CHAPTER IV

RESULTS AND DISCUSSION

In this research an internally stiffened cylindrical shell is subjected to uniform axial compression , $\overline{N}$. The shell properties and applied loads are as follows:

$R = 95.5$ in., $L = 291$ in.,

$\nu = 0.33$, $\sigma_0 = 50,000$ psi.,

$E = E_x = E_y = 10.5 \times 10^6$ psi.,

$\rho_{sk} = \rho_x = \rho_y = 0.101$ lb/in^3.,

MG = Minimum Gage = 0.02 in.

Stiffening members are tee stringers and rectangular rings (TSRR).

$\overline{N} = 800$ lb/in., $\overline{N}^* = 1.233 \times 10^{-8}$,

$\overline{N} = 900$ lb/in., $\overline{N}^* = 1.341 \times 10^{-8}$,

$\overline{N} = 1000$ lb/in., $\overline{N}^* = 1.4899 \times 10^{-8}$,

$\overline{N} = 1100$ lb/in., $\overline{N}^* = 1.6389 \times 10^{-8}$.

The result of calculations to determine minimum weight of the stiffened cylindrical shell under uniform axial compression of 900, 1000, and 1100 lb/in. are shown in the Figures 3, 4, and 5 respectively. The design results indicate that the location of the minimum weight for various axial loads correspond to approximately the same value for h (0.022 in.). The solution of the minimum weight is not unique for each uniform axial compression. This means that there are several combinations of

