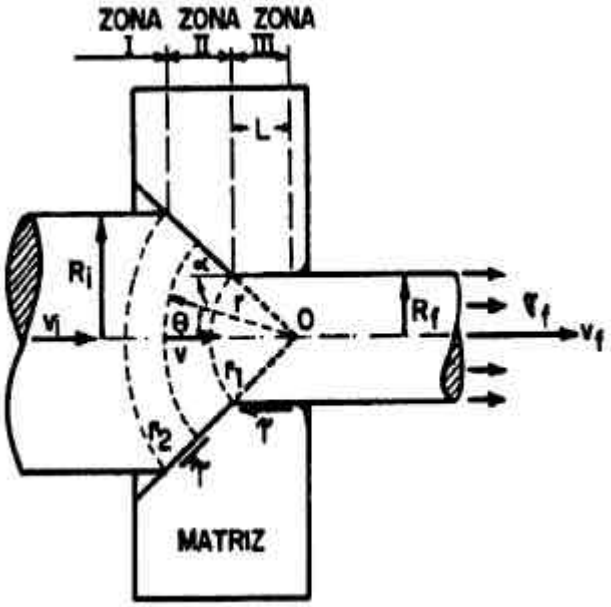
TREFILAÇÃO

APLICAÇÃO DO MÉTODO DO LIMITE SUPERIOR

(MÉTODO DE AVITZUR)



- Tensão total de def. interna:

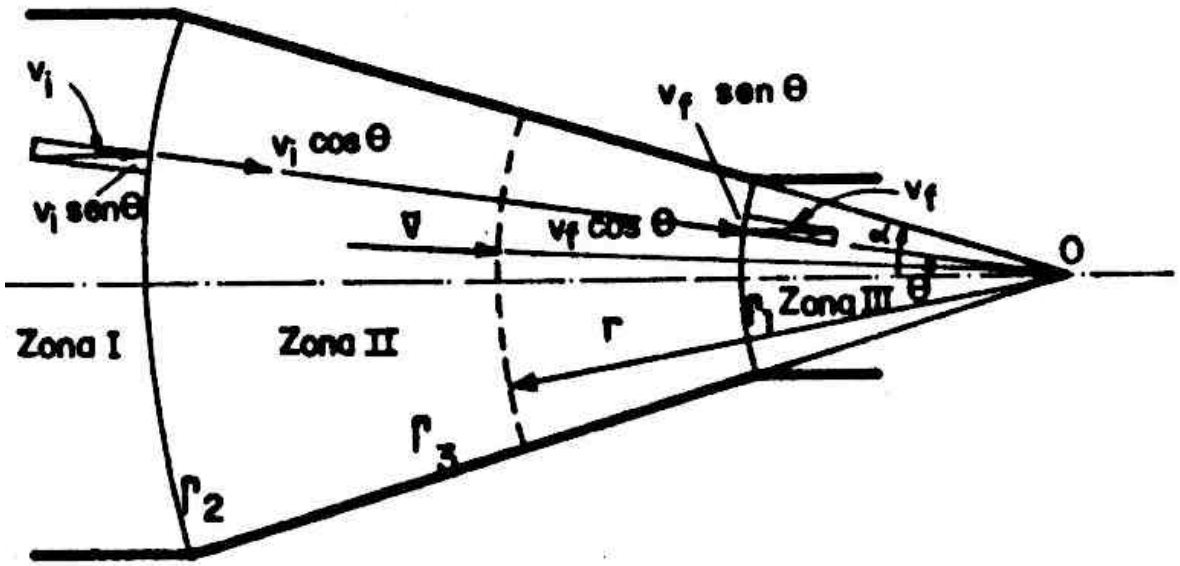
$$U_i = 2f(\alpha)\ \bar{Y}\ \ln\left(\frac{R_i}{R_f}\right)$$

- Efeito do atrito:

$$U_f = \frac{2}{\sqrt{3}}\ \bar{Y}\, m\, \mathrm{ctg}\,\alpha\, \ln\left(\frac{R_i}{R_f}\right)$$

- Perdas por distorção:

$$U_R = \frac{2}{\sqrt{3}}\ \left[\frac{\alpha}{\mathrm{sen}^2\alpha} - \mathrm{ctg}\,\alpha\right]\ \bar{Y}$$



Tensão para trefilação:

