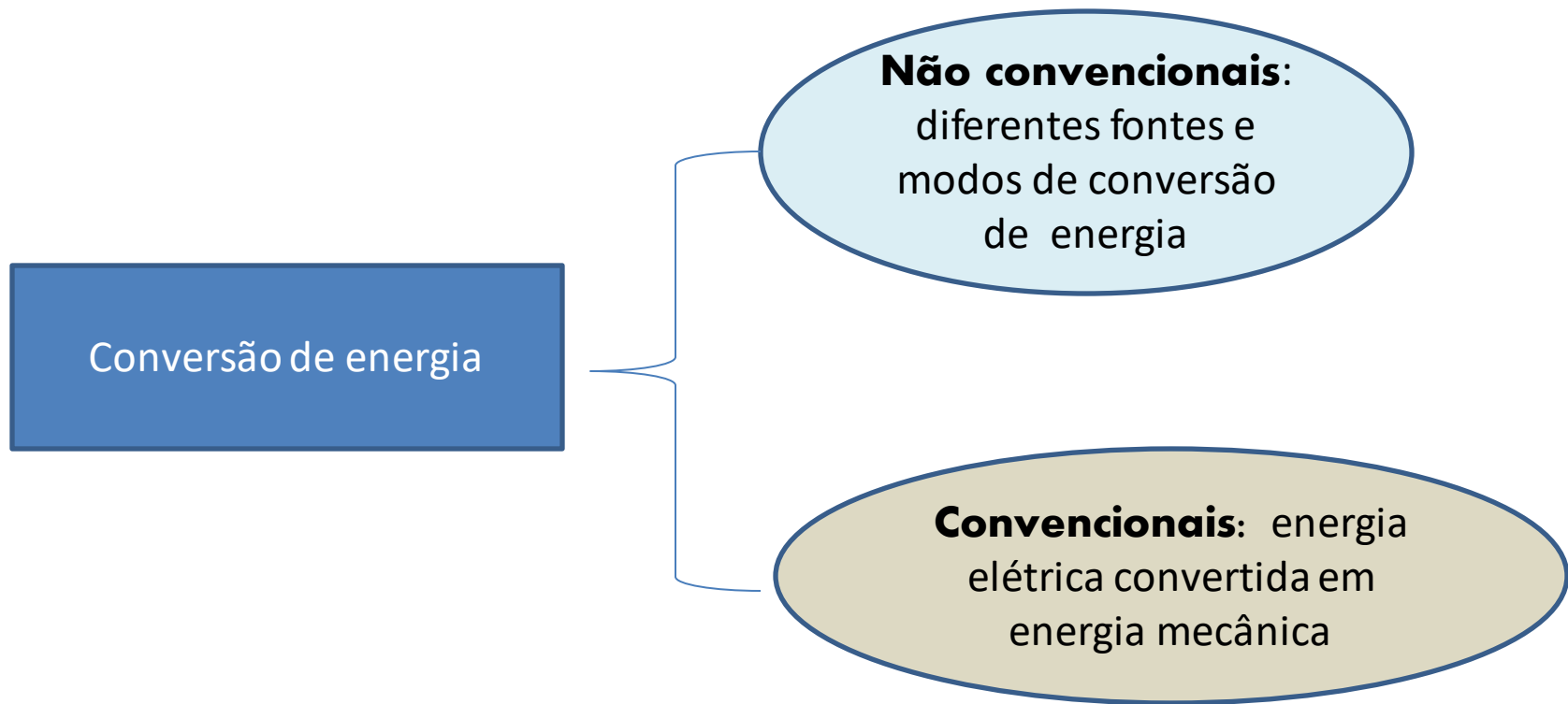


TMEC-022 – USINAGEM

AULA Nº 1

VISÃO GERAL SOBRE OS PROCESSOS DE USINAGEM

Classificação dos processos de usinagem



Processos não convencionais de usinagem

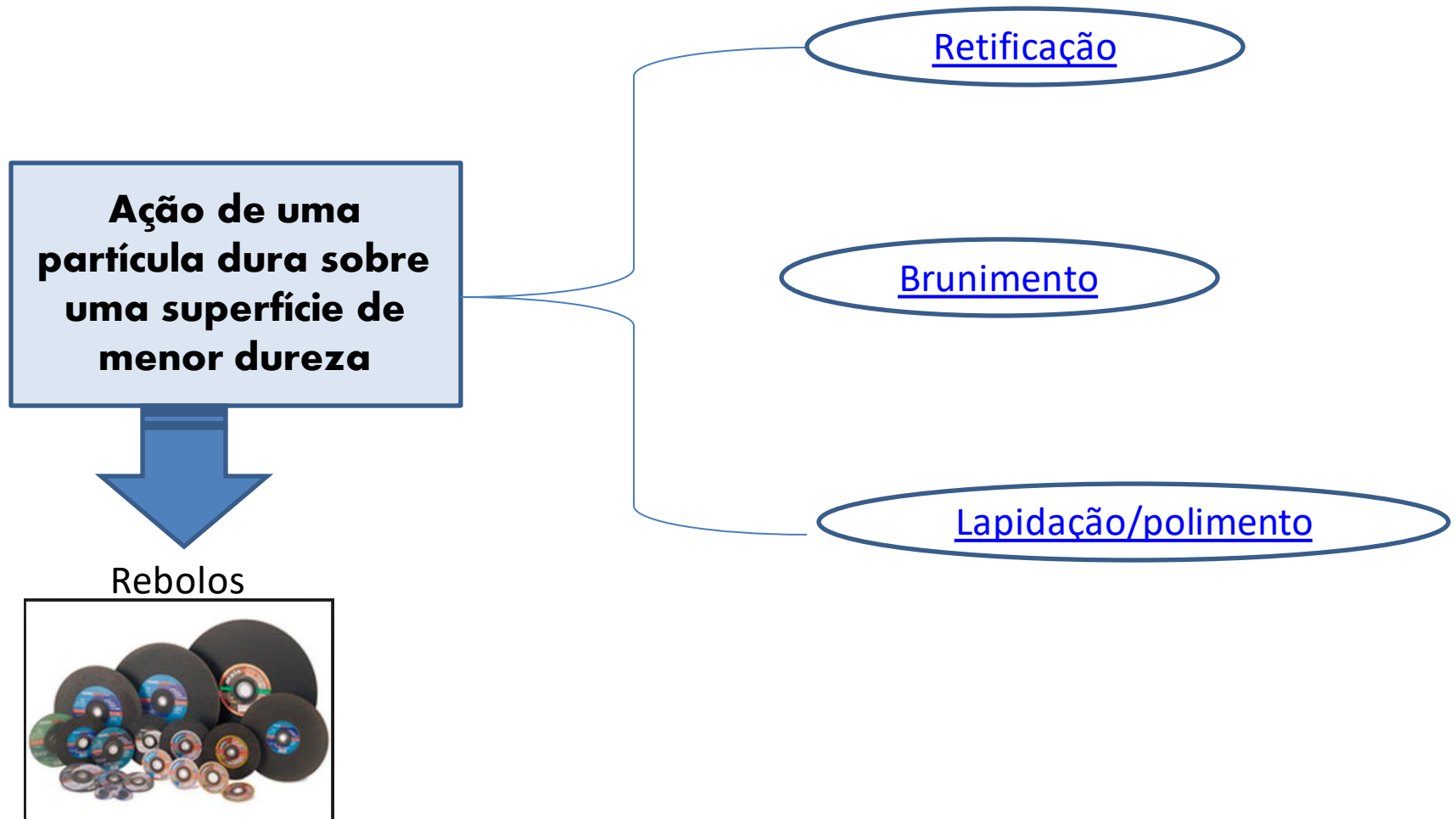
diferentes fontes e formas de conversão de energia

Exemplos:

- [Eletroerosão](#): energia elétrica convertida em descargas elétricas
- [Fotoquímica](#): transferência de elétrons – corrosão controlada
- [Eletroquímica](#): transferência de elétrons – eletrólise
- [Laser](#): energia elétrica – conversão em energia luminosa
- [Jato de água](#): energia elétrica – energia de fluxo – energia cinética
- [Ultrassom](#): energia elétrica – aceleração de abrasivos – energia cinética

