UNIVERZITET U NOVOM SADU
FAKULTET TEHNIČKIH NAUKA
DEPARTMAN ZA PROIZVODNO MAŠINSTVO

STUDIJSKI MODUL

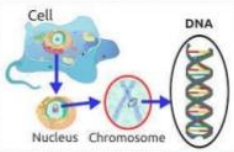
SAVREMENE TEHNOLOGIJE OBLIKOVANJA PLASTIKE

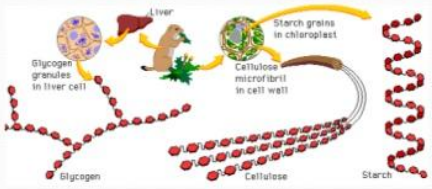
PLASTICS ARE EVERYWHERE!

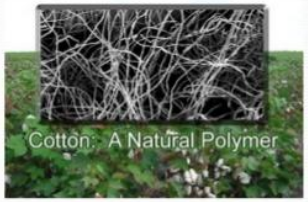
You'll find them in:

- transport
- packaging
- building and construction
- electrical and electronics
- medicine
- sports
- agriculture, etc.

Natural polymers







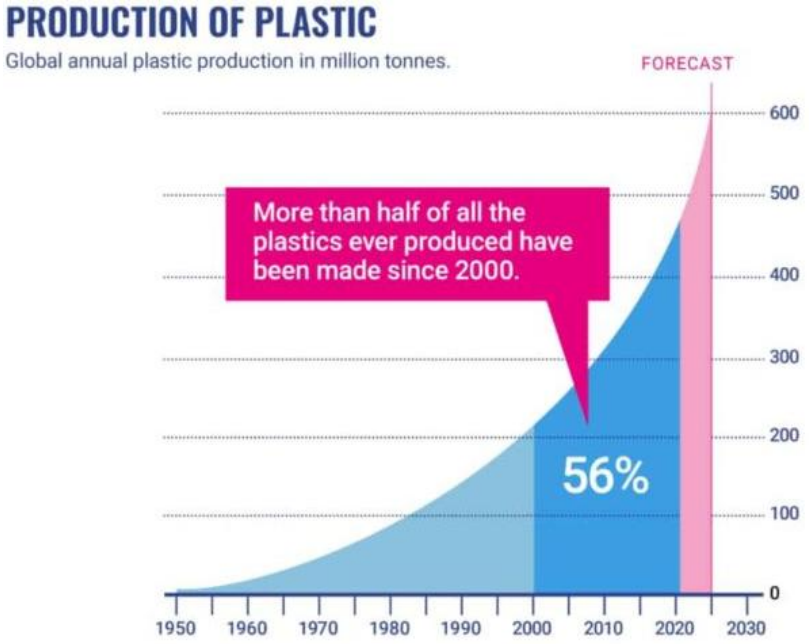
Synthetic polymers for demand ...

