CORROSION RESISTANCE OF AMPCO ALLOYS
TO VARIOUS REAGENTS
CONDITION – TOTAL IMMERSION

The rates of corrosion were obtained under laboratory conditions and will therefore indicate only relative rates of corrosion. Actual service life in application will, of course, depend upon such external factors as temperature, pressure, agitation, aeration and impurities.

Corrosion rates up to 2 mpy per year penetration are usually considered indicative of fully resistant material.

Maximum rates of 20 mpy are considered "satisfactory" but further testing is recommended.

Rates above 20 mpy are considered severe and detailed study must be undertaken before recommendation of any material is made.

Substance	Temperature		Corrosion Rate	
ACETIC ACID	°F	°C	mpy	mm/y
50%	72	22	4.0	.102
35%	72	22	3.0	.076
10%	72	22	2.0	.051
35%	192	89	2.0	.051
ACETIC ACID VAPORS	244	118	5.2	.132
ACETATE SOLVENTS				
Amyl Acetate	72	22	2.0	.051
Butyl Acetate	72	22	2.0	.051
Ethyl Acetate	72	22	2.0	.051
ACETONE	120	49	0.5	.013
CARBOLIC ACID (PHENOL)				
Saturated with water	72	22	0.1	.003
CARBOLIC ACID 35%	72	22	0.1	.003
CARBON TETRACHLORIDE	72	22	0.2	.005
CHLOROFORM	72	22	0.2	.005

Substance	Temperature		Corrosion Rate	
CITRIC ACID	°F	°C	mpy	mm/y
50%	72	22	0.8	.020
35%	72	22	1.0	.025
10%	72	22	2.2	.056
35%	192	89	1.9	.048
COAL TAR SOLVENTS				
Benzene	72	22	0.2	.005
Naphtha	72	22	0.2	.005
Toluene	72	22	0.2	.005
Xylene	72	22	0.2	.005
FORMIC ACID				
50%	72	22	2.5	.064
35%	72	22	2.8	.071
10%	72	22	2.3	.058
35%	192	89	19.5	.495
FREON (Moist or Dry)	72	22	0.3	.008
FURFURAL	72	22	0.3	.008
GELATINE			0.1	.003
GLUCOSE	72	22	0.1	.003
GLUE	72	22	0.1	.003
GLYCERINE	72	22	0.1	.003
HYDROCHLORIC ACID				
5%	72	22	4.0	.102
10%	72	22	5.0	.127
15%	72	22	8.0	.203
20%	72	22	18.0	.457
25%	72	22	35.0	.889
30%	72	22	57.0	1.448
35%	72	22	116.0	2.946
LACTIC ACID				
50%	72	22	1.1	.028
35%	72	22	1.3	.033
10%	72	22	1.7	.043
35%	192	89	17.2	.437
MONO CHLOROBENZINE	72	22	0.2	.005

Substance	Temperature		Corrosion Rate	
OXALIC ACID	°F	°C	mpy	mm/y
9.0%	72	22	0.3	.008
8.6%	194	90	6.8	.173
PHOSPHORIC ACID				
50%	72	22	1.2	.030
35%	72	22	1.9	.048
10%	72	22	2.9	.074
35%	192	89	14.3	.363
SULFURIC ACID				
1%	90	32	1.8	.046
2%	90	32	1.8	.046
5%	90	32	1.5	.038
10%	90	32	1.3	.033
35%	194	90	44.5	1.130
35%	72	22	1.8	.046
50%	72	22	2.6	.066
SODIUM CARBONATE				
35%	72	22	0.4	.010
10%	72	22	0.3	.008
SODIUM HYDROXIDE				
49%	72	22	0.1	.003
35%	72	22	0.1	.003
10%	72	22	0.6	.015
35%	192	89	0.5	.013
35%	85	29	0.1	.003
TARTARIC ACID				
50%	72	22	0.3	.008
35%	72	22	0.5	.013
10%	72	22	0.8	.020
35%	192	89	2.0	.051
TRICHLOR ETHYLENE	72	22	0.2	.005
TRISODIUM PHOSPHATE				
35%	72	22	0.5	.013
10%	72	22	0.6	.015

The following are additional media in which AMPCO metal is highly corrosion resistant, penetration rates below 2 mpy.

ALCOHOLS

- Amyl Alcohol
- Butyl Alcohol
- Ethyl Alcohol
- Methyl Alcohol
- Propyl Alcohol
- Monohydric Alcohols
- Ethylene Glycol
- Diethylene Glycol

ALDEHYDES

- Acetaldehyde
- Benzaldehyde
- Formaldehyde
- Propionaldehyde

ALUMINUM FLUORIDE

ALUMINUM HYDROXIDE

AMYL CHLORIDE

ASPHALT

BARIUM CHLORIDE

BEER

BORAX (Sod. Tetraborate)

BORIC ACID

BRINE

CALCIUM HYDROXIDE

CANE SUGAR LIQUORS

CARBON DIOXIDE

CAUSTIC POTASH

CAUSTIC SODA

CORE OILS

DISTILLERY WORT

ESTERS

- Amyl Acetate
- Butyl Acetate
- Ethyl Acetate
- Ethyl Butyrate
- Ethyl Formate
- Ethyl Heptylate
- Ethyl Pelargonate
- Ethyl Propionate
- Ethyl Valerate
- Isoamyl Acetate
- Isoamyl Butyrate
- Isoamyl Isovalerate
- Isobutyl Acetate
- Methyl Acetate
- Methyl Butyrate
- Methyl Formate
- Methyl Isovalerate
- Methyl Propionate
- Methyl Valerate
- Octyl Acetate

