

MATERIAL SELECTION CRITERIA

The selection of a material for an application is a very difficult task. Usually one is only able to narrow the selection down to two or three candidates and the final selection is then determined by testing.

The first and most important step in selecting a material from the broad spectrum (steel, aluminum, brass, UHMW, Delrin®, nylon, etc.) is to carefully define the properties required and the environment in which the material will need to perform.

It may be necessary to ask some of the following questions to define the application. The more completely the application is defined, the better the chance of selecting the best material for the job.

What load will the part have to carry?

Will the design carry high loads? What will the highest load be? What is the maximum stress in the part? What kind of stress is it (tensile, flexural, etc.)? How long will the load be applied? What is the projected life of the part or design?

What temperatures will the part see and for how long?

What is the maximum temperature the material must sustain? What is the minimum temperature the material must sustain? How long will the material be at these temperatures? Will the material have to withstand impact at the low temperature?

Will the material be exposed to chemicals or moisture?

Will the material be exposed to normal relative humidity? Will the material be submerged in water? If so, at what temperature? Will the material be submerged or wiped with solvents or other chemicals? If so, which ones? Will the material be exposed to chemical or solvent vapors? If so, which ones? Will the material be exposed to other materials that can outgas or leach detrimental materials, such as plasticizers?

Will the material be used as a bearing or need to resist wear?

Will the material be expected to perform as a bearing? If so, what will the load, shaft diameter, shaft material, shaft finish, and rpm be? What wear or abrasion condition will the material see? Note: Materials with friction reducers added, such as TFE, Molybdenum disulfide, or graphite, generally exhibit less wear in rubbing applications.

Does the part have to retain its dimensional shape?

What kind of dimensional stability is required?

Does the part have to meet any regulatory requirements?

Is an FDA approved material required (taste/odor)?

Should the material have a special color and/or appearance?

What color material is desired? Does it have to match anything else? Is a textured surface needed?

Will the part be used outdoors?

Is material cost an important factor?

The following is a list of materials beginning with the least expensive and ending with the most expensive:

UHMW-PE (Ultra High Molecular Weight Polyethylene)

TIVAR 88®

Nylon 6

Nylon 6/6

Nylon MD (Molybdenum Disulfide Filled)

Nyloil®, FG and MDX

Delrin®

Noryl (PPO)

Nylon Supertough ST801

PET (Polyethylene Terephthalate)

Hydex® 4101

Polycarbonate (Machine Grade)

Hydex® 202 and 301 (Rigid Polyurethane)

Delrin® Glass Filled

Teflon® (PTFE)

Polyethersulfone (Hydex™ 6201)

Ultem® (Hydex™ 6101/Polyetherimide)

Polyethersulfone (PES)

Kynar® (PVDF)

Hydlar® ZF (Kevlar™/Nylon)

Delrin® AF

Hydex® 4101L

Fibralon® 4840 (PTFE/Kevlar™)

PEEK® (Polyetheretherketone)

Torlon poly(amide - imide)

Sintimid(TM) T

Sintimid(TM) X

Sintimid(TM) V

Vespel® (polyimide)

(Comparative pricing based on price per square foot for 1inch thick slab.)