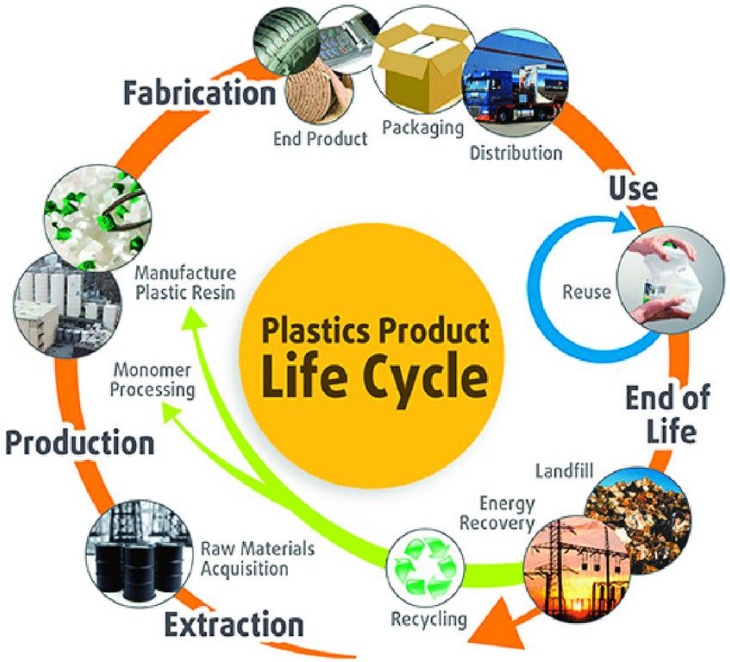
HELPING TO ADVANCE MEDICINE

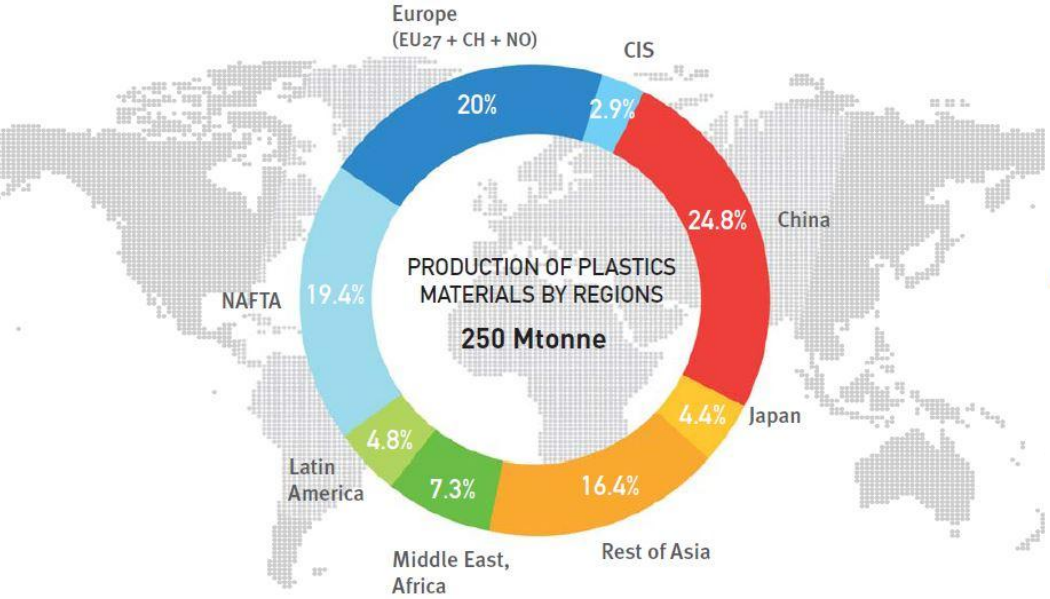
Thanks to plastics:

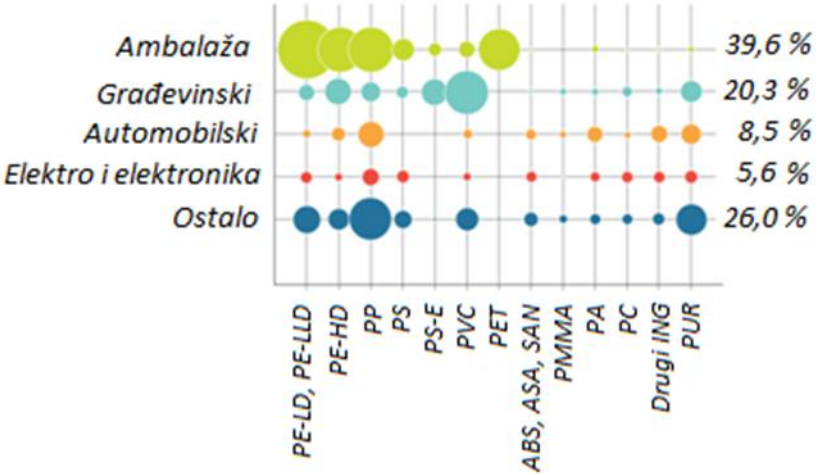
- people live healthier, longer and more fulfilling lives than at any time in history
- medical breakthroughs considered unthinkable 50 years are now possible.