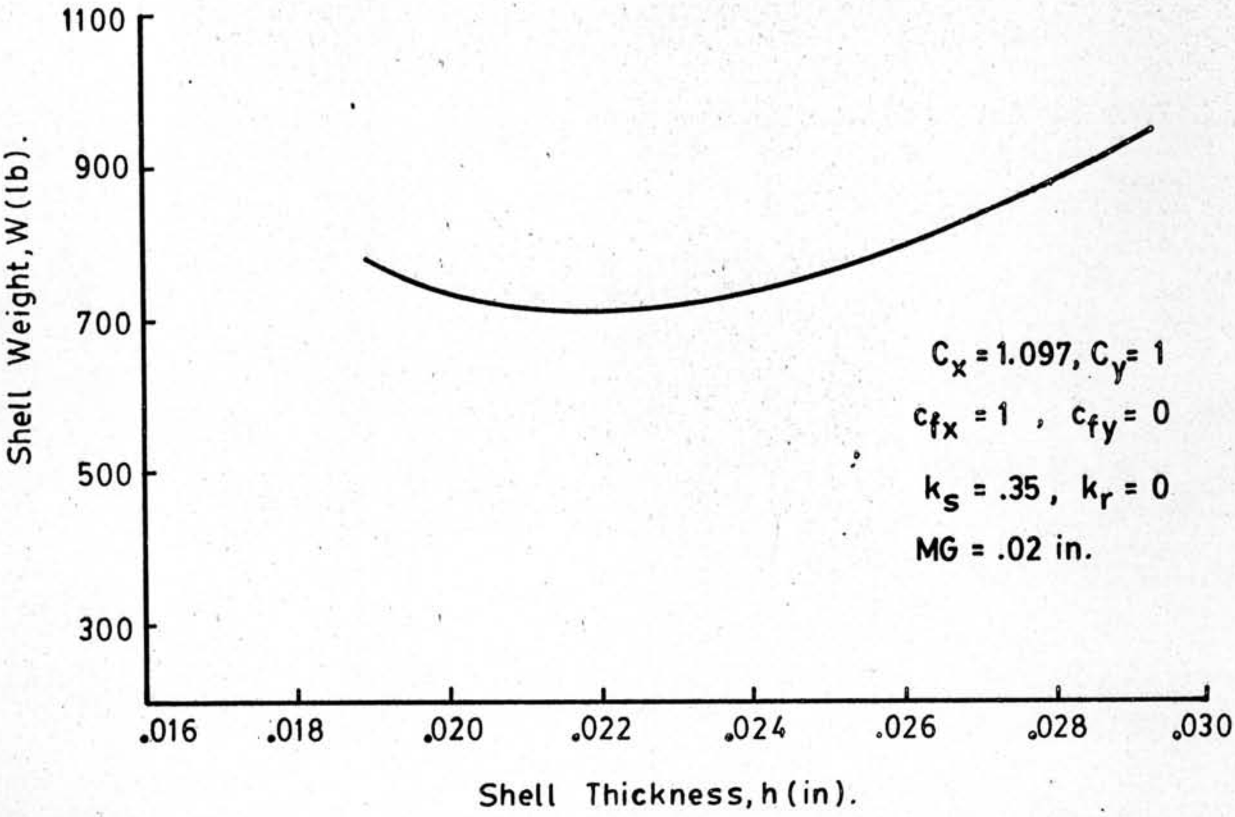

Fig.3 Result of Calculations to Determine Minimum Weight Design of Stiffened Cylindrical Shell (TSRR) for $\bar{N}$ = 900 lb/in.

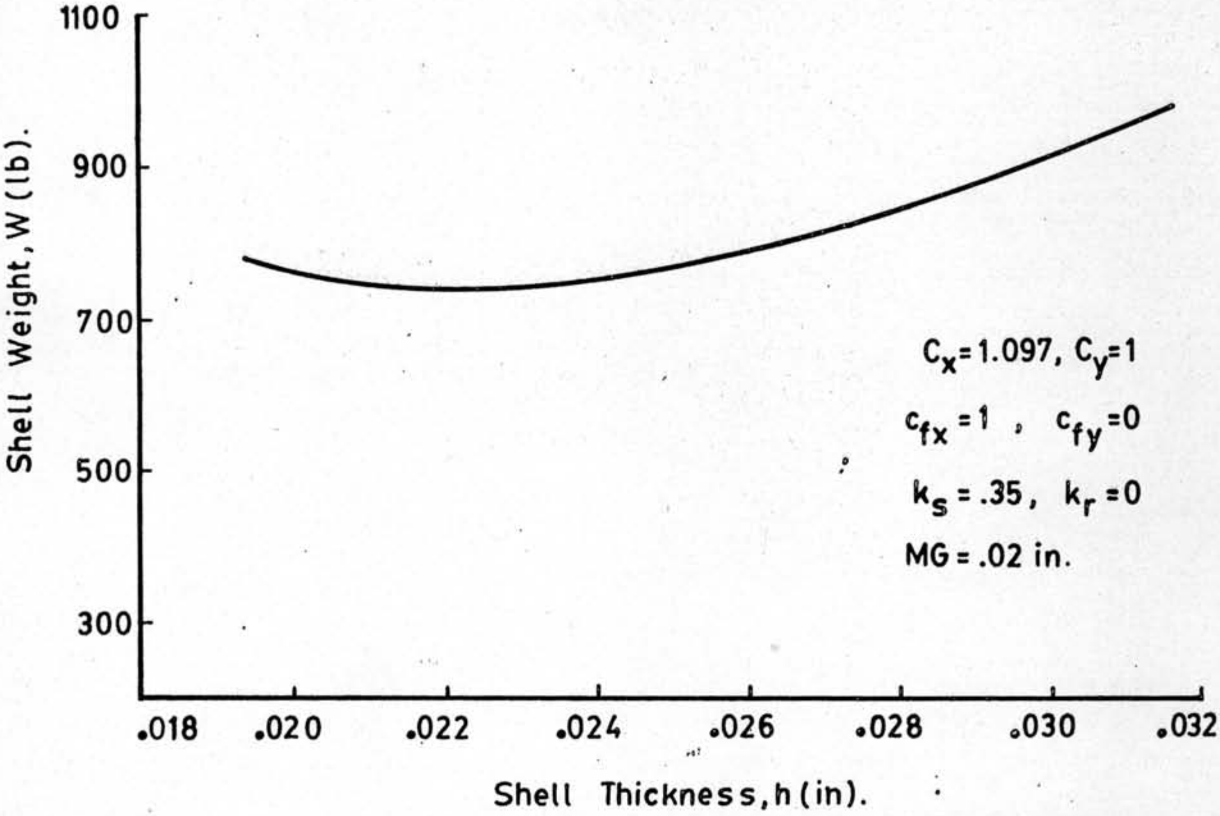

Fig.4 Result of Calculationsto Determine Minmum Weight Design of Stiffened Cylindrical Shell(TSRR) for $\bar{N}$=1000 lb/in.