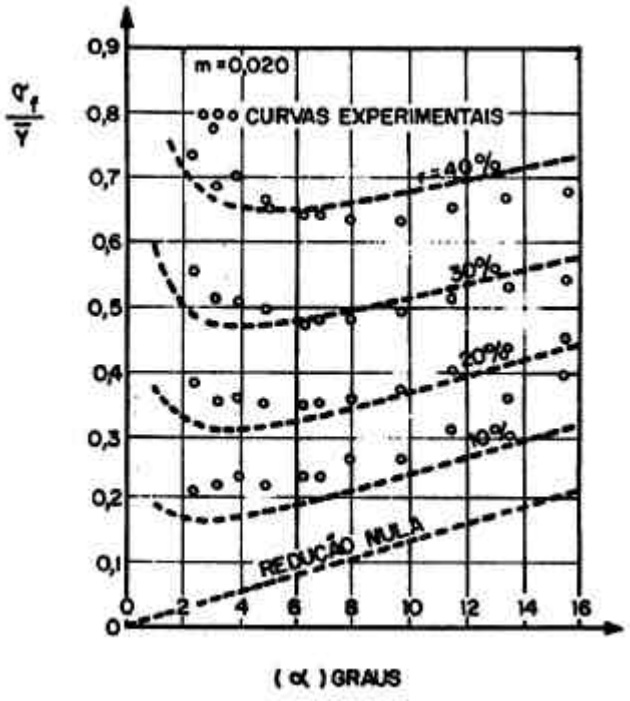
$$\sigma_f = \bar{Y}\ 2f\,(\alpha)\ \ln\left(\frac{R_i}{R_f}\right) + \frac{2\bar{Y}}{\sqrt{3}}\ \left[\frac{\alpha}{\mathrm{sen}^2\alpha} - \mathrm{ctg}\,\alpha + m(\mathrm{ctg}\,\alpha)\ \ln\left(\frac{R_i}{R_f}\right) + m\,\frac{L}{R_f}\right]$$

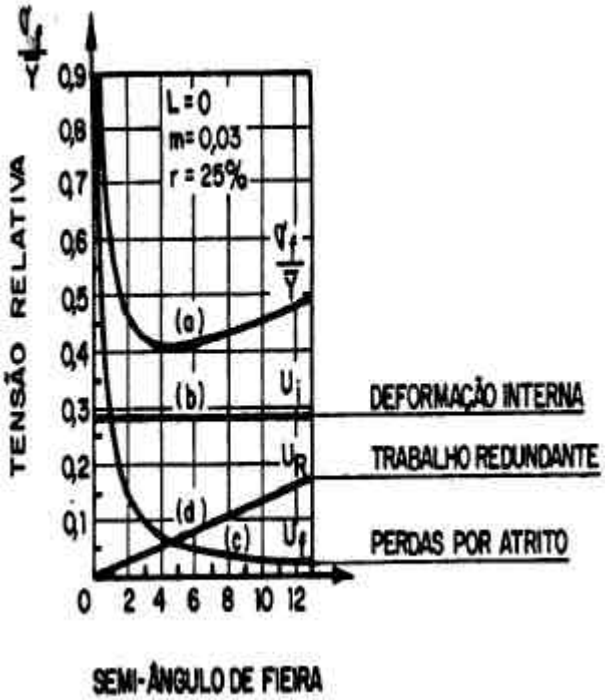
Onde:

$$f(\alpha) = \frac{1}{\text{sen}^2\alpha}\left[1-(\cos\alpha)\sqrt{1-\frac{11}{12}\text{sen}^2\alpha}+\right.$$

$$\left.+\frac{1}{\sqrt{11\times 12}}\ln\frac{1+\sqrt{\frac{11}{12}}}{\sqrt{\frac{11}{12}}\cos\alpha+\sqrt{1-\frac{11}{12}\text{sen}^2\alpha}}\right]$$

α^o	$f(\alpha)$	$\frac{\alpha}{\text{sen}^2\alpha}-\text{ctg}\,\alpha$	α^o	$f(\alpha)$	$\frac{\alpha}{\text{sen}^2\alpha}-\text{ctg}\,\alpha$
0	1,00000	0			
1	1,00001	0,011636	16	1,00167	0,18813
2	1,00003	0,023275	17	1,00189	0,20016
3	1,00006	0,034920	18	1,00212	0,21223
4	1,00010	0,046573	19	1,00237	0,22437
5	1,00016	0,058237	20	1,00264	0,23656
6	1,00023	0,069915	21	1,00292	0,24881
7	1,00031	0,081611	22	1,00322	0,26112
8	1,00041	0,093327	23	1,00354	0,27350
9	1,00052	0,10507	24	1,00387	0,28595
10	1,00064	0,11683	25	1,00422	0,29848
11	1,00078	0,12862	26	1,00459	0,31108
12	1,00093	0,14045	27	1,00498	0,32377
13	1,00109	0,15231	28	1,00538	0,33653
14	1,00127	0,16421	29	1,00581	0,34939
15	1,00146	0,17614	30	1,00625	0,36234





