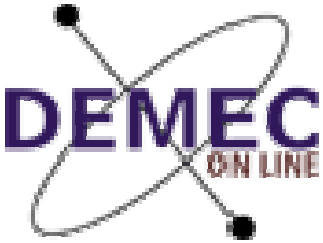
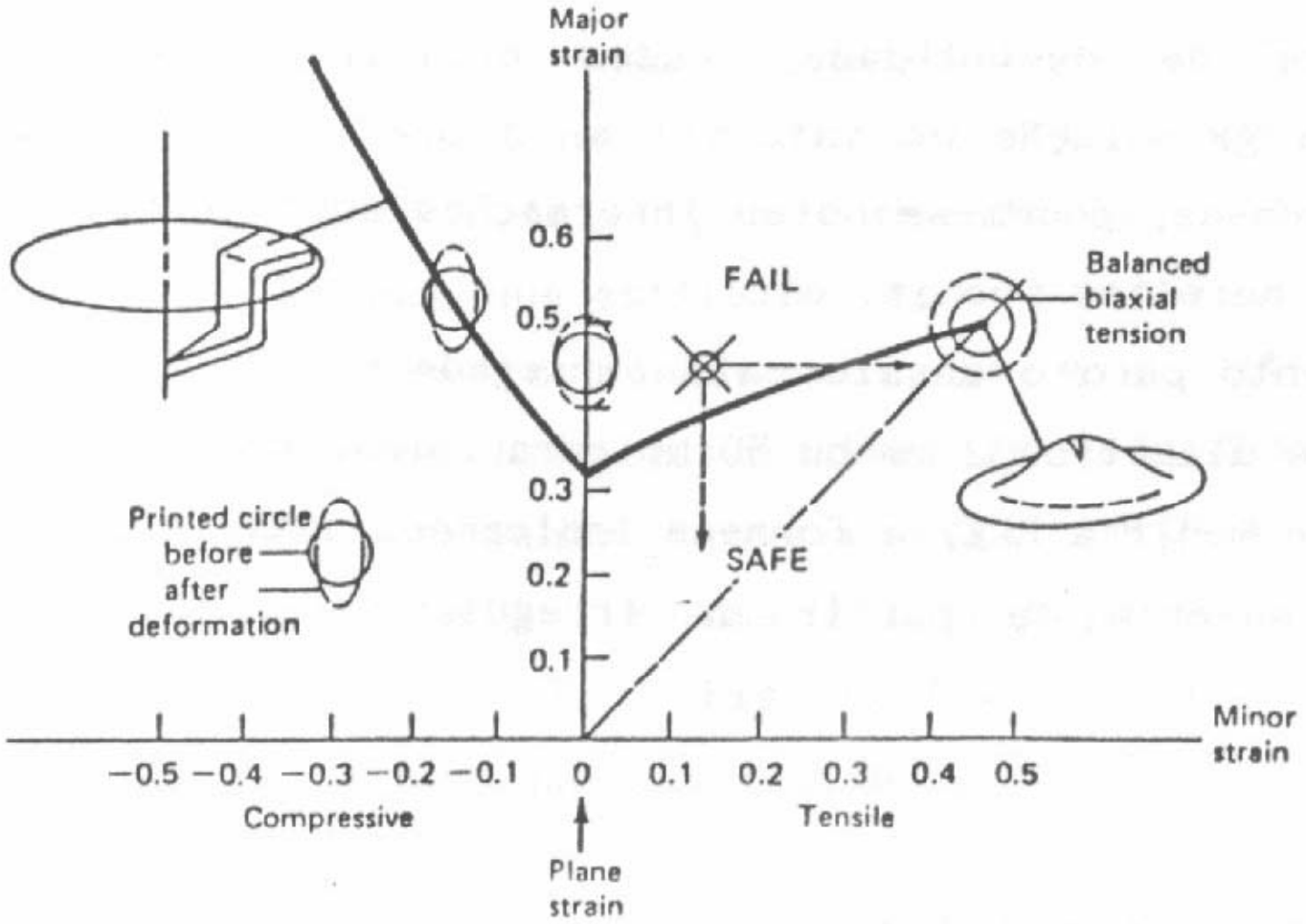