POTROŠNJA POLIMERNIH MATERIJALA U SVETU









Kućna elektronika

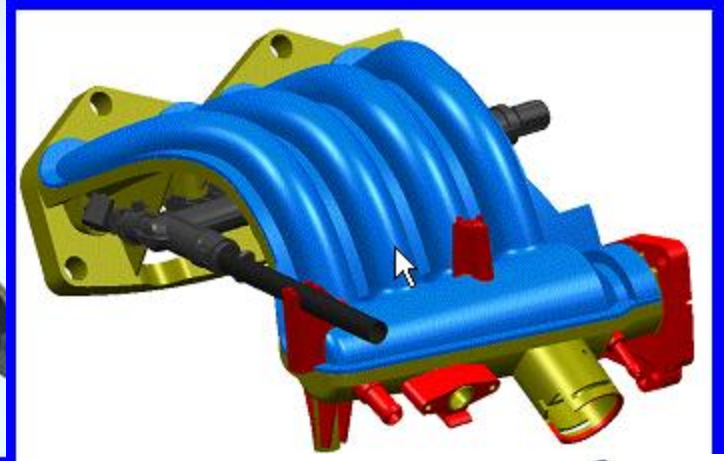
Ambalaža:

- **Sitna ambalaža (boce, tube, kantice ...)**
- **Krupna ambalaža (burad, kante, rezervoari....**

Građevinsko-konstrukcioni materijali

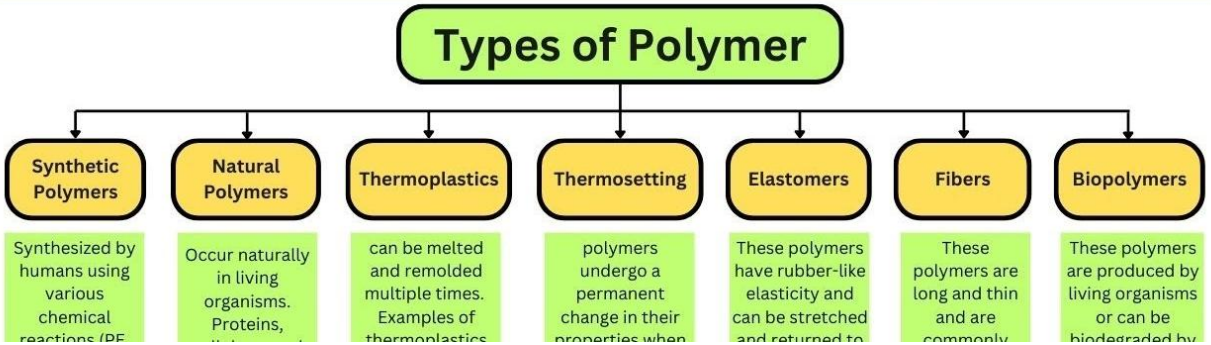
- *Profili*
- *Cevi*
- *Zidne obloge*
- *Podne obloge*
- *Stolarija*