Geometria não definida

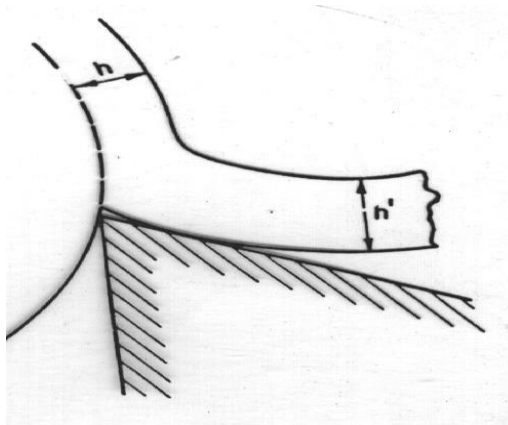
(usinagem por abrasão)



Usinagem convencional

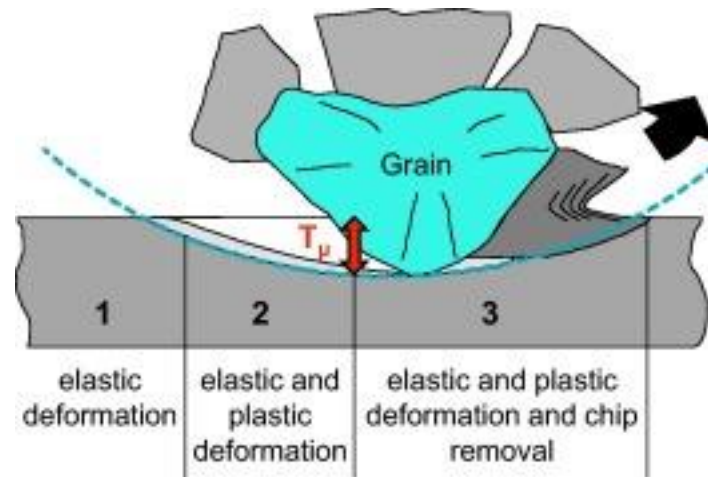
energia elétrica convertida em energia mecânica

Geometria definida

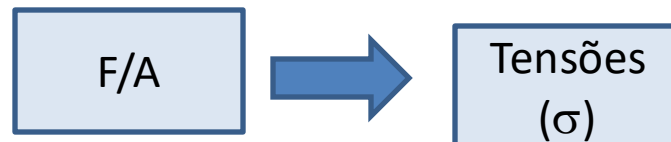


Corte Ortogonal: espessura do cavaco
Fonte: Ferraresi

Geometria não definida (usinagem por abrasão)



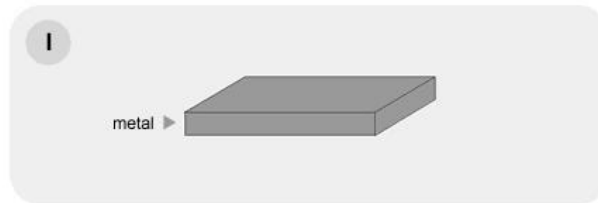
Fonte: <http://dx.doi.org/10.1016/j.jmatprotec.2015.06.041>



Processos de Usinagem com geometria definida

- Alargamento
- Aplainamento
- Brochamento
 - Furação
 - Fresamento
- Mandrilamento
 - Serramento
 - Torneamento
- Operações especiais: roscamento e corte de engrenagens