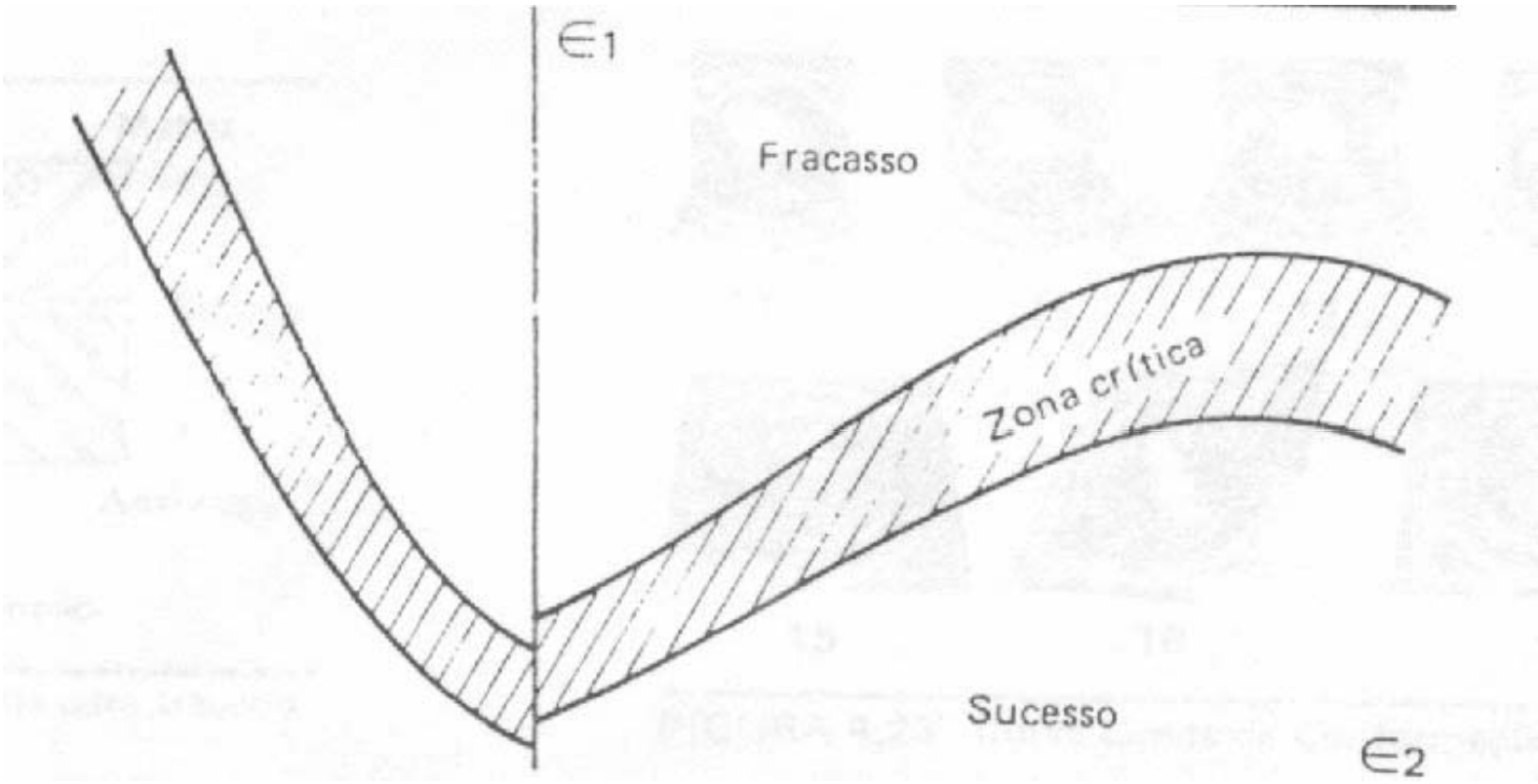
Curvas Limite de Conformação CLC

Prof. Paulo Marcondes, PhD.
DEMEC / UFPR

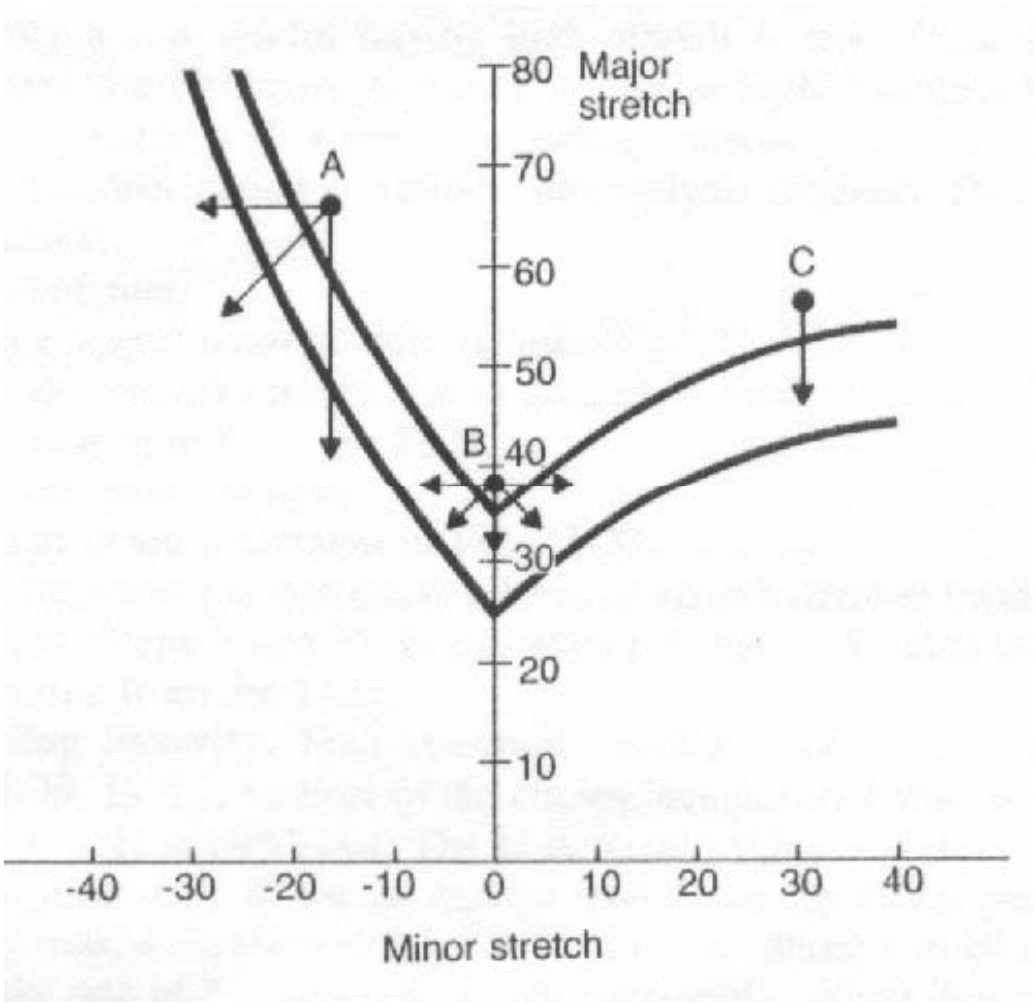
Diagrama Limite de Conformação (DLC) com a Curva Limite de Conformação (CLC)



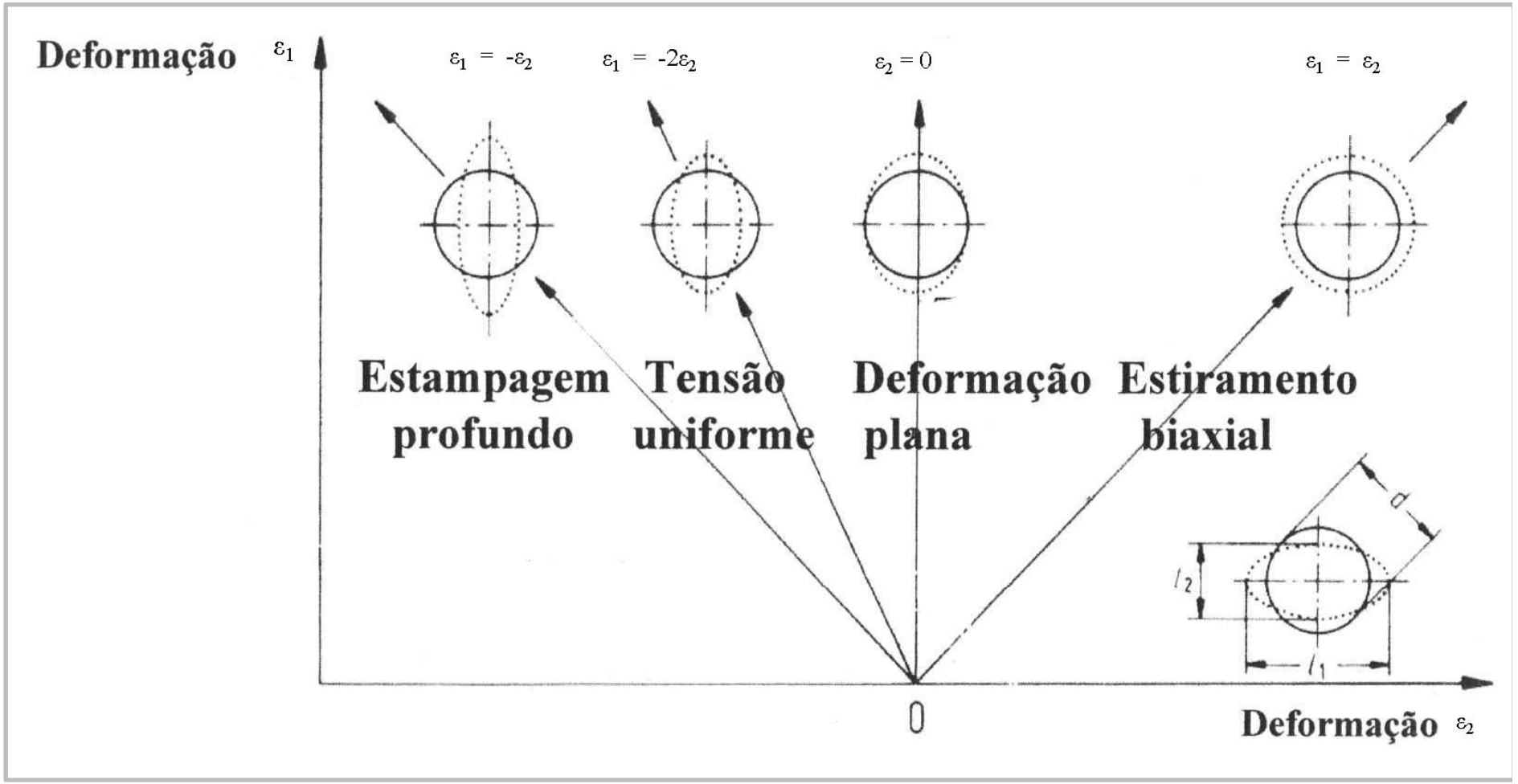
Curva Limite de Conformação



Curva Limite de Conformação



Curva Limite de Conformação



Os pontos a serem plotados no gráfico DLC são obtidos através das equações:

$$e_1 = \frac{(Df_1 - Do_1)}{Do_1}$$

$$e_2 = \frac{(Df_2 - Do_2)}{Do_2}$$

$$e_3 = \frac{(Tf - To)}{To}$$

$$\varepsilon_1 = \ln(e_1 + 1)$$

$$\varepsilon_2 = \ln(e_2 + 1)$$

$$\varepsilon_3 = \ln(e_3 + 1)$$

Onde:

e1: Deformação maior da elipse;

e2: Deformação menor da elipse;

e3: Deformação no sentido da espessura da chapa;

