25%        | 200           | 93 | 100                   | 38 |
| AMALGA COMPOSITES          | Max. Temp.    |    | Max. Temp.            |    |

| CHEMICAL ENVIRONMENT          | INNER SURFACE |    | ANHYDRIDE CURED EPOXY |    |
|-------------------------------|---------------|----|-----------------------|----|
|                               | °F            | °C | °F                    | °C |
| COPPER SULFATE, 25%           | 200           | 93 | 150                   | 66 |
| CRUDE OIL, SWEET OR SOUR      | 200           | 93 | 200                   | 93 |
| DICHLOROBENZENE (ORTHO), 100% | NR            | NR | NR                    | NR |
| DIESEL FUEL, 100%             | 170           | 77 | 150                   | 66 |
| DIETHYLENE TRIAMINE, 1%       | 100           | 38 | 75                    | 24 |
| DIETHYLENE TRIAMINE, 10%      | NR            | NR | NR                    | NR |
| ETHANOL, 100%                 | 100           | 38 | 75                    | 24 |
| ETHYL ACETATE, 100%           | NR            | NR | NR                    | NR |
| ETHYLENE GLYCOL, ALL          | 200           | 93 | 190                   | 88 |
| FERRIC CHLORIDE, ALL          | 200           | 93 | 150                   | 66 |
| FERRIC NITRATE, 10%           | 200           | 93 | 100                   | 38 |
| FERRIC SULFATE, 10%           | 200           | 93 | 150                   | 66 |
| FERROUS CHLORIDE, 25%         | 200           | 93 | 150                   | 66 |
| FERROUS SULFATE, ALL          | 200           | 93 | 150                   | 66 |
| FORMALDEHYDE, 37%             | 100           | 38 | NR                    | NR |
| FUEL OIL, 100%                | 170           | 77 | 150                   | 56 |
| GASOLINE, ALL TYPES, 100%     | 140           | 60 | 140                   | 60 |
| GLUCOSE, ALL                  | 200           | 93 | 125                   | 52 |
| GLYCERIN, ALL                 | 200           | 93 | 200                   | 93 |
| HYDRAULIC FLUID               | 100           | 38 | 100                   | 38 |
| HYDROBROMIC ACID, 10%         | 200           | 93 | 75                    | 24 |
| HYDROBROMIC ACID, 50%         | 150           | 66 | NR                    | NR |
| HYDROCHLORIC ACID, 3%         | 200           | 93 | 150                   | 66 |
| HYDROCHLORIC ACID, 10%        | 175           | 79 | 125                   | 52 |
| HYDROCHLORIC ACID, 20%        | 125           | 52 | 75                    | 24 |
| HYDROCHLORIC ACID, 37%        | NR            | NR | NR                    | NR |
| HYDROFLUORIC ACID             | NR            | NR | NR                    | NR |
| HYDROGEN CHLORIDE (DRY), 100% | 150           | 66 | 100                   | 38 |
| AMALGA COMPOSITES             | Max. Temp.    |    | Max. Temp.            |    |