USINAGEM FOTOQUÍMICA



Chemically cleaned surface

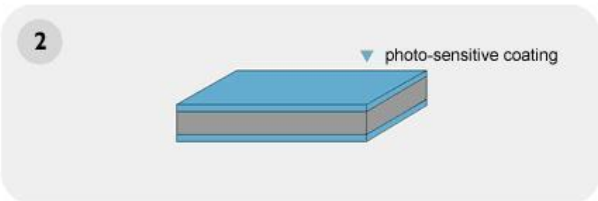


Photo-sensitive coating applied to both top and bottom

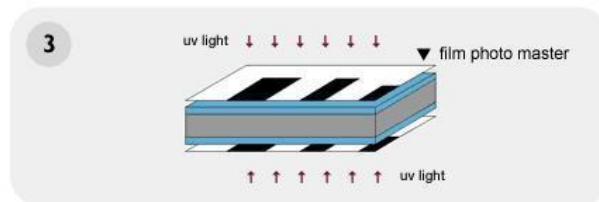
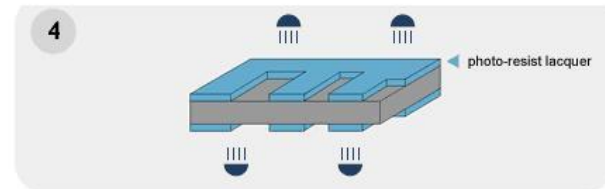
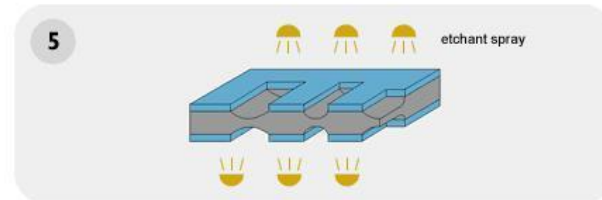


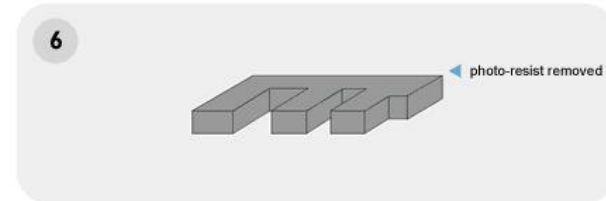
Image transfer by photo exposure through image mask and developing solved photo-resist



Rinsing off solved photo-resist



Progressive removal of metal



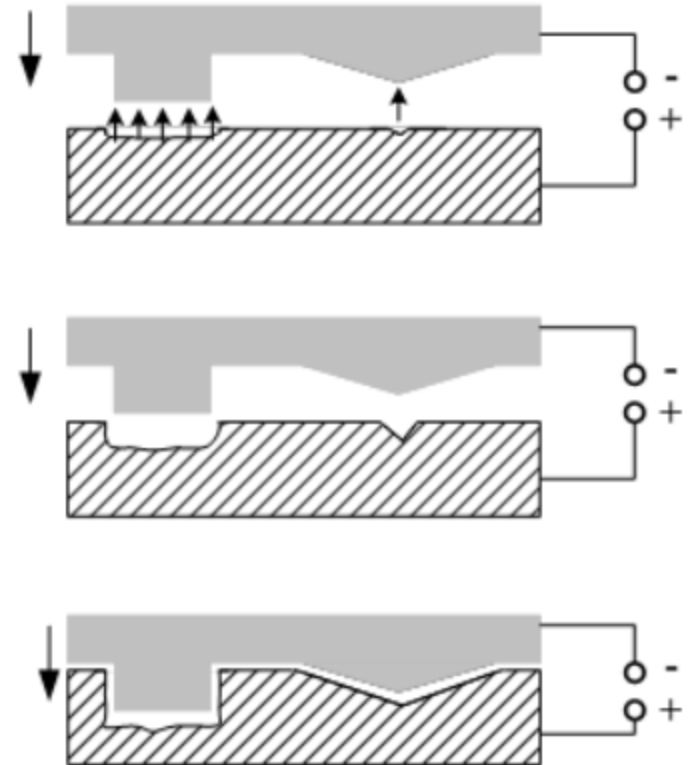
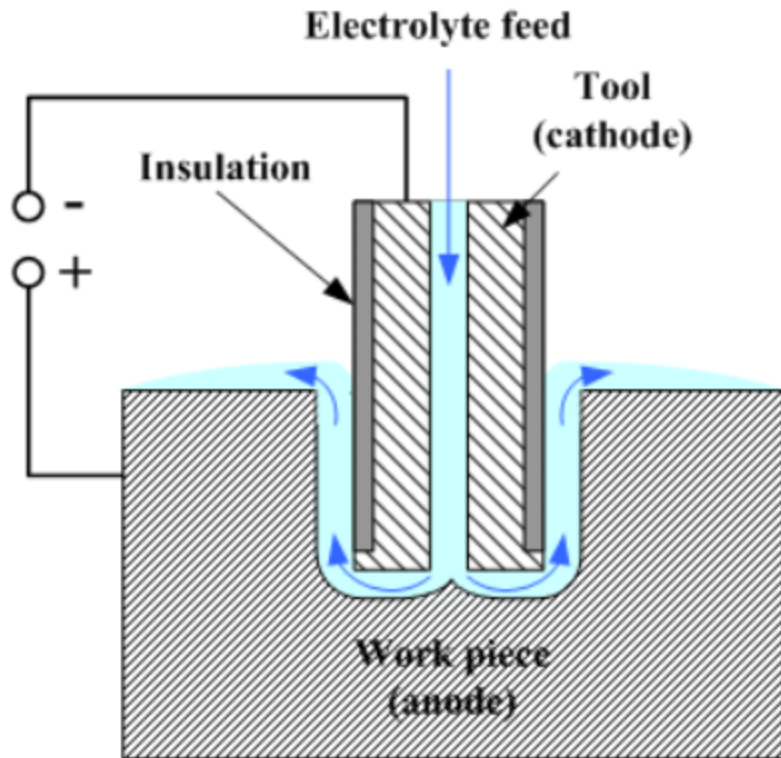
Completed etched product