ε1, ε2, ε3: Deformações verdadeiras;

Do1=Do2: Diâmetro inicial do círculo;

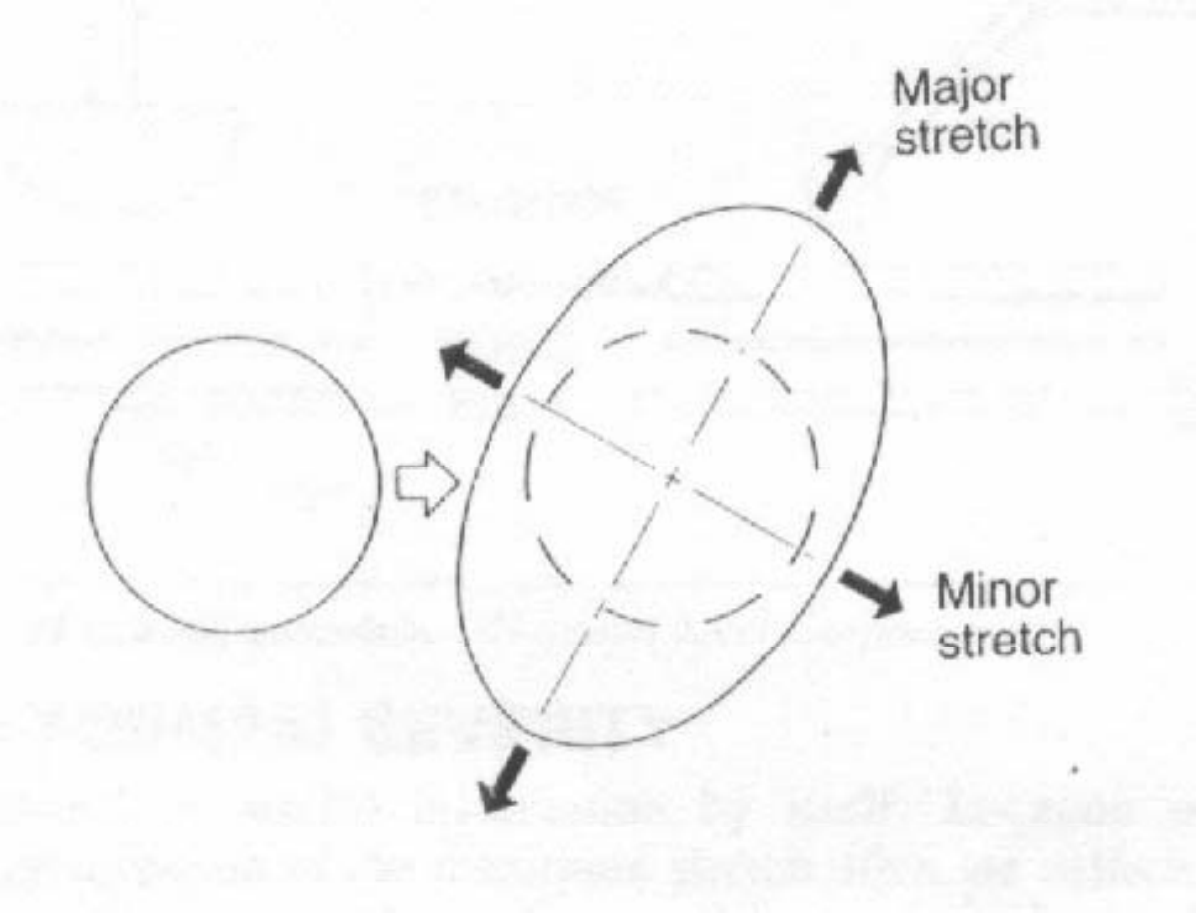
Df1: Diâmetro maior da elipse;

Df2: Diâmetro menor da elipse;

To: Espessura inicial da chapa;

Tf: Espessura final da chapa.

Avaliação das deformações em chapas



Medição das deformações

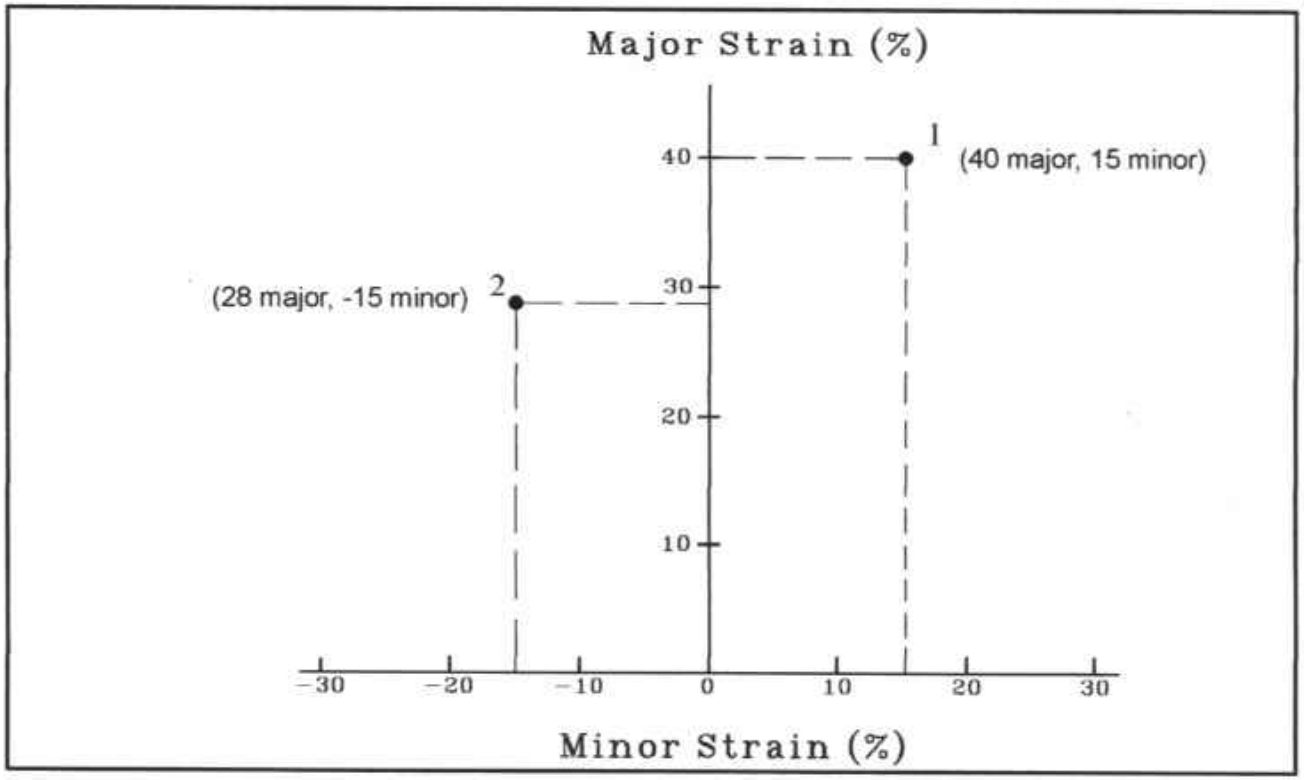
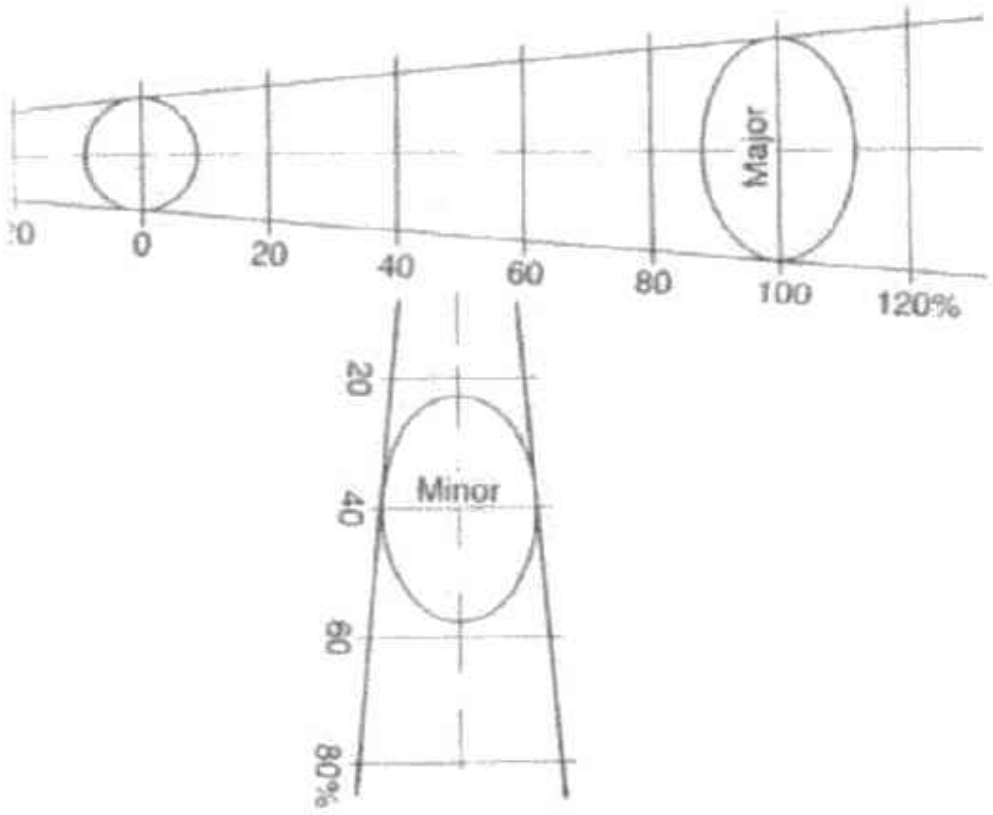