**Composite  
Tubing Rings**



## AMALGA COMPOSITES, INC.

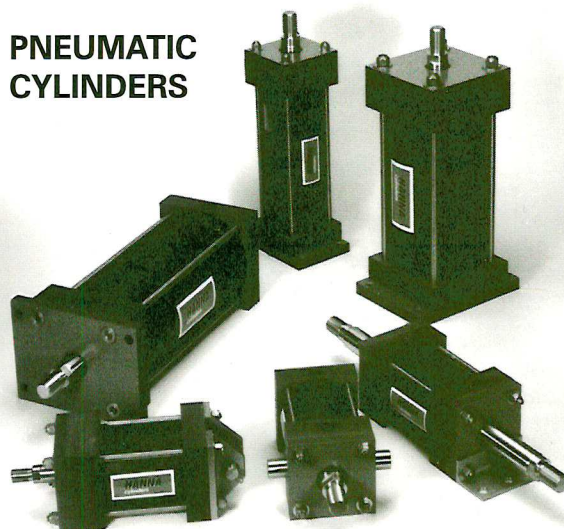
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| CHEMICAL ENVIRONMENT                    | INNER SURFACE |    | ANHYDRIDE CURED EPOXY |    |
|---|---------------|----|-----------------------|----|
|   | °F            | °C | °F                    | °C |
| HYDROGEN PEROXIDE, 10%                  | 100           | 38 | NR                    | NR |
| HYDROGEN SULFIDE (DRY), 100%            | 150           | 66 | 150                   | 66 |
| HYDROGEN SULFIDE (WET, SATURATED), 100% | 125           | 52 | 125                   | 52 |
| ISOPROPYL ALCOHOL, 10%                  | 150           | 66 | 100                   | 38 |
| ISOPROPYL ALCOHOL, 100%                 | 80            | 27 | 75                    | 24 |
| JET FUEL, 100%                          | 120           | 49 | 150                   | 66 |
| KEROSENE                                | 150           | 66 | 150                   | 66 |
| LACTIC ACID, ALL                        | 200           | 93 | 150                   | 66 |
| LEAD ACETATE, ALL                       | 200           | 93 | 190                   | 88 |
| LINSEED OIL                             | 200           | 93 | 200                   | 93 |
| LIME SLURRY                             | 175           | 79 | 100                   | 38 |
| MAGNESIUM CHLORIDE                      | 200           | 93 | 200                   | 93 |
| MAGNESIUM NITRATE, 10%                  | 170           | 77 | 150                   | 66 |
| MAGNESIUM SULFATE, 10%                  | 170           | 77 | 200                   | 93 |
| MALEIC ACID, 10%                        | 200           | 93 | 150                   | 66 |
| METHANOL, 10%                           | 140           | 60 | 100                   | 38 |
| METHANOL, 100%                          | NR            | NR | NR                    | NR |
| METHYLENE CHLORIDE, 1%                  | 75            | 24 | NR                    | NR |
| METHYLENE CHLORIDE, 10%                 | NR            | NR | NR                    | NR |
| METHYL ETHYL KETONE, 1%                 | NR            | NR | 75                    | 24 |
| METHYL ETHYL KETONE, 100%               | NR            | NR | NR                    | NR |
| METHYL ISOBUTYL KETONE, 100%            | NR            | NR | NR                    | NR |
| MINERAL OIL                             | 200           | 93 | 200                   | 93 |
| MINERAL SPIRITS, 100%                   | 100           | 38 | 75                    | 24 |
| MUD ACID, 5% (8 hr. maximum exposure)   | 150           | 66 | 125                   | 52 |
| NAPHTHA, 100%                           | 125           | 52 | 100                   | 38 |
| NATURAL GAS                             | 200           | 93 | 175                   | 79 |
| NICKEL CHLORIDE, 25%                    | 200           | 93 | 150                   | 66 |
| NICKEL NITRATE, 25%                     | 200           | 93 | 100                   | 38 |
| NITRIC ACID, 1%                         | 180           | 82 | 120                   | 49 |
| NITRIC ACID, 5%                         | 140           | 60 | NR                    | NR |
| NITRIC ACID, 10%                        | 140           | 60 | NR                    | NR |
| OLEIC ACID, ALL                         | 200           | 93 | 150                   | 66 |
| OXALIC ACID, ALL                        | 200           | 93 | 150                   | 66 |
| PERCHLOROETHYLENE, 100%                 | 90            | 32 | 70                    | 21 |
| PHENOL, 1%                              | 100           | 38 | 75                    | 24 |
| PHENOL, 1%                              | NR            | NR | NR                    | NR |
| PHOSPHORIC ACID, 10%                    | 200           | 93 | 125                   | 52 |
| PHOSPHORIC ACID, 30%                    | 160           | 71 | 100                   | 38 |
| PHOSPHORIC ACID, 50%                    | 140           | 60 | 70                    | 21 |
| PICKLING ACID                           | 200           | 93 | 100                   | 38 |
| POTASSIUM BICARBONATE, 20%              | 150           | 66 | 100                   | 38 |
| POTASSIUM BROMIDE, 25%                  | 200           | 93 | 200                   | 93 |
| POTASSIUM CARBONATE, 14%                | 150           | 66 | NR                    | NR |
| POTASSIUM CHLORIDE, 25%                 | 200           | 93 | 200                   | 93 |
| POTASSIUM DICHROMATE, 3%                | 200           | 93 | 75                    | 24 |
| POTASSIUM NITRATE                       | 200           | 93 | 150                   | 66 |
| POTASSIUM PERMANGANATE, 5%              | 200           | 93 | 75                    | 24 |
| POTASSIUM SULFATE, 10%                  | 200           | 93 | 100                   | 38 |
| PROPANE                                 | 125           | 52 | 125                   | 52 |
| PROPYLENE GLYCOL, ALL                   | 175           | 79 | 180                   | 82 |
| SOAPS, ALL                              | 150           | 66 | 200                   | 93 |
| SODIUM ACETATE, 25%                     | 200           | 93 | 200                   | 93 |
| SODIUM BICARBONATE, 5%                  | 160           | 71 | 125                   | 52 |
| SODIUM BISULFATE, ALL                   | 200           | 93 | 180                   | 82 |
| SODIUM BROMIDE, 25%                     | 200           | 93 | 180                   | 82 |
| SODIUM CARBONATE, 10%                   | 180           | 71 | 75                    | 24 |
| SODIUM CARBONATE, 25%                   | 140           | 60 | NR                    | NR |
| SODIUM CHLORIDE, ALL                    | 200           | 93 | 200                   | 93 |
| AMALGA COMPOSITES                       | Max. Temp.    |    | Max. Temp.            |    |