Fonte: Colton, J.
<http://www.me.gatech.edu/jonathan.colton/me4210/mfgvideos.html>



USINAGEM ELETROQUÍMICA

Electrochemical machining process

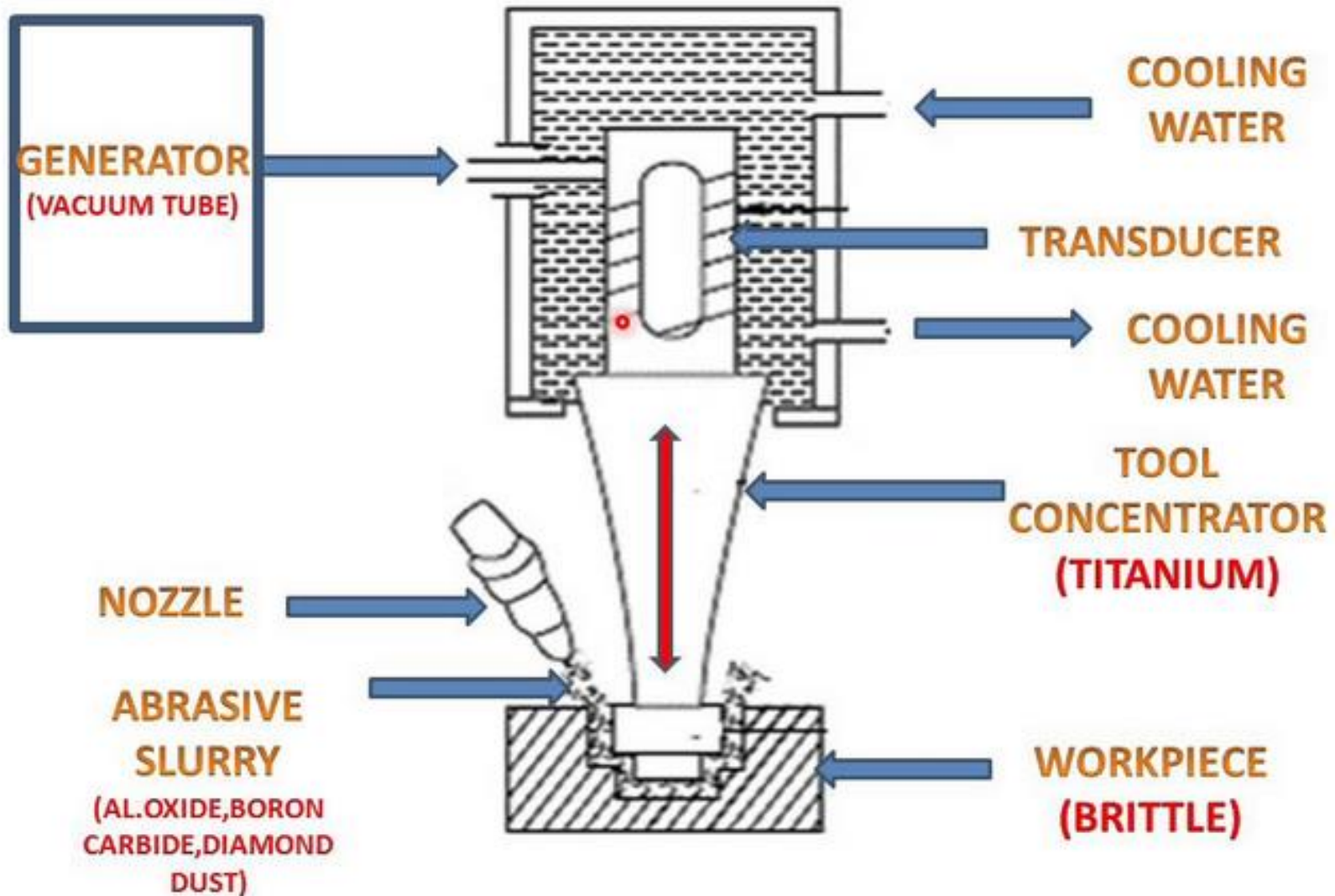


www.substech.com

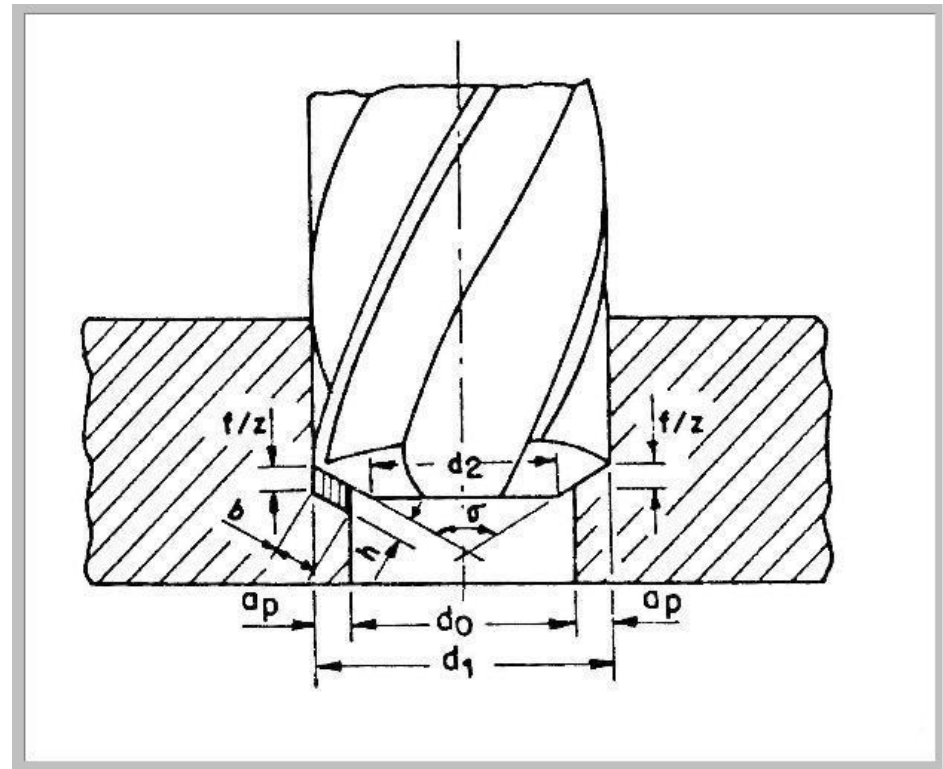
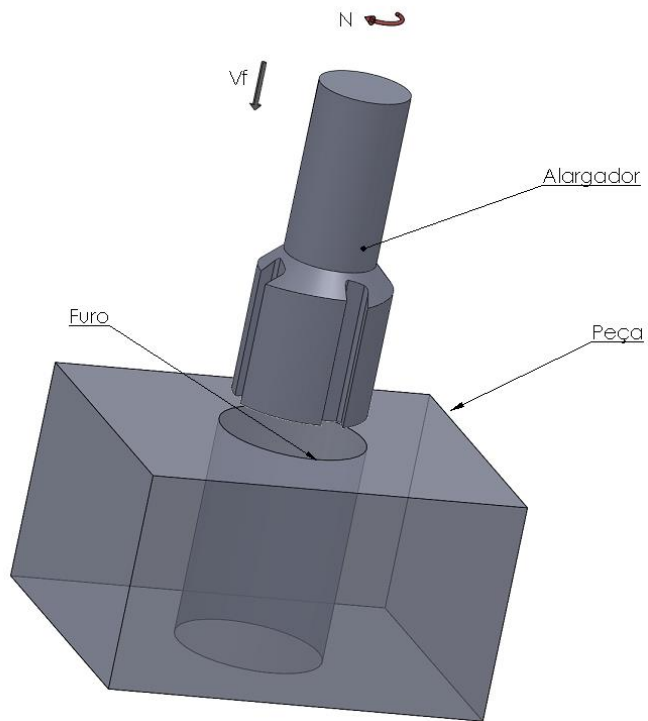