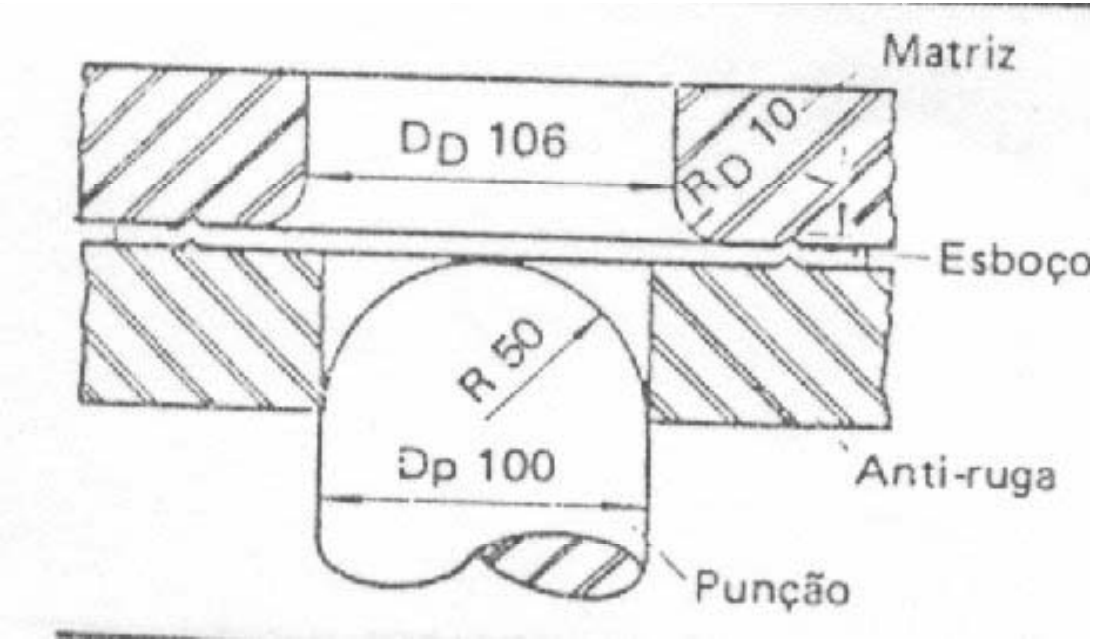
Figure 3-12. Strains plotted on a Major and Minor Strain Graph