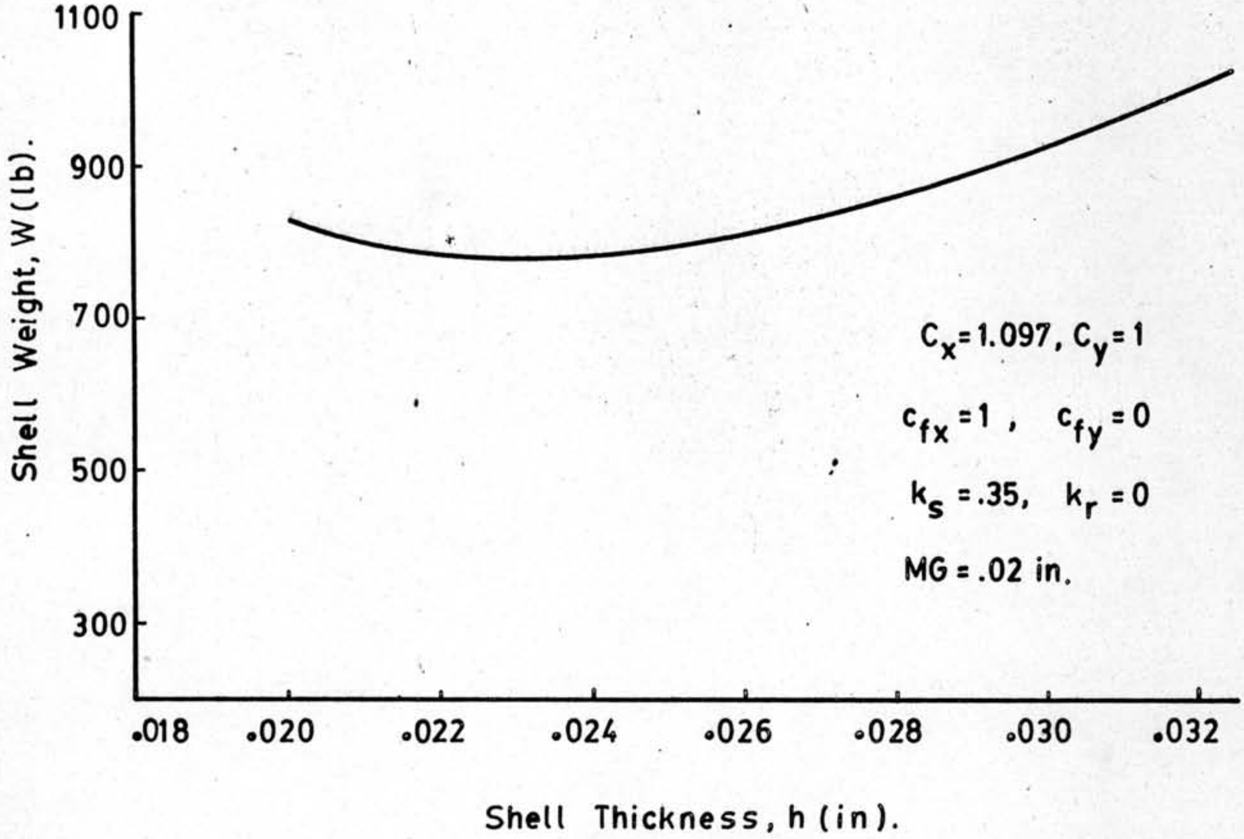

Fig. 5 Result of Calculationsto Determine Minimum Weight Design of Stiffened Cylindrical Shell(TSRR) for N = 1100 lb/in.