USINAGEM POR ULTRASSOM

ULTRA SONIC MACHINING



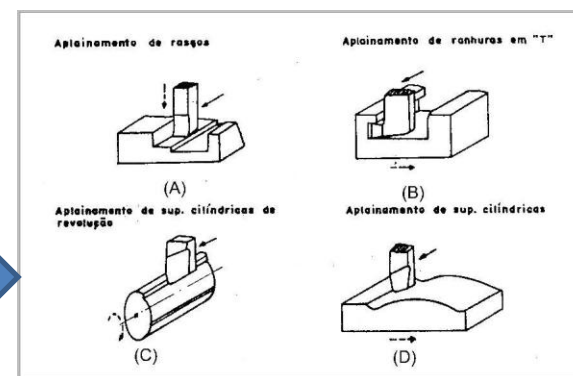
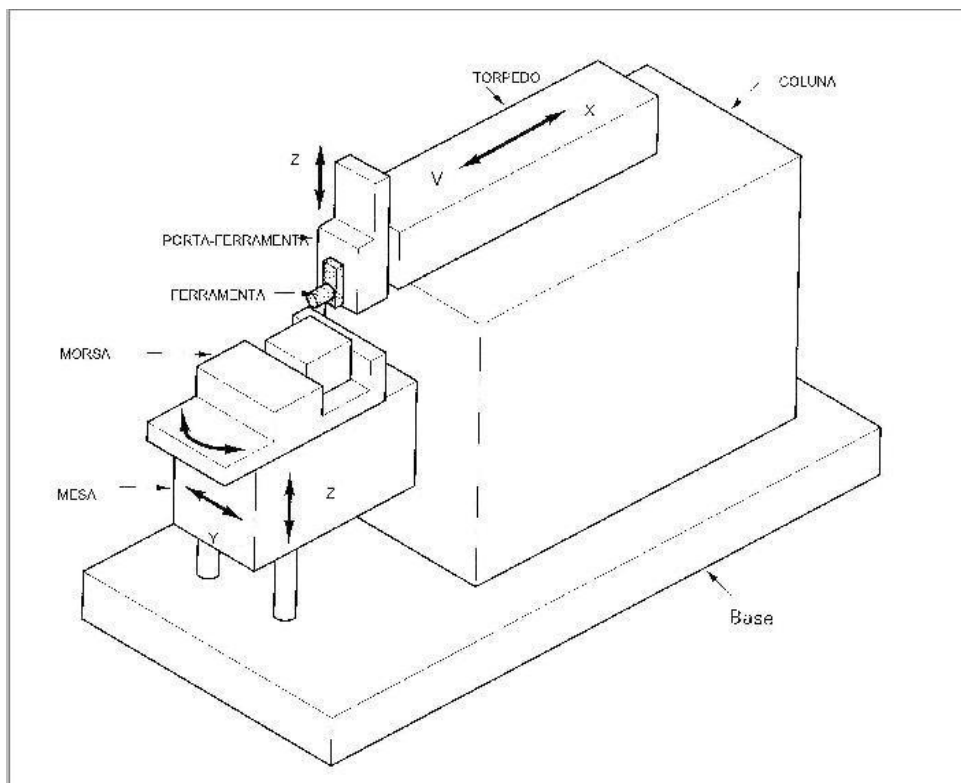
Alargamento