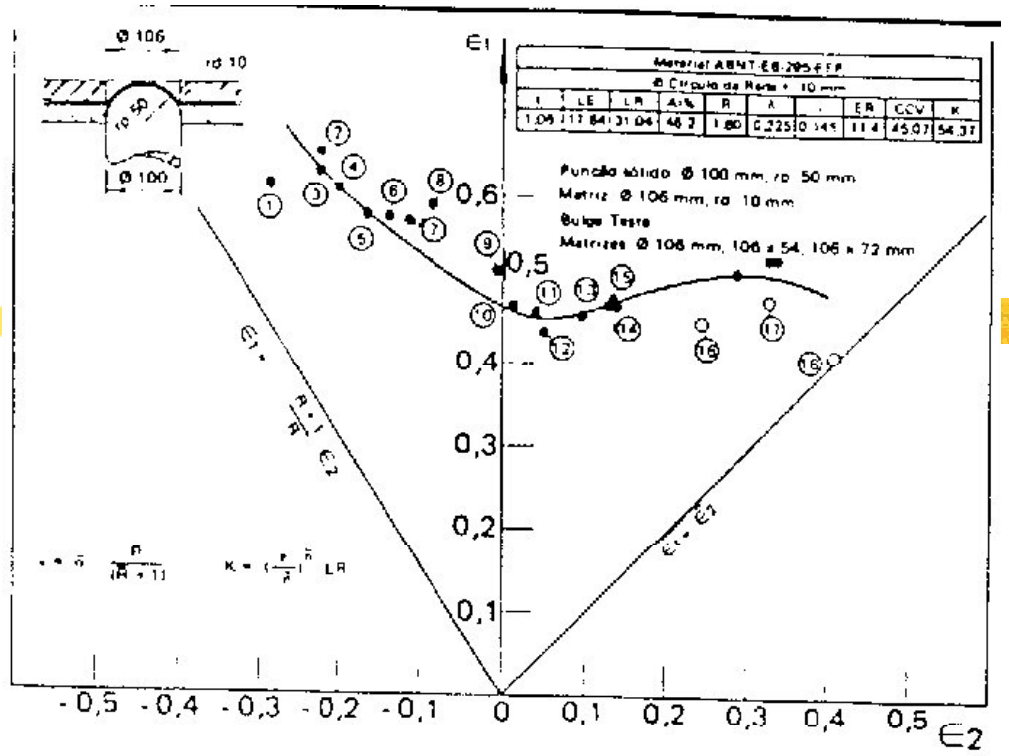
Medição das deformações

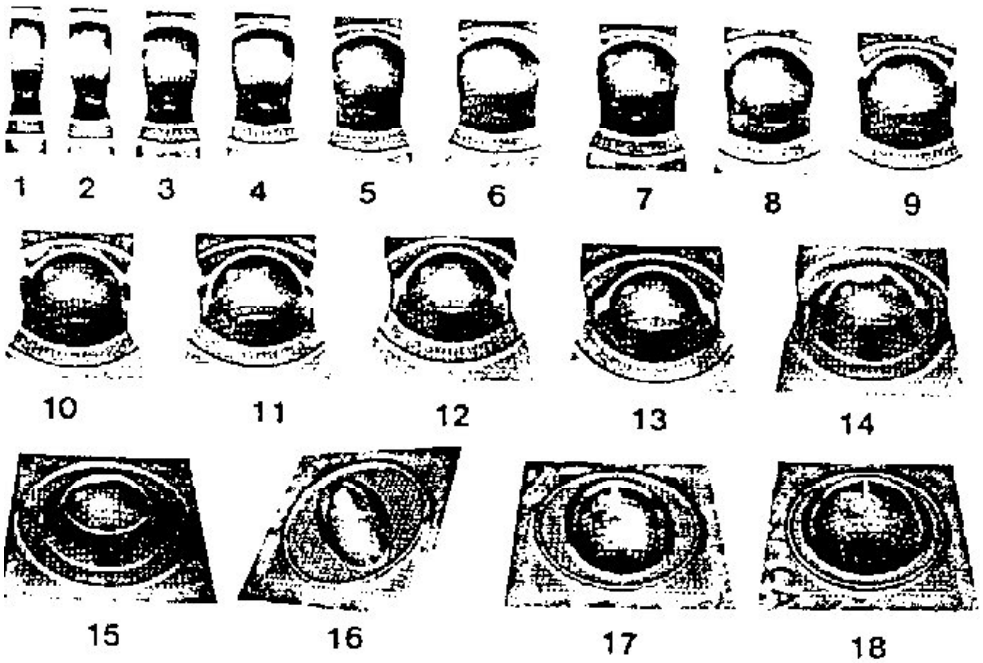


Curva Limite de Conformação

Ferramenta de Nakazima

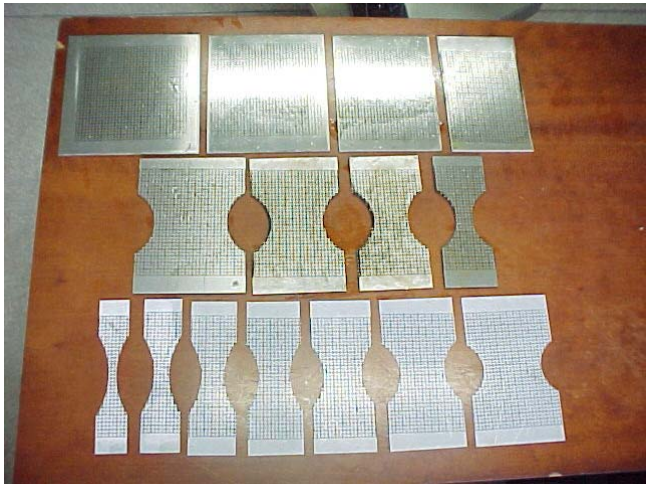


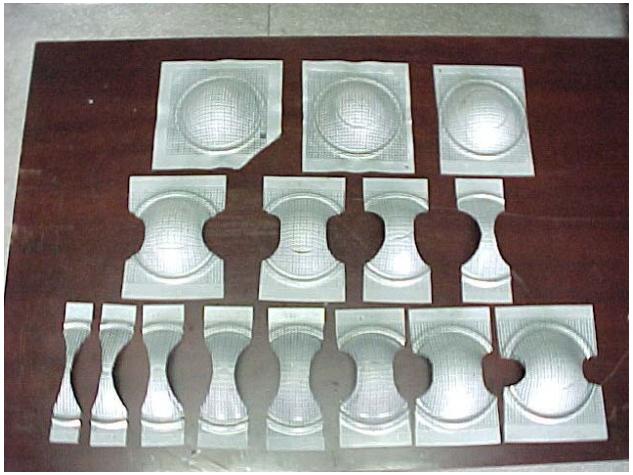




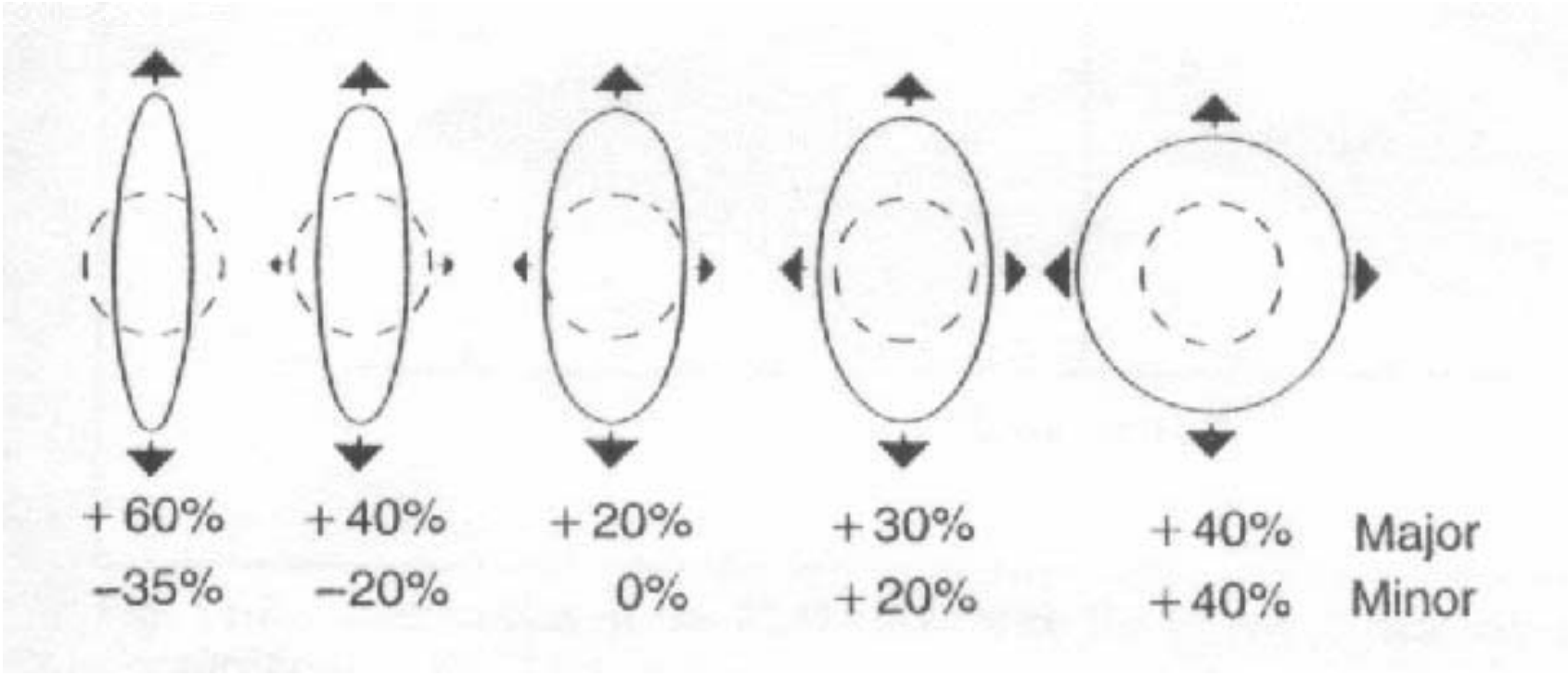
CLC método
Nakazima

