the numbers in brackets give the percentage difference between the calculated and experimental values of ultimate pressure. The table also gives the ultimate pressure calculated with the aid of the mean diameter formula (see Appendix) which relies on tension data.

Study of Table 3 shows that there is good agreement between the ultimate pressure calculated with the mean diameter formula and experiment, and also the ultimate pressure calculated from shear stress-strain data and experiment. Figure 20 shows the ultimate pressure calculated from the average shear stress-strain curve plotted against the diameter ratio K for various temperatures; the experimental values are also shown.

Table 3. Theoretical and experimental values of ultimate pressure for Hykro (EN40).

Diameter ratio K	Temp. (°C)	Experimental ultimate pressure (tonf in^{-2})	Calculated ultimate pressure (tonf in^{-2})		
			mean diameter	based on shear stress-strain	
				maximum	minimum
1·6	20°	25·5	26·4 (+3·5%)	26·9 (+1·9%)	26·3 (−0·4%)
1·2	300°	9·25	8·9 (−3·8%)	9·75 (+5·4%)	9·39 (+1·5%)
1·4	300°	17·00	16·3 (−4·1%)	17·9 (+5·3%)	17·26 (+1·5%)
1·6	300°	23·4	22·5 (−3·9%)	24·9 (+6·4%)	24·01 (+2·6%)
1·8	300°	28·8	27·8 (−3·5%)	31·0 (+7·6%)	29·94 (+4·0%)
2·0	300°	34·6	32·5 (−6%)	36·4 (+5·2%)	35·19 (+1·7%)

Vibrac (EN25)

At 20, 300 and 370°C the pressure-expansion curves at small and large strains have been calculated from shear stress-strain data. The elastic line, initial yield and the pressure when yield has just spread through the cylinder wall, that is the collapse pressure, have been calculated using the equations in the Appendix. The excellent agreement between theory and experiment at 300°C can be seen in Figure 16 and

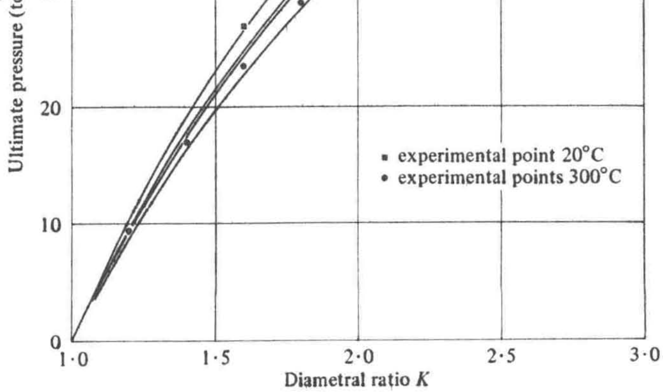

Figure 20. Ultimate pressure of Hykro cylinders calculated from torsion data.

Table 4. Theoretical and experimental values of initial yield pressure and collapse pressure for Vibrac (EN25).

Diameter ratio K	Temp. (°C)	Experimental initial yield pressure (tonf in^{-2})	Calculated initial yield pressure (tonf in^{-2}) maximum	Calculated initial yield pressure (tonf in^{-2}) minimum	Experimental collapse pressure (tonf in^{-2})	Calculated collapse pressure (tonf in^{-2}) maximum	Calculated collapse pressure (tonf in^{-2}) minimum
1·4	20	12·7	13·5	12·8	17·2	18·4	17·5
1·2	300	6	6·7	6·2	7·8	8·0	7·5
1·4	300	10·2	10·8	10	15·0	15·4	14·3
1·6	300	13·0	13·4	12·5	20·2	21·2	20·0
1·8	300	15·0	15·2	14·2	25·5	27·0	25·2
2·0	300	17·0	16·5	15·4	31 [a]	32·0	30·0
2·5	300	–	18·5	17·2	41 [a]	42·5	40·5
1·4	370	9·0	8·9	8·3	13·7	13·4	12·4
2·0	370	13	13·6	12·7	29·0	30·0	28·0

[a] It will be seen from Figure 16 that there is no very well defined region of reasonably constant pressure as with the other curves.

Table 4. The collapse pressure is given by $\tau_{PY} \ln K^2$ which assumes a constant plastic shear yield stress, whereas from Figure 9 it can be seen that this is not completely true. The value τ_{PY}, taken for the calculation of collapse pressure, was the shear stress at the mean strain in the cylinder wall given by $\frac{1}{2}(K^2+1) \times$ shear strain at initial yield. This is based on the fact that at the collapse pressure yield has just spread throughout the cylinder wall, and the shear strain at the outer diameter (OD) will be equal to that at the initial shear yield and the shear strain at the bore will be approximately K^2 times the strain at OD. The theoretical and experimental values of initial yield pressure and collapse pressure have been collected together in Figure 21 and Table 4.

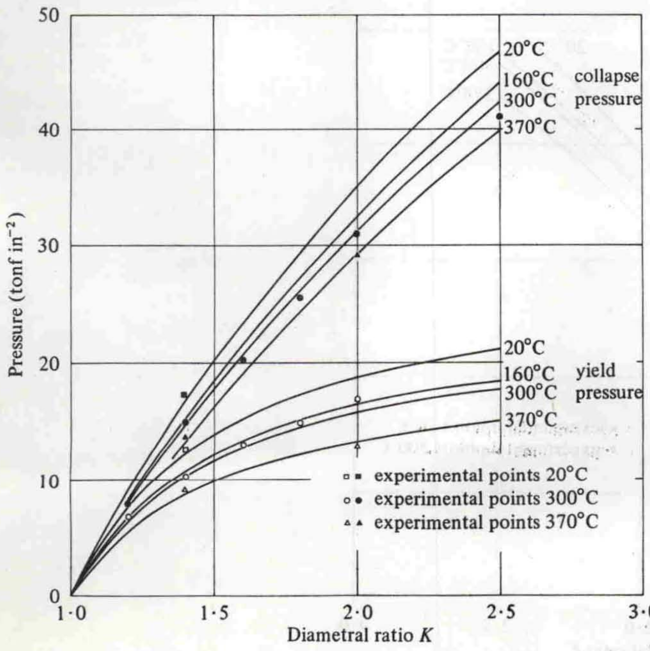

Figure 21. Yield and collapse pressures of Vibrac cylinders calculated from torsion data.