Ângulo ótimo:

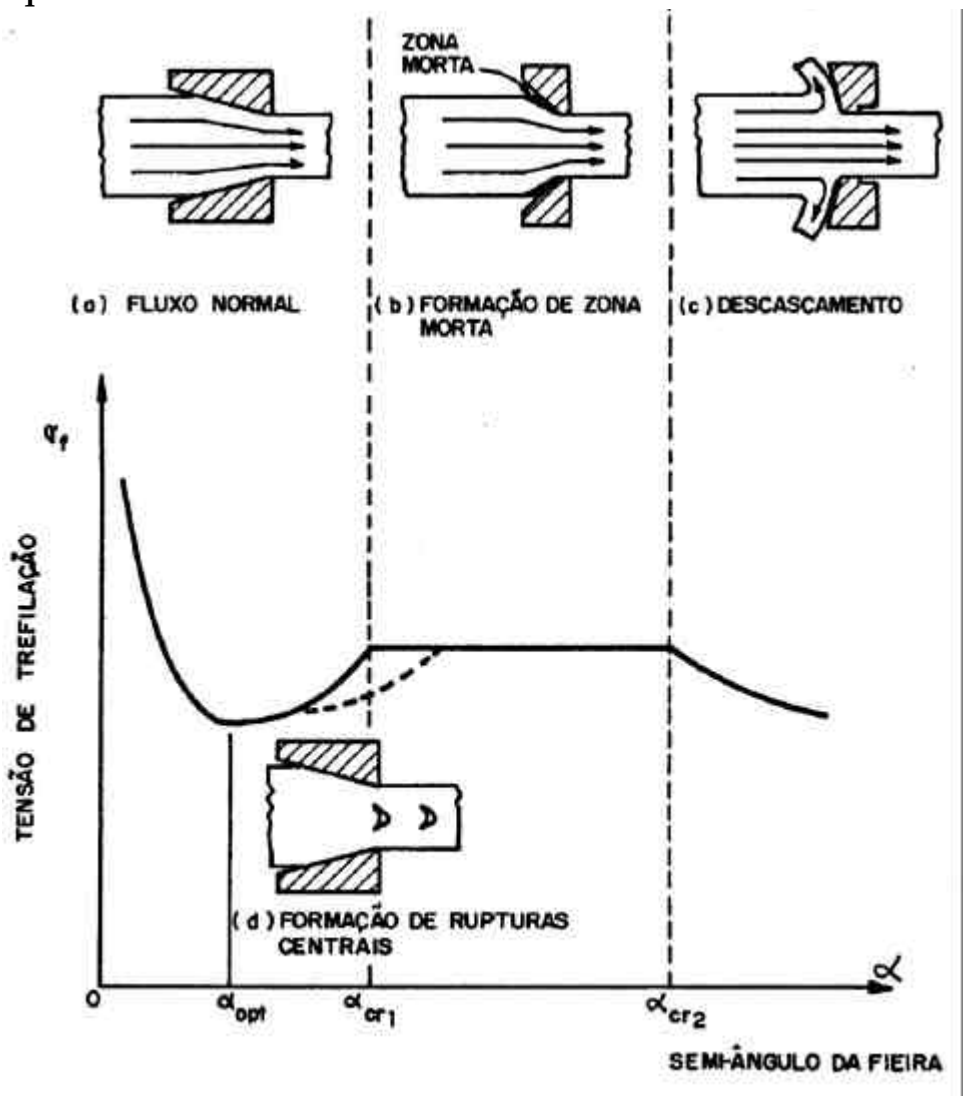
- $$\frac{\partial \sigma_f}{\partial \alpha} = 0$$

$$2 \operatorname{sen} \alpha \left[1 - \sqrt{\frac{11}{12} \operatorname{sen}^2 \alpha} - (\cos \alpha) f(\alpha) \right]$$

- $$\ln \frac{R_i}{R_f} + \frac{1}{\sqrt{3}} \left[2(1 - \alpha \operatorname{ctg} \alpha) - m \ln \left(\frac{R_i}{R_f} \right) \right] = 0$$

- $$\alpha_{opt} \approx \sqrt{\frac{3}{2} m \ln \left(\frac{R_i}{R_f} \right)}$$

Outros Esquemas:



Correlação da geometria de fluxo com o semi-ângulo da fieira (segundo Avitzur).