ETHERS

- Anisole
- Diallyl Ether
- Diamyl Ether
- Dibutyl Ether
- Diethyl Ether
- Diphenyl Ether
- Ethyl-butyl Ether
- Methyl-butyl Ether
- Methyl-ethyl Ether

ETHYL SULFATE

FATS

- Esters of fatty acids with glycerol or formaldehyde

GASES, FUEL

- Blast Furnace
- Carburetted Water
- Casing Head
- Coke Oven
- Natural
- Producer

GASES, HYDROCARBON

- Butane
- Ethane
- Methane
- Pentane
- Propane

GASES, INERT

- Helium
- Neon
- Krypton
- Xenon

GASES, REFRIGERATION

- Freon-dichlorodifluoromethane (moist or dry)
- Ethyl Chloride (dry)
- Methyl Chloride (dry)
- Sulfur Dioxide (dry)

GLYCERINE (glycerol)

HYDROGEN

INSECTICIDES

PYRETHRINS

ROTENONE

LACQUERS

LACQUER SOLVENTS

LIQUORS

- Cider
- Rum
- Whiskey
- Wine

MALT BEVERAGES

- Ale
- Beer

MOLASSES

NAPHTHENIC ACIDS

NITROGEN

OXYGEN

PAINT VEHICLES

PETROLEUM OIL AND SOLVENTS

- Benzine
- Gasoline
- Kerosene
- Lubricating oils
- Oleum spirits
- Benzene
- Corn oil
- Fish oil
- Linseed oil
- Resin
- Tung oil
- Turpentine
- Turpentine subst.

POTASSIUM SULFATE

SALT AIR

SEWAGE

SHELLAC

SOAPS

SOILS

SODIUM CHLORIDE

SODIUM NITRATE

SODIUM SILICATE

SULFURIC ACID SLUDGE

SULFURIC ACID PICKLING BATH

TANNIC ACID

TAR

VARNISH

WATERS

Distilled
Fresh
Hard
Rain
Sea
Harbor

WAXES

ZINC SULFATE

The following are media in which Ampco normally is corrosion resistant, but the rate of corrosive attack will be influenced by other factors present during exposure. The factors which will cause this variance are the concentration, degree of aeration, temperature and acidity of the solution.

An example of increasing the corrosiveness of a media would be addition of ferric sulfate or copper sulfate salts in an acid solution. Another condition would be the formation of some ferric chloride from ferrous chloride as a result of the presence of an oxidizing agent or a high degree of aeration.

In general, the acids will be more corrosive when the amount of dissolved oxygen or degree of aeration and agitation is increased.

The effect of increased concentration is most pronounced in the strong acids or mineral acids such as hydrochloric, sulfuric and phosphoric acids.

For hydrocholric acid, the rate of attack is almost doubled for each 5% increase in concentration so that above 15% the corrosion attack will be serious under ordinary conditions. Sulfuric acid becomes very corrosive in concentrations over 50%. Aeration, increased temperatures and agitation will strongly accelerate the corrosiveness of these acids when present in increased concentrations.

ACETYLENE, PURE

ACIDS

Benzoic
Butyric
Chloracetic, no air
Carbolic (Phenol)
Gallic
Hydrochloric, dilute
Hydrocyanic
Hydrofluoric, dilute
Hydrofluosilicic
Oleic
Oxalic
Palmetic
Phosphoric, dilute
Propionic
Salicylic
Sulfuric, dilute
Sulfurous
Stearic
Tannic
Sludge

ALUM

ALUMINUM SULFATE

AMMONIA (Dry)

AMMONIUM CHLORIDE

AMMONIUM PHOSPHATE

AMMONIUM SULFATE

BARIUM NITRATE

BARIUM SULFATE

BARIUM SULFIDE (Dilute Soln.)

BEET SUGAR LIQUORS

BROMINE (Dry Gas)

CALCIUM ACETATE

CALCIUM CHLORATE

CALCIUM HYPOCHLORITE (Dilute Soln.)

CHLORINE (Dry Gas)

CITY GAS

COPPER NITRATE

COPPER SULFATE

CREOSOTE

FERRIC SULFATE

FERROUS CHLORIDE

FERROUS SULFATE

FOOD PRODUCTS

FRUIT PRODUCTS

HYDROGEN CYANIDE

HYDROGEN FLUORIDE

IODINE (Dry)

MAGNESIUM CHLORIDE

MAGNESIUM SULFATE

NITROBENZENE

PETROLEUM OILS AND SOLVENTS
(not refined)

PHOTOGRAPHIC SOLUTIONS

PHTHALIC ANHYDRIDE

PRINTING INKS

PYRIDINE

SOAP (Dilute Solns.)

SODIUM BISULFATE

SODIUM HYDROSULFITE

SODIUM SULFIDE (Dilute Soln.)

SODIUM SULFITE

SULFUR

SULFITE LIQUOR

VEGETABLE OILS

- Castor
- Coconut
- Henyseed
- Cottonseed
- Linseed
- Palm
- Peanut
- Tung

The following are media in which Ampco is considered not to be suitable:

ACIDS

- Chromic Acid
- Hydrochloric Acid, Conc.
- Nitric Acid, Fuming
- Nitric Acid, Dilute
- Nitrous Acid
- Perchloric Acid
- Picric Acid
- Sulfuric Acid, Conc.

AMMONIA GAS (Moist)

AMMONIUM HYDROXIDE

AMMONIUM NITRATE

BROMINE (Moist)

CHLORINE (Moist)

FERRIC CHLORIDE

IODINE (Moist)

MERCURY

MERCURY SALTS

POTASSIUM CYANIDE

POTASSIUM HYPOCHLORITE

SODIUM CYANIDE

SODIUM HYPOCHLORITE

STANNIC SALTS

SULFIDES (Conc. Solns.)

SULFUR CHLORIDE