Alargamento no torno: https://www.youtube.com/watch?v=8K_MLDb0mhg



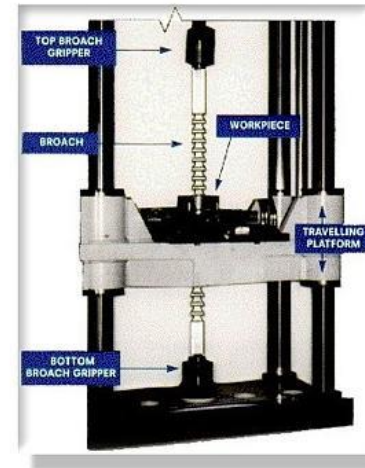
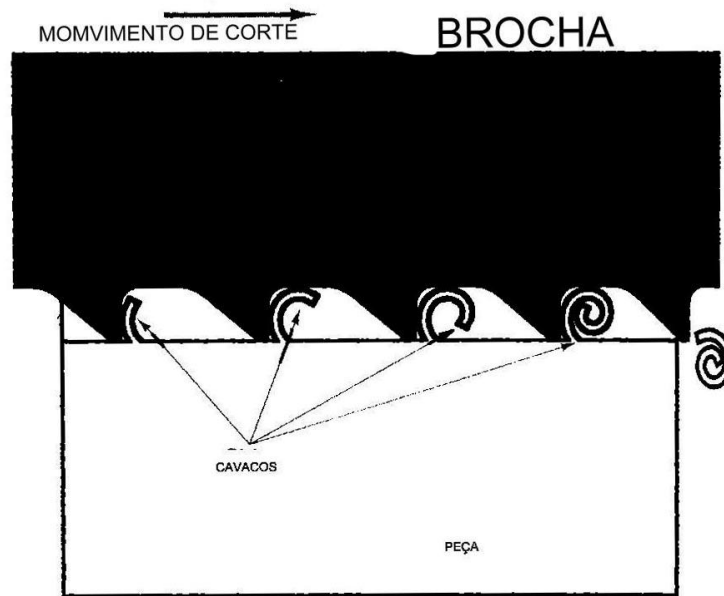
Aplainamento



Filme: <https://www.youtube.com/watch?v=Omsyy-RiaqU>



brochamento



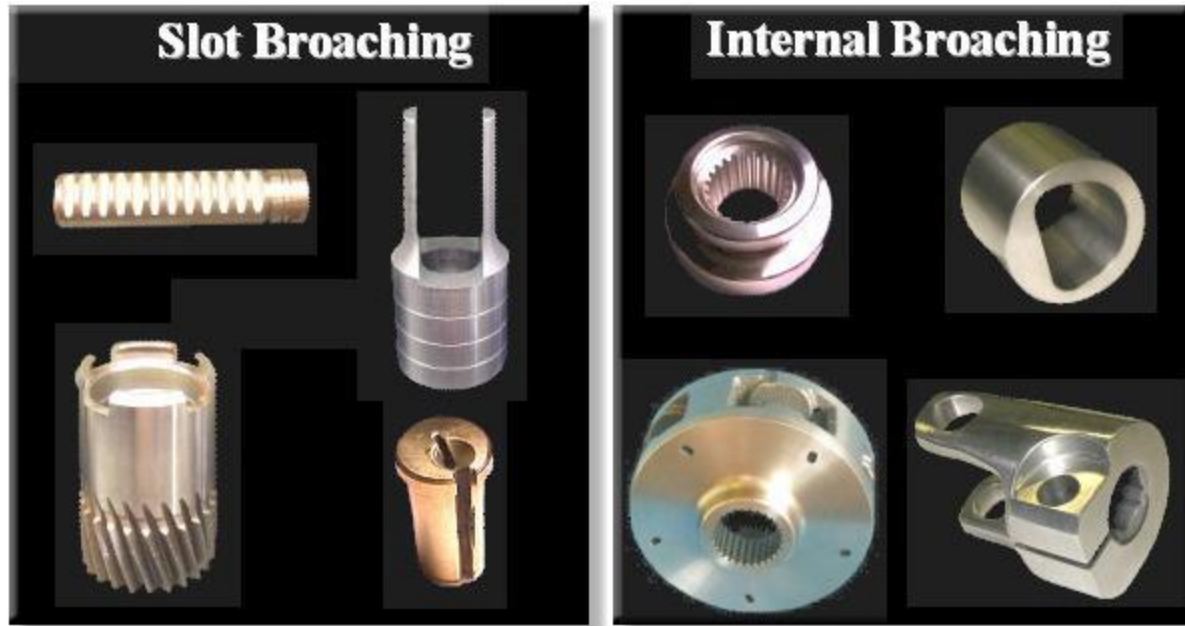
FONTE: MILES - http://www.tymiles.com/broaching_tabup.htm

Brochamento linear:

<https://www.youtube.com/watch?v=Dyfp1HbReR8>

Brochamento rotativo: <https://www.youtube.com/watch?v=smTdkevMMTc>

Exemplo de peças usinadas por brochamento



FONTE: MILES - www.tymiles.com/broaching.htm

