PRECISION PUNCH & PLASTICS
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# Durollers

A new concept for manufacturing rollers, wheels, and casters from stock size rollers. Available in 20" standard lengths with several I.D.'s and O.D.'s, the Dual Durometer design provides the user with the most economical "Custom roller" from stock.

Durollers are produced by bonding together two High Performance urethane compounds. The inner hub is a very hard urethane Black) with special additives to produce a self-lubricating bearing. This is securely adhered to a tough, wear resistant resistant urethane tire (90A Red/and 70A Blue), thus providing superior cut resistance and shock absorption. For special applications several other durometers of color-coded urethanes are available.

## TYPICAL APPLICATIONS

- Car Wash Rollers
- Conveyors
- Wire Guide Rollers
- Conveyor System Drive Rollers
- Diverter Rollers on Package Handling Systems
- Rollers on Paper and Plastic Slitting Equipment
- Equipment
- Cloth Feed Rollers
- Labeling Machine Rollers
- Driver Rollers in Lumber Cutting Machinery
- Glass

## ADVANTAGES OF USING DUROLLERS

- Lower Cost - Durollers can be stocked on the shelf and cut as required, they can be machined on the O.D. or bored on the I.D. (keyed, grooved etc.)
- Impact Resistance - by using urethane elastomers throughout Durollers can take impact and shock loads without deforming.
- Dry Running - in many low PV (Pressure Velocity Co-efficient) applications no lubrication is needed. In other applications where a lubricant may contaminate the end product, the use of Durollers eliminates the problem.
- Lightweight - no metal hub and Durollers have been found to be lighter in weight than aluminum rollers.
- Ease of Installation - band or lathe cut to length and insert shaft through hub and roller is ready to roll. Because of internal lubrication, there is no need for bearing or grease fittings, or the worry of scheduled maintenance.
- Noise Reduction - since there are no metal components, Durollers are quiet running and in material handling applications, noise is significantly reduced especially where metal contacts metal.
- Oil and Chemical Resistance - generally superior to rubber, but see chart below for more details.
- Non-Marking - whereas most metallic and rubber rollers will mark or scratch surfaces. Durollers will not.
- Flat Spotting - Durollers, if left stationary under load tend to recover more quickly and to a greater extent than rubber. Plastics and metallic rollers will not recover and will result in permanent damage.
- Out-Standing Temperature Range - Durollers are manufactured from High Performance urethane elastomers which stand up to temperatures ranging from -60° to +212°F.

| Stock Number | Bearing ID | Bearing OD | Overall OD |
|---|---|---|---|
| 371015 | 3/8" | 1" | 1-1/2" |
| 371520 | 3/8" | 1-1/2" | 2" |
| 501015 | 1/2" | 1" | 1-1/2" |
| 501520 | 1/2" | 1-1/2" | 2" |
| 501525 | 1/2" | 1-1/2" | 2-1/2" |
| 501530 | 1/2" | 1-1/2" | 3" |
| 501540 | 1/2" | 1-1/2" | 4" |
| 621520 | 5/8" | 1-1/2" | 2" |
| 621525 | 5/8" | 1-1/2" | 2-1/2" |
| 621530 | 5/8" | 1-1/2" | 3" |
| 751520 | 3/4" | 1-1/2" | 2" |
| 751525 | 3/4" | 1-1/2" | 2-1/2" |
| 751530 | 3/4" | 1-1/2" | 3" |
| 751540 | 3/4" | 1-1/2" | 4" |
| 102050 | 1" | 2" | 5" |

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## TECHNICAL INFORMATION AND DESIGN CONSIDERATION

Depending on the pressure (P.S.I.), the coefficient of friction(μ), is .20 to .30 of its bearing material. Higher pressure relates directly to a higher μ value. The nature of the shaft material as well as lubrication will reduce this value. A Steel that is highly polished (10 RMS finish), to use an example, will halve the coefficient or friction when compared to that of a finish of 125 RMS. Reduction in hardness will cause an increase in the co-efficient of friction of the tire. Roughening up of the O.D., with an emery cloth or a grinding wheel can achieve a "grab" to it, to a certain extant, if the Duroller is required to be a drive wheel.