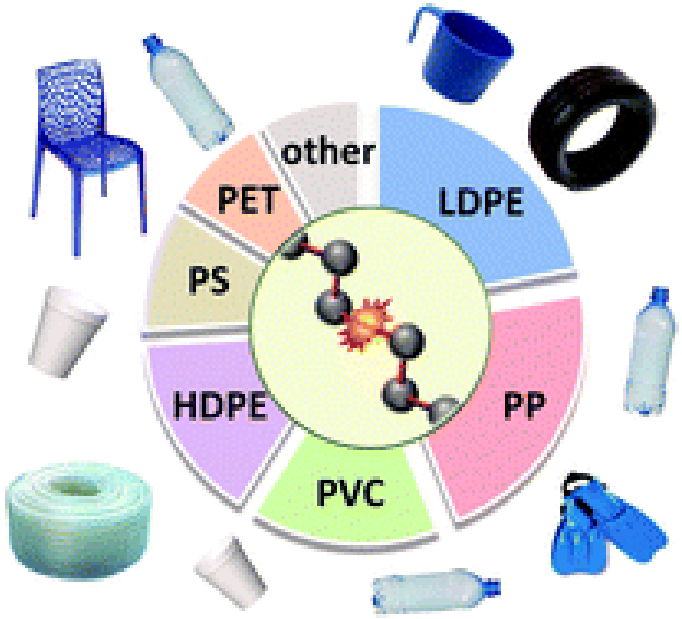
Auto-Industrija



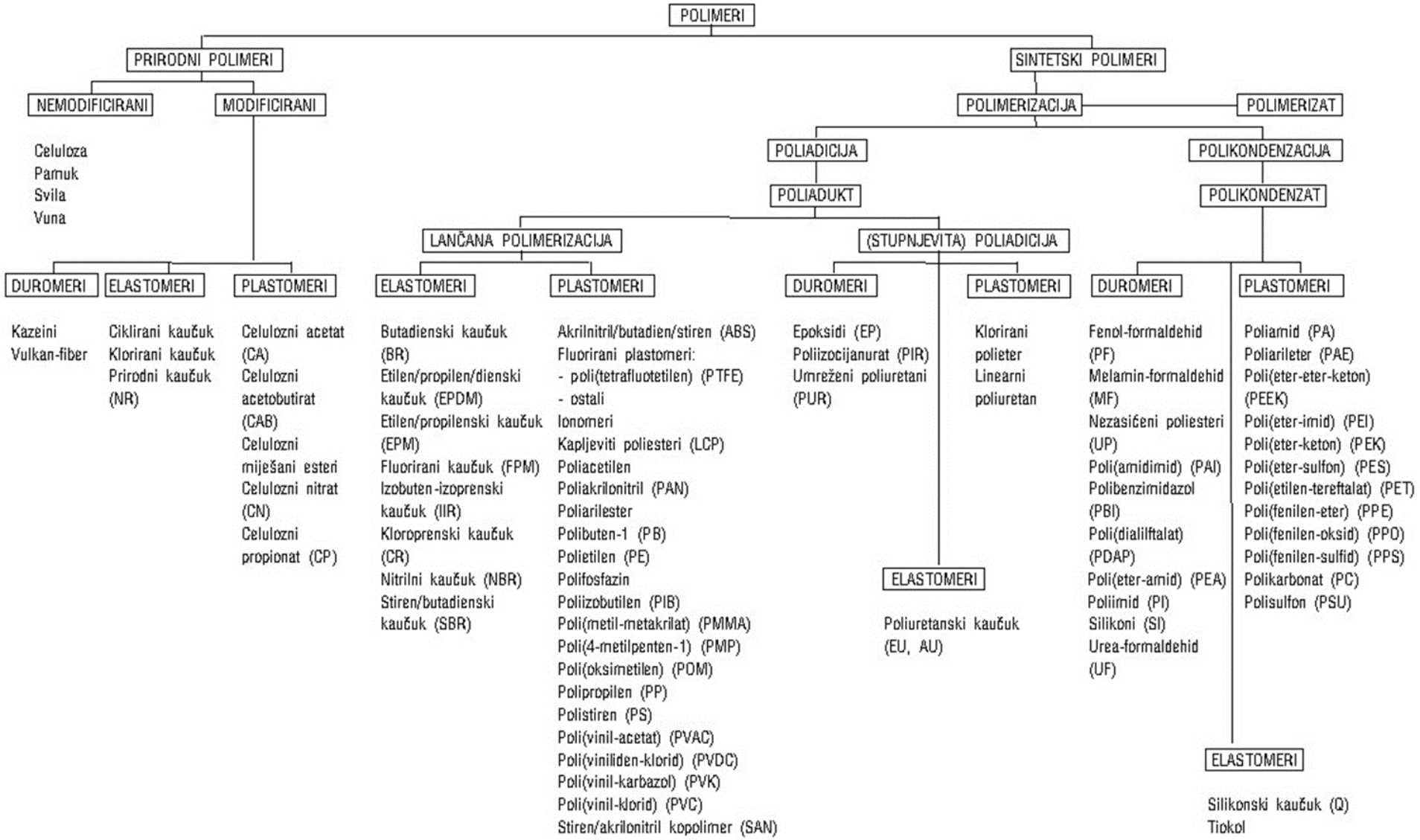
predmet: Svojstva i primena plastičnih materijala

What is polymer and different types of polymers



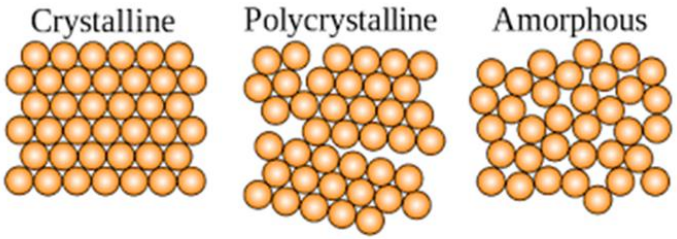


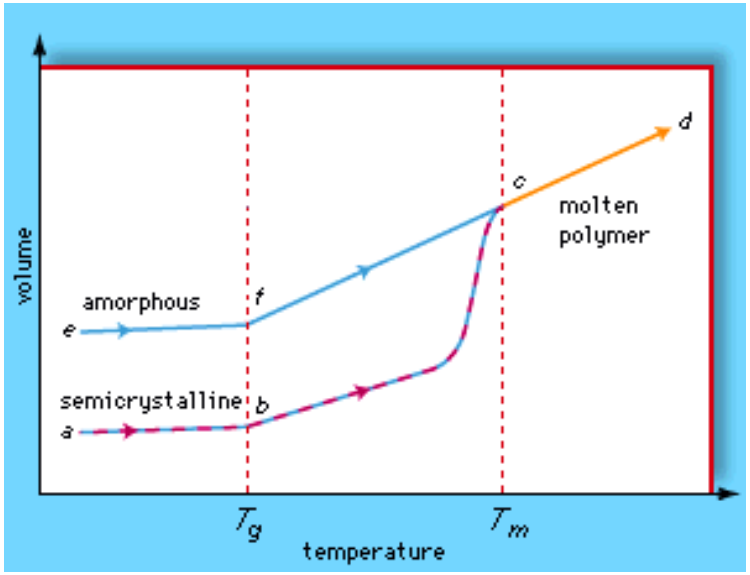
predmet: Svojstva i primena plastičnih materijala



predmet: Fizička i fazna stanja polimera

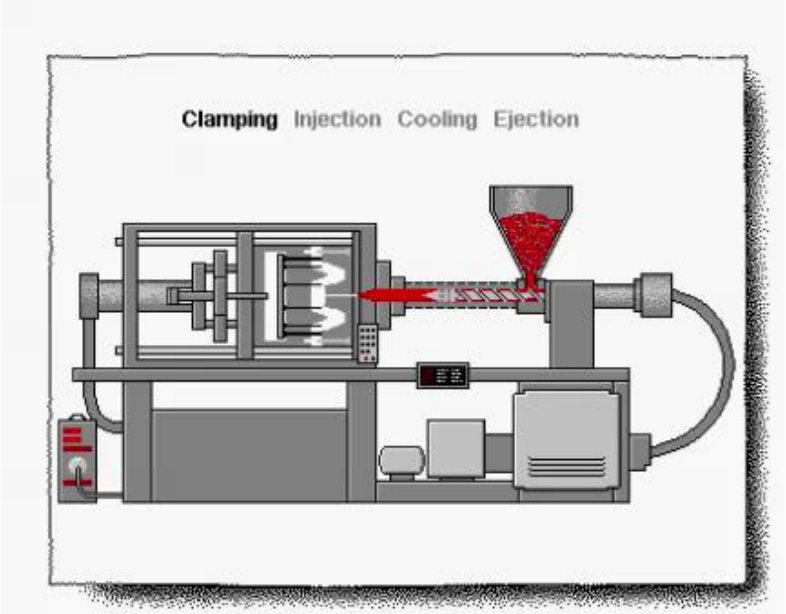
GRAĐA	 **linearna** Van der Valsove veze	 **razgranata** imaju i bočne veze	 **umrežena** kovalentno vezani lanci i poprečno umreženi	 **prostorna mreža** 3D **mreža**
Glavne grupe	Termoplasti		Elastomeri	Duromeri
Struktura	kristalna	amorfna	amorfna	amorfna

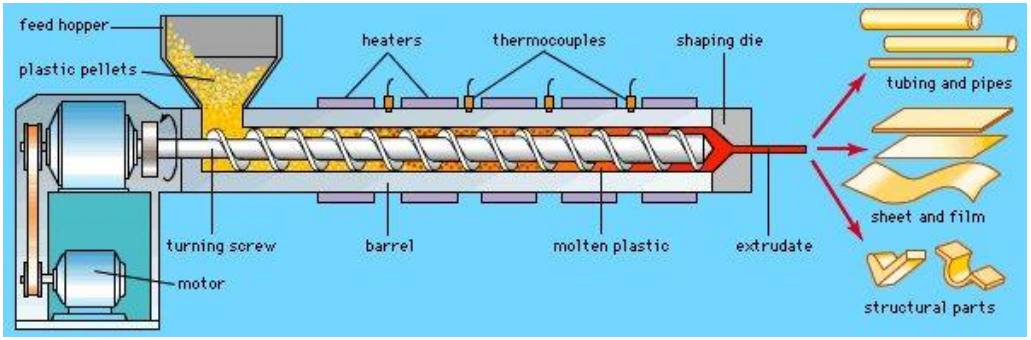


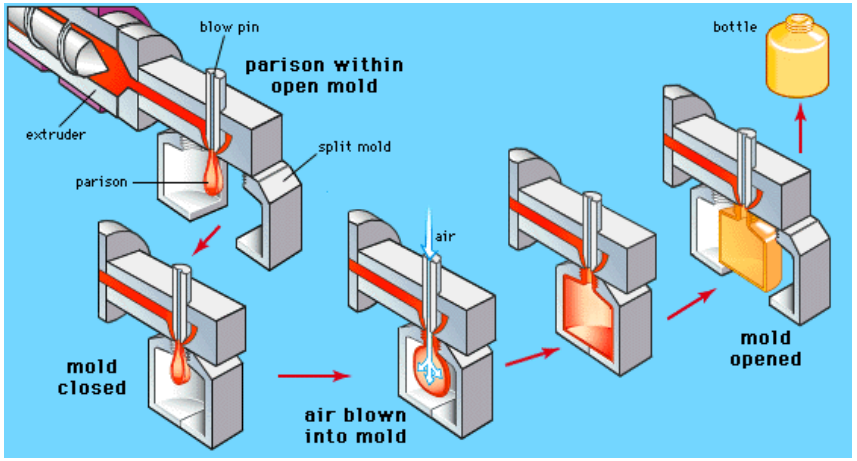


predmet: Tehnologije oblikovanja plastike

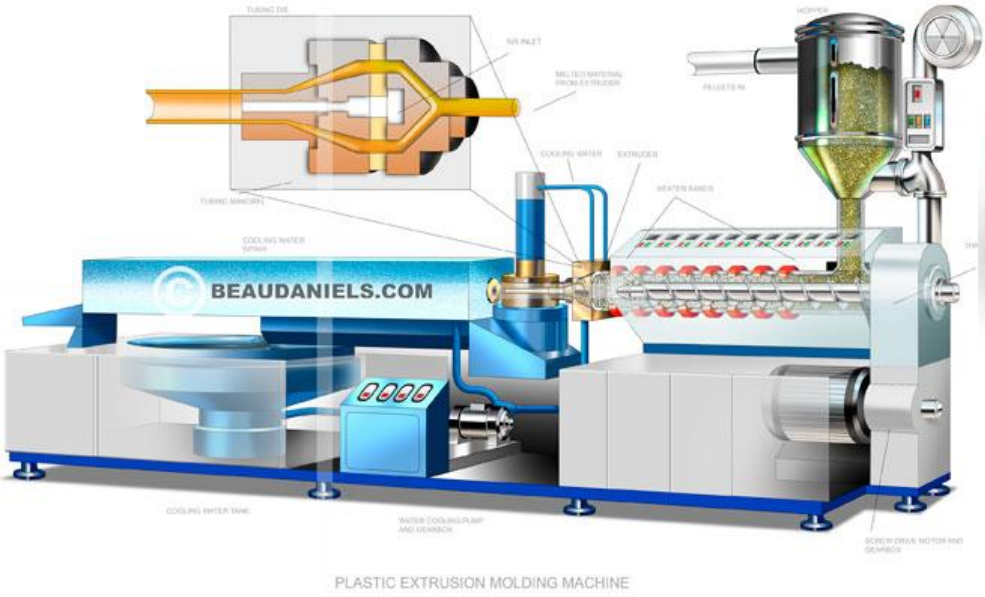
- **KONTINUIRANI POSTUPCI**
- **CIKLIČKI POSTUPCI**



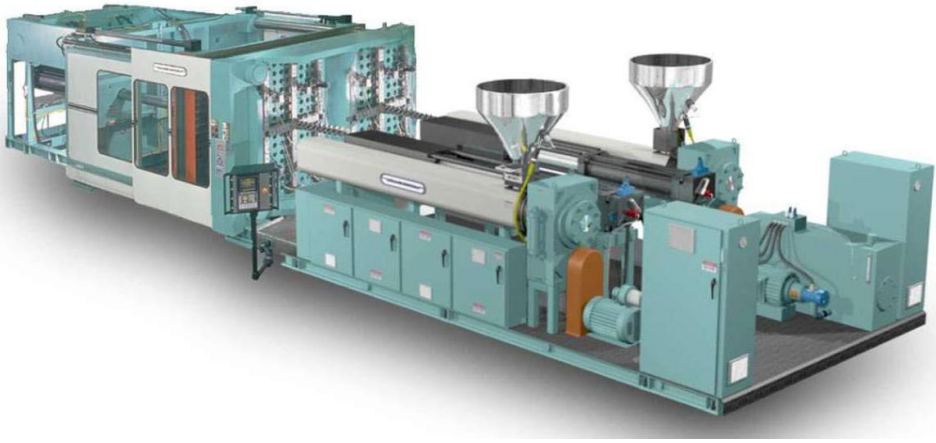


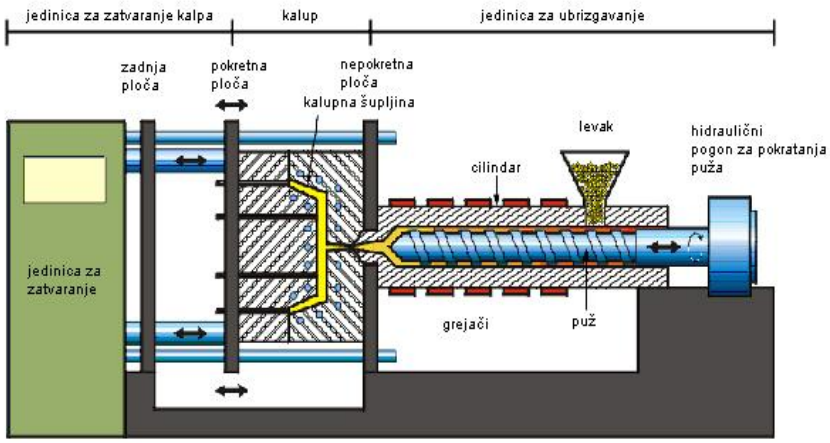


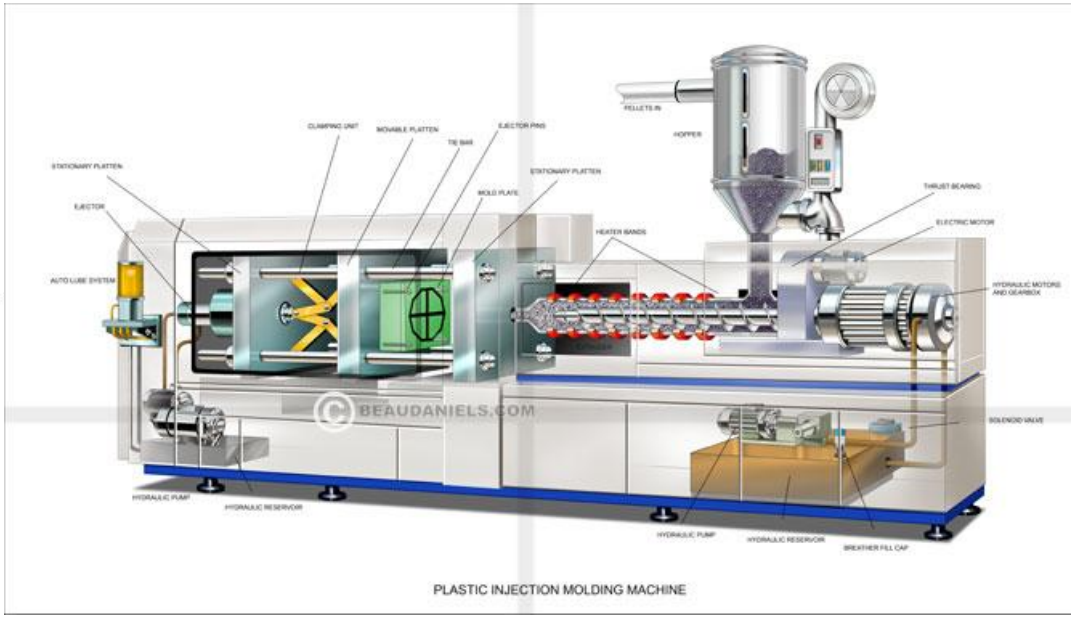
predmet: Mašine i uređaji za preradu plastike



PLASTIC EXTRUSION MOLDING MACHINE

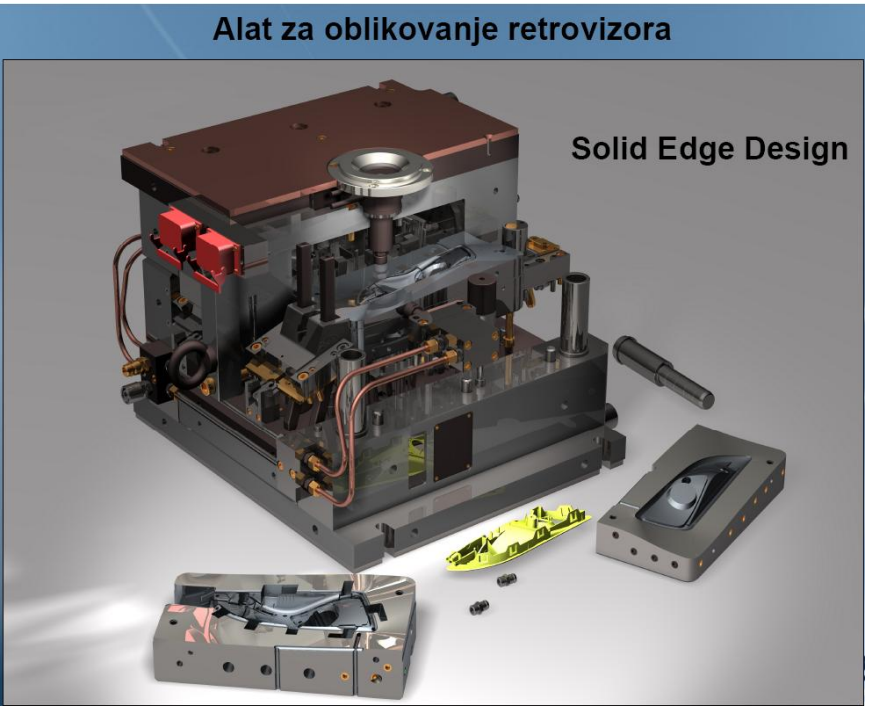


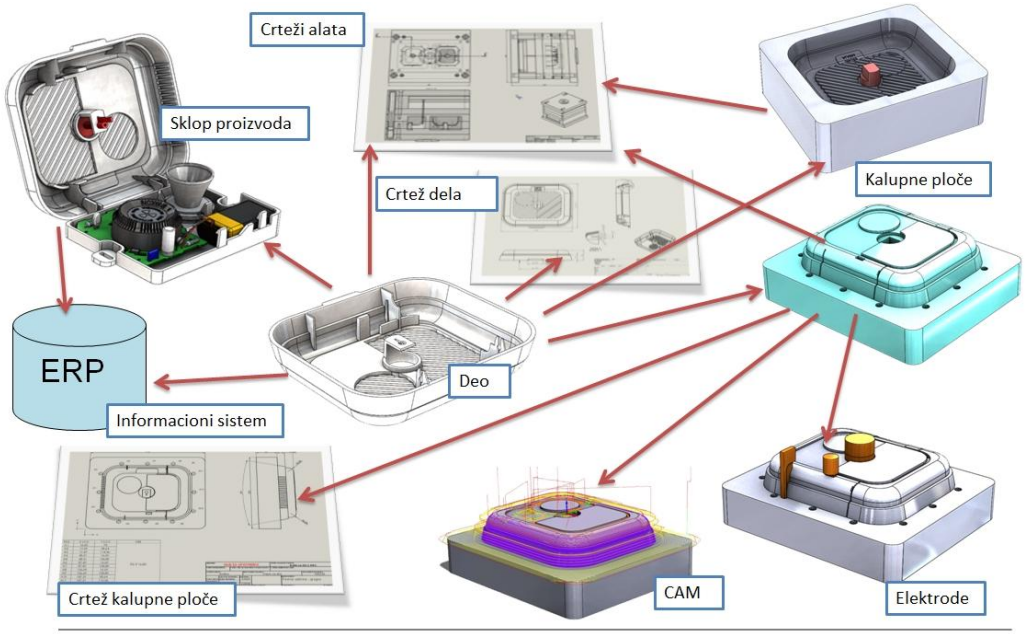