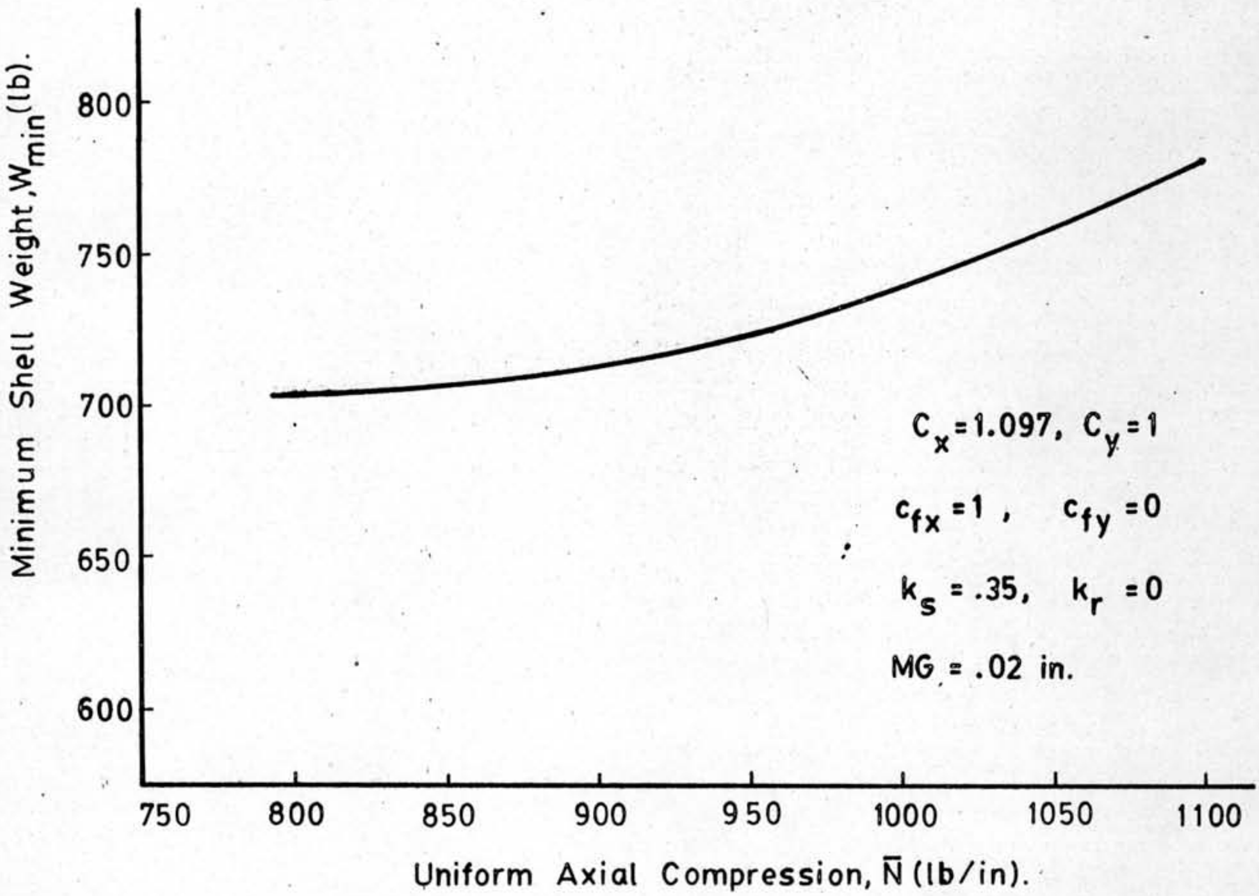

Fig. 6 Effect of Uniform Axial Compression on Minimum Weight of an Internally Stiffened Cylindrical Shell (TSRR).

the design variables for the same minimum weight. The curves of minimum weight against thickness in Figures 3, 4, and 5 have wide flat portion. This implies that large variations in skin thickness (up to about 10 %) yield design configurations with small difference in weight. These results also correspond to the results of V. Ungbhakorn's research.[1]

Results from Figures 3, 4, and 5 are listed in Table 2 and plotted in Figure 6. Figure 6 shows the effect of uniform axial compression on the minimum weight of internally stiffened cylindrical shells. When the uniform axial load is increased the minimum weight of the stiffened shell is increased at a lower rate.

Table 2. Effect of uniform axial compression on the minimum weight of stiffened cylindrical shell.

$\overline{N}$ (lb/in)	W_{min} (lbs)	% increase in $\overline{N}$	% increase in W_{min}
800	703.4	—	—
900	711	12.5	1.08
1000	740	25.0	5.20
1100	780	37.5	10.89

It should be noted that the starting point in Figure 6 which $\overline{N}$ = 800 lb/in. and W_{min} = 703.4 lbs. are obtained from Appendix C, case 1 of V. Ungbhakorn's research.

[1] Ungbhakorn, V., op. cit., pp. 80-81.