## PRESSURE-VELOCITY CALCULATIONS (PV)

The PV value relates to buildup of frictional heat and the consequential failure of the bearing. This is caused by thermal expansion capturing the shaft, or reaching its melting point. The bearing material does not serve as a good conductor of heat and is a major constraint to the Duroller. Use of lubricants, either conventional like grease or oil, and unconventional such as water, can help greatly in dissipation of heat, which in turn allows the use of higher PV values, The PV calculation is based on :

$$\mathbf{P\ (PSI)} = \frac{\text{Load}}{\text{Brg.I.D. x Brg. Length}}$$

$$\mathbf{V\ (fpm)} = \pi \times \text{Shaft diameter} \times \frac{\text{revs}}{\text{min}} \times \frac{1\ \text{ft.}}{12\ \text{ins.}}$$

**Example:**

Load – 300 lbs.

Duroller Size – 3 1/2" O.D. x 3/4" I.D. x 3" Lg.

RPM=100

$$P = \frac{300\ \text{lbs.}}{.75\text{"x3"}} = \frac{300}{2.25} = \mathbf{133.33\ PSI}$$

$$V = \frac{3.146 \times .75 \times 100}{12} = \mathbf{19.64}$$

PV value = P x V

= 133.33 x 19.64

= **2618**



If a given PV value is maintained below 10,000 with maximum pressures at 600-800 PSI, in full rotation, and with the use of non-lubricated application, operation should occur problem free.

Surrounding conditions in the environment may influence this result, wherein PV values may need to be reduced as temperature increases. All applications that are intended should first be proven on a trial basis, since the limits previously shown are only to serve as guidelines. Load capacities that are outlined should not be exceeded for application with individual Durollers. Problems may occur with excess deflection. The capacity graphs should be used and followed as a general rule prior to the calculations of PV values. For duro meters other than the ones shown in the graphs, selection should be based on interpolation and trials.

## LOAD CARRYING CAPACITY

As previously mentioned, the load carrying ability must be determined both prior to and in addition to the PV limits. The given table shows three different tire durometers (Hardnesses). The relationship is based on the deflection that is permissible and the modulus (PSI) of the tire material. Deflection can be varied by reducing or increasing load. This can also be achieved by changing the hardness of the tire material. This may vary upon the application and whether deflection is desired due to the Duroller conveying items over the rollers by friction, or for rolling over irregular surfaces. The opposite holds true to lower durometer materials causing greater deflection of the tire.

## LOAD CAPACITY

PV values must be considered with the loading of Durollers. These are different from the load capacities of casters and wheels which have metal hubs and bearings. Once the PV value is in line, you may calculate load on a particular size of a Duroller with the use of the chart. This chart may be used to determine the optimal size Duroller. The chart shows the diameter on the X-axis and the load capacity on the Y-axis. The load is per inch of face length at the specified diameter as related to various deflections. In general, you wouldn't want to design greater than 10% deflection, because the loads that are required to deflect Durollers to such an extent, most likely will result in excessive PV values. Only if bearing grease is supplied to it, or it is used in very slow application this may be possible. Once again, the chart serves only as a guide and each application be treated individually by trial to determine the appropriate load capacity.

## OPERATING TEMPERATURES

The operating temperatures for the Durollers are suggested in the range of -60°F (-76°C) to 212°F (1 OO°C). In general practice, it is recommended that continuous use below -40°F (-40°C) and above 180°F (82°C) be verified by trial. Urethanes often become brittle with temperatures below -6Q°F, as well as, increasing the chance that physical properties may begin to degrade with temperatures that are at a constant level above 200°F. However, intermittent exposures up to 225°F can be tolerated.