Corpos de Prova - Nakazima



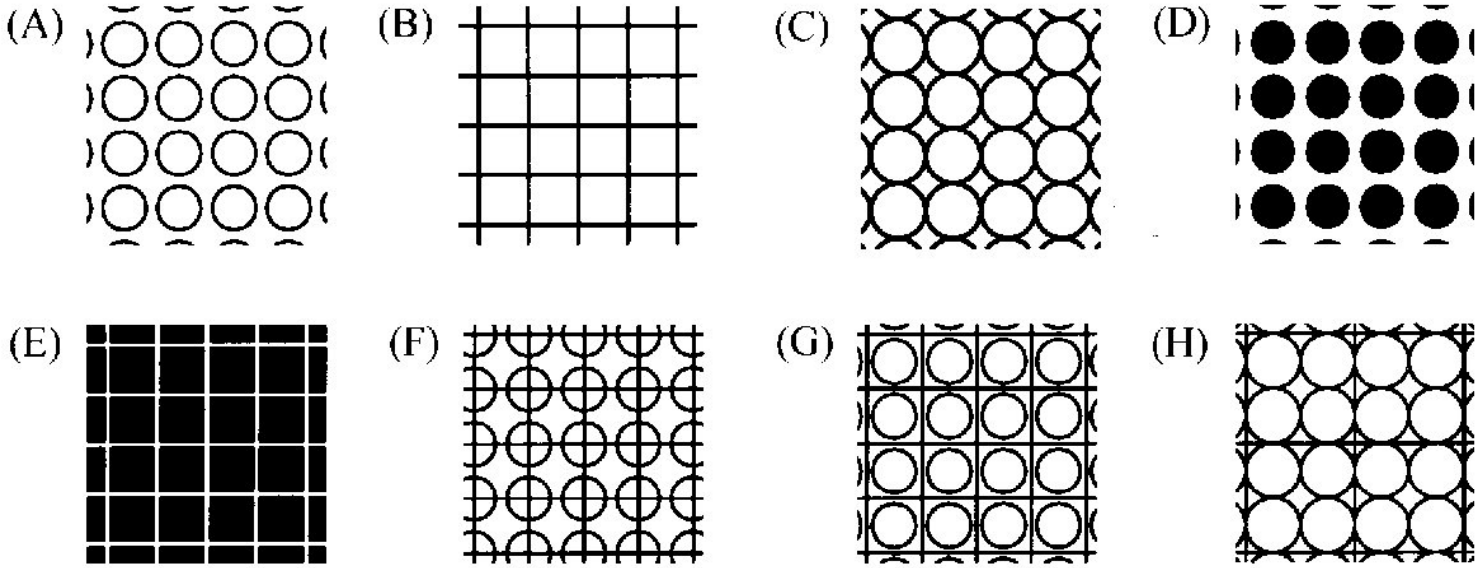


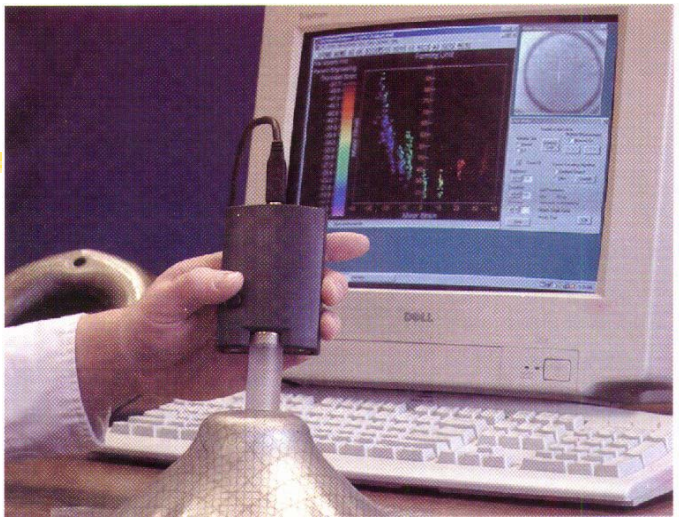
Medição das deformações

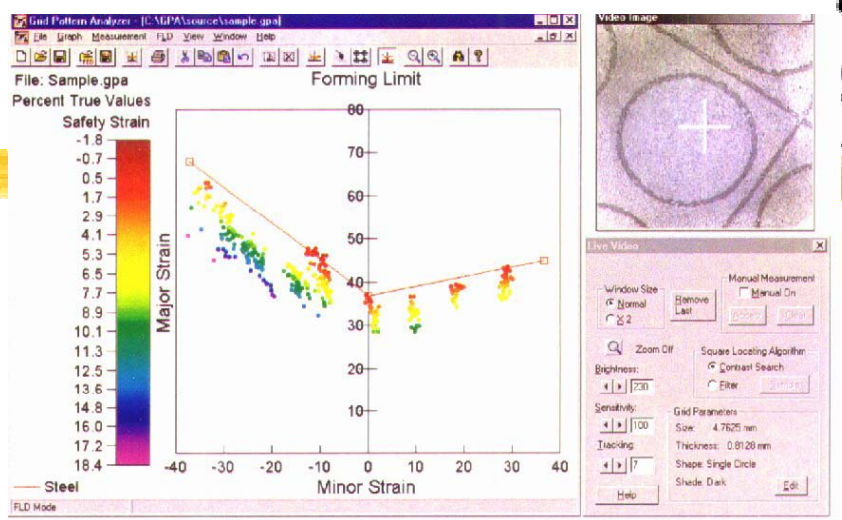


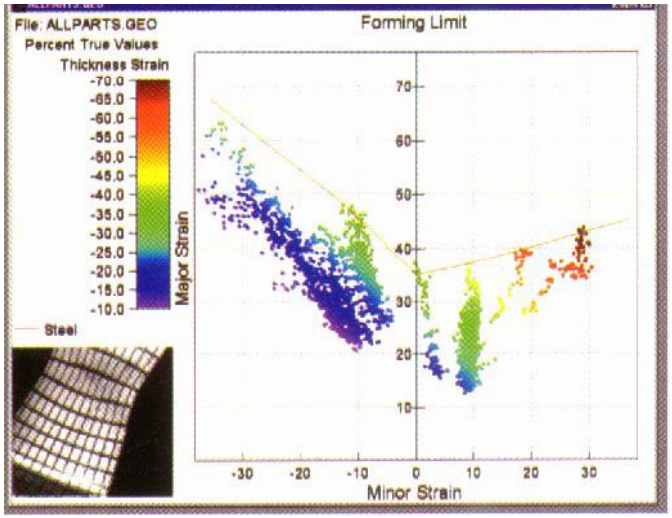
Curva Limite de Conformação

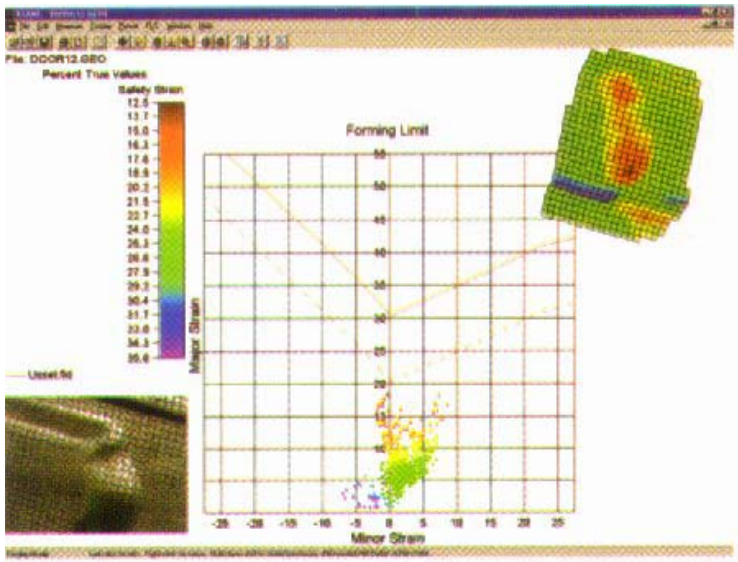
Tipos de malhas:



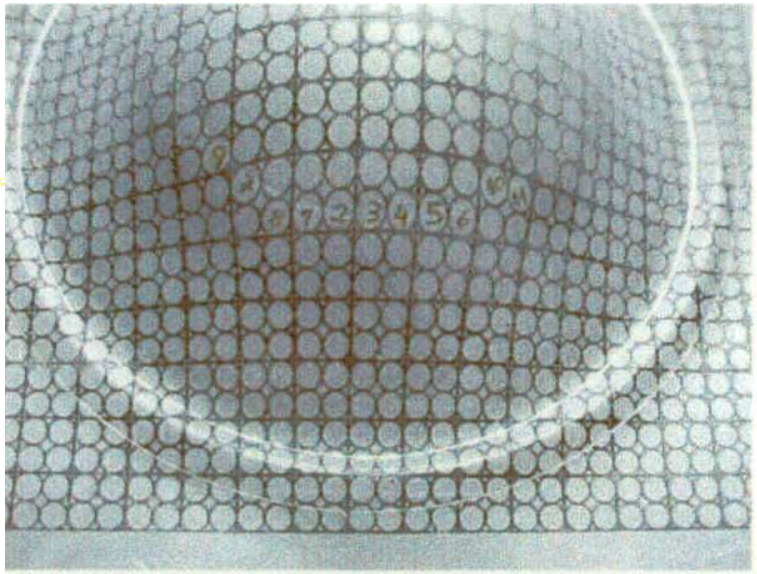


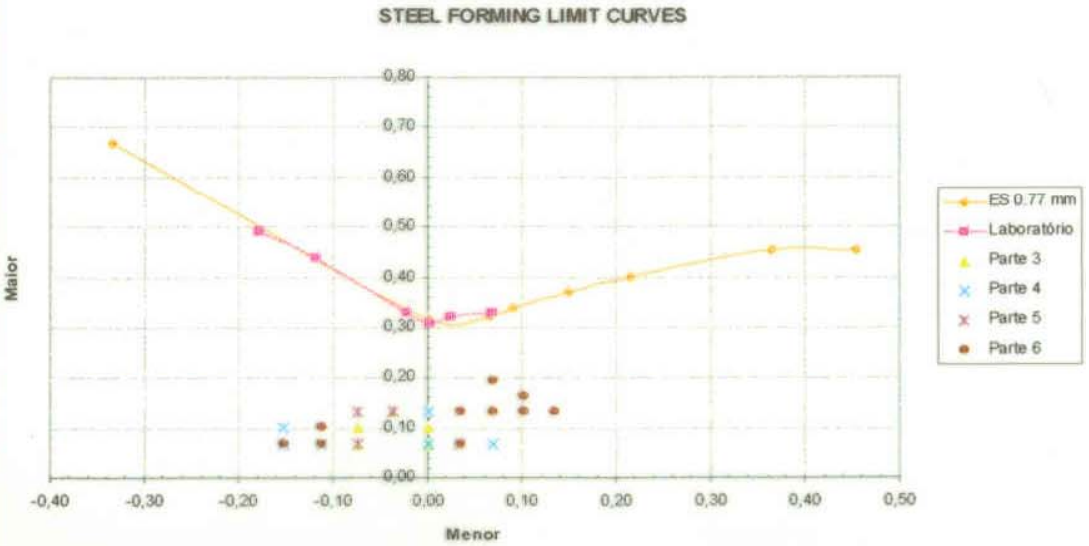

File: Sample.gpa
Percent True Values
Safety Strain
Forming Limit
Major Strain
Minor Strain
Steel
FLD Mode
Video Image
Live Video

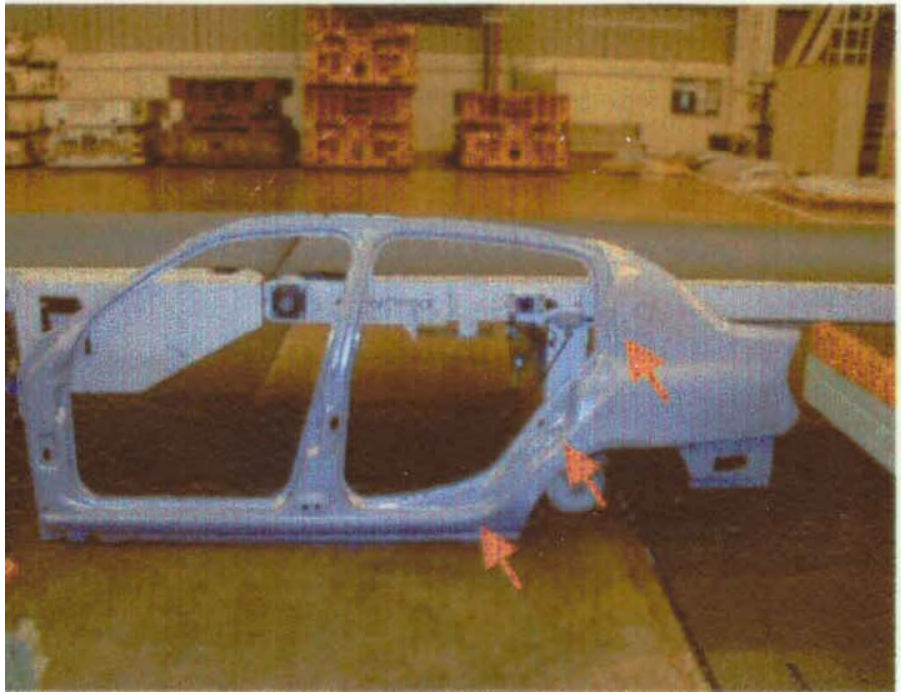

File: ALLPARTS.GEO
Percent True Values
Thickness Strain
Forming Limit
Major Strain
Minor Strain
Steel

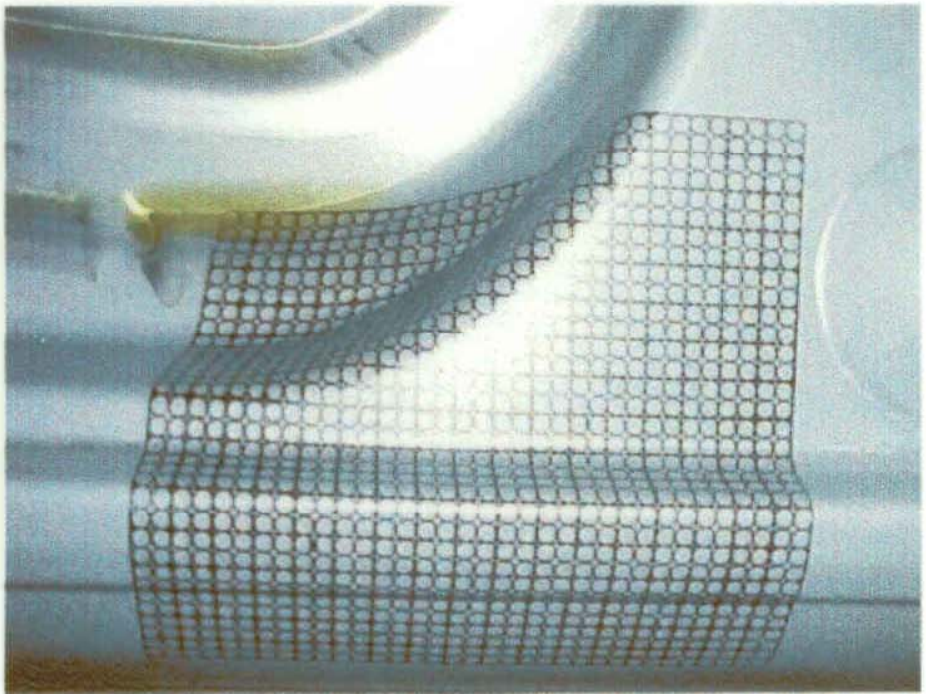

Forming Limit
Major Strain
Minor Strain

Aplicacao CLC









CLC – Aplicação prática

- Aplicação de uma Malha na Superfície da Chapa
- Medição dos Círculos ou Quadrados
- Cálculo das Deformações
- Comparação com os Limites dos Materiais

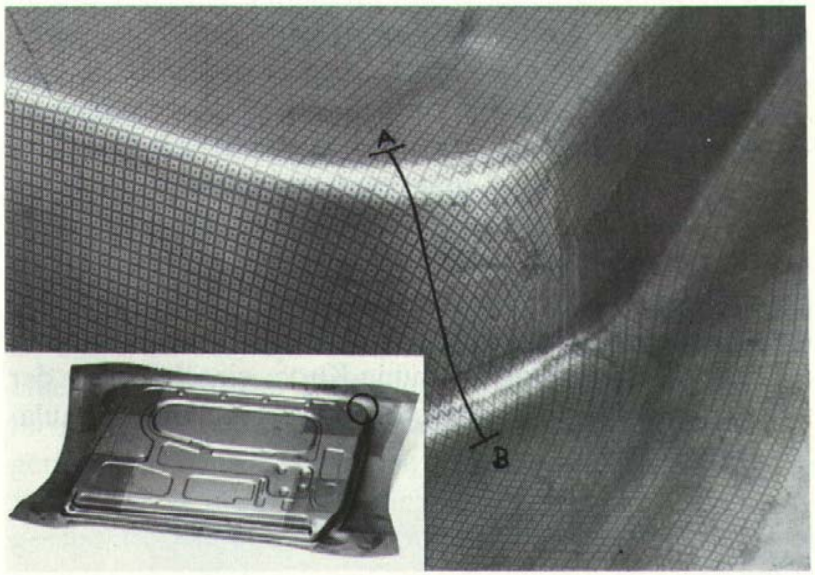


Bild 7. Meßraster aus überlappenden Kreisen auf einem Türinnenteil (Ausschnitt)

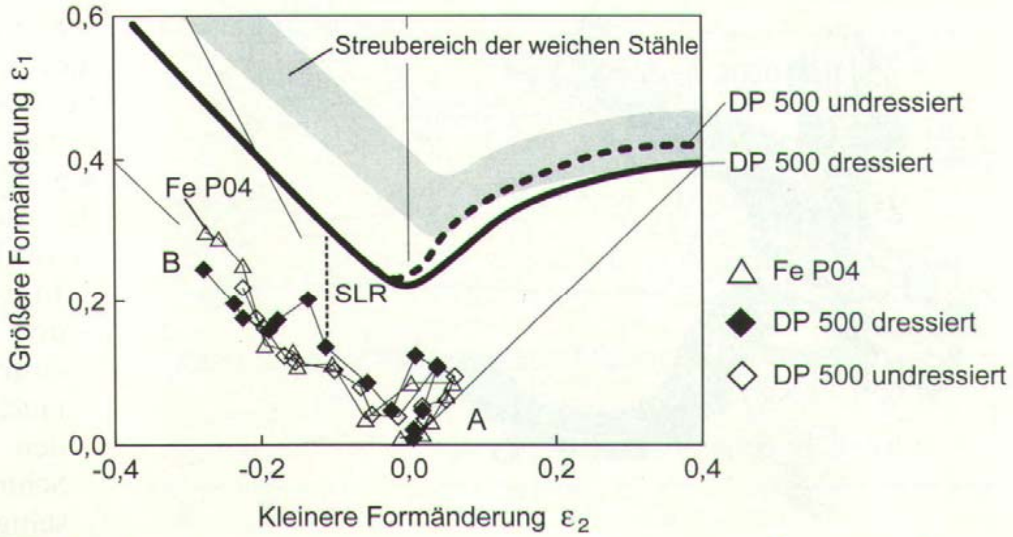
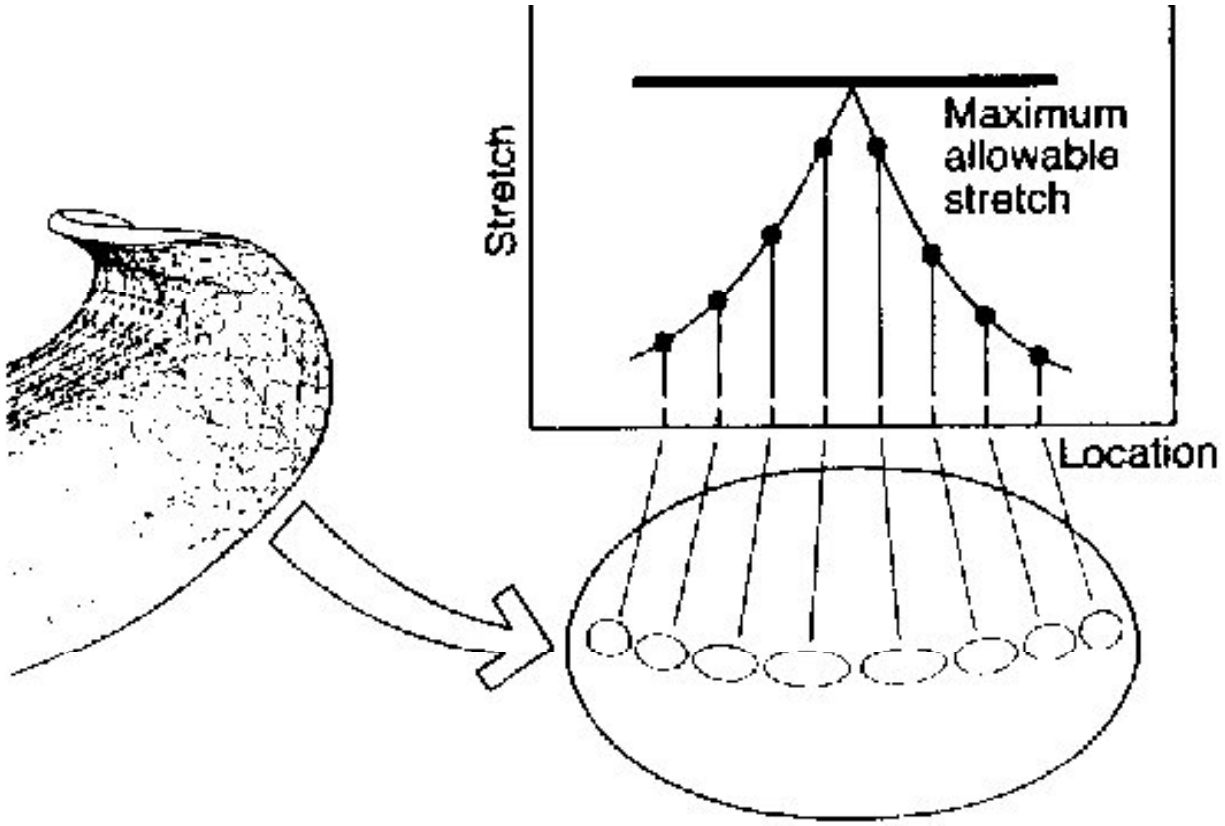


Bild 8. Formänderungsanalyse an einem Türinnenteil; Schnitt A-B aus Bild 7

Curva Limite de Conformação



Curva Limite de Conformação