### PNEUMATIC CYLINDERS



| CHEMICAL ENVIRONMENT                        | INNER SURFACE |    | ANHYDRIDE CURED EPOXY |    |
|---|---------------|----|-----------------------|----|
|   | °F            | °C | °F                    | °C |
| SODIUM DICHROMATE, 25%                      | 200           | 93 | 75                    | 24 |
| SODIUM HYDROXIDE, 5%                        | 125           | 52 | NR                    | NR |
| SODIUM HYDROXIDE, 10%                       | 75            | 24 | NR                    | NR |
| SODIUM HYDROXIDE, 25%                       | NR            | NR | NR                    | NR |
| SODIUM HYPOCHLORITE, ALL                    | NR            | NR | NR                    | NR |
| SODIUM NITRATE, 25%                         | 200           | 93 | 100                   | 38 |
| SODIUM NITRATE, 50%                         | 200           | 93 | 100                   | 38 |
| SODIUM SULFATE, 10%                         | 200           | 93 | 100                   | 38 |
| SODIUM SULFIDE, 10%                         | 200           | 93 | 75                    | 24 |
| SODIUM SULFITE, 10%                         | 190           | 88 | 100                   | 38 |
| SODIUM THIOSULFATE, 25%                     | 160           | 71 | NR                    | NR |
| STANNIC CHLORIDE, 25%                       | 200           | 93 | 100                   | 38 |
| STERIC ACID, ALL                            | 190           | 88 | 150                   | 63 |
| STYRENE, 100%                               | NR            | NR | NR                    | NR |
| SULFAMIC ACID, 25%                          | 200           | 93 | 80                    | 26 |
| SULFUR DIOXIDE, DRY                         | 200           | 93 | 150                   | 66 |
| SULFUR DIOXIDE, WET                         | 150           | 66 | 150                   | 66 |
| SULFURIC ACID, 3%                           | 200           | 93 | 125                   | 52 |
| SULFURIC ACID, 10%                          | 150           | 66 | 100                   | 38 |
| SULFURIC ACID, 25%                          | 100           | 38 | NR                    | NR |
| SULFURIC ACID, 50%                          | NR            | NR | NR                    | NR |
| TANNIC ACID, 15%                            | 200           | 93 | 150                   | 66 |
| TARTARIC ACID, 10%                          | 200           | 93 | 150                   | 66 |
| TARTARIC ACID, 15%                          | 200           | 93 | 150                   | 66 |
| TOULENE, 100%                               | 75            | 24 | NR                    | NR |
| TRANSFORMER OIL                             | 75            | 24 | 75                    | 24 |
| TRIETHANOLAMINE, 100%                       | 150           | 66 | NR                    | NR |
| TURPENTINE, 100%                            | 80            | 26 | 80                    | 26 |
| UREA, 25%                                   | 200           | 93 | NR                    | NR |
| VINEGAR                                     | 200           | 93 | 150                   | 66 |
| WATER, CHLORINATED, 100ppm                  | 200           | 93 | 170                   | 77 |
| WATER, DIONIZED                             | 180           | 82 | 125                   | 52 |
| WATER, DIMINERALIZED or CLOSED LOOP HEATING | 200           | 93 | 100                   | 38 |
| WATER. DISTILLED                            | 200           | 93 | 100                   | 38 |
| WATER, BRINE                                | 200           | 93 | 170                   | 77 |
| WATER, HARD                                 | 200           | 93 | 170                   | 77 |
| WATER, SALT. ALL                            | 200           | 93 | 170                   | 77 |
| WATER, SEA                                  | 200           | 93 | 170                   | 77 |
| XYLENE, 10%                                 | 100           | 38 | 75                    | 23 |
| XYLENE, 100%                                | 75            | 24 | NR                    | NR |
| ZINC CHLORIDE, 25%                          | 200           | 93 | 150                   | 66 |
| ZINC SULFATE, 25%                           | 200           | 93 | 150                   | 66 |
| AMALGA COMPOSITES                           | Max. Temp.    |    | Max. Temp.            |    |
| NR = NOT RECOMMENDED                        |               |    |                       |    |