HYDRAULIC DIAMETER

Note: The hydraulic diameter is not the same as the geometric equivalent diameter of non-circular ducts or pipes. Hydraulic diameter is the value that should be used in calculating the Reynolds number. The following examples represent shapes commonly found in injection molding cooling circuits.

Hydraulic Diameter can be calculated using this general equation:

$d_h = 4\ A / P$

d_h = hydraulic diameter (m, ft, in)

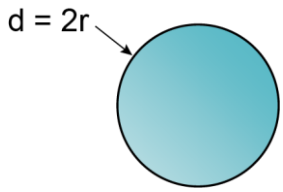
A = cross section area of the duct or pipe (m^2, ft^2, in^2)

P = "wetted" perimeter of the duct or pipe (m, ft, in)

Hydraulic Diameter of a Circular Duct:

$d_h = 4\ \pi\ r^2 / 2\ \pi\ r = 2\ r = d$

Note that for a circular duct, hydraulic diameter is the same as actual diameter.

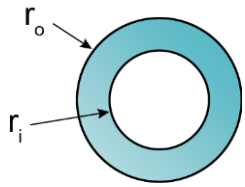


Hydraulic Diameter of an Annular Passage:

$d_h = 4\ \pi\ (r_o^2 - r_i^2) / 2\pi(r_o + r_i)$

$d_h = 2(r_o^2 - r_i^2) / (r_o + r_i)$

$d_h = 2(r_o - r_i)$



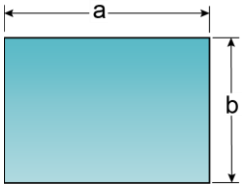
Hydraulic Diameter of a Rectangular Duct:

$d_h = 4\ a\ b / (2\ (a + b))$

$d_h = 2\ a\ b / (a + b)$

a = width of the duct (m, ft)

b = height of the duct (m, ft)



Hydraulic Diameter of a Half Circular Duct:

This shape occurs when using cooling baffles that divide the flow area of a drilled cooling circuit. For simplicity this example ignores the thickness of the baffle.

$d_h = 4\ A / P$

$A = \pi\ r^2/2$

$P = \pi\ r + d$

$d_h = (4\ \pi\ r^2/2) \div (\pi\ r + d)$

$d_h = 2\ \pi\ r^2 / (\pi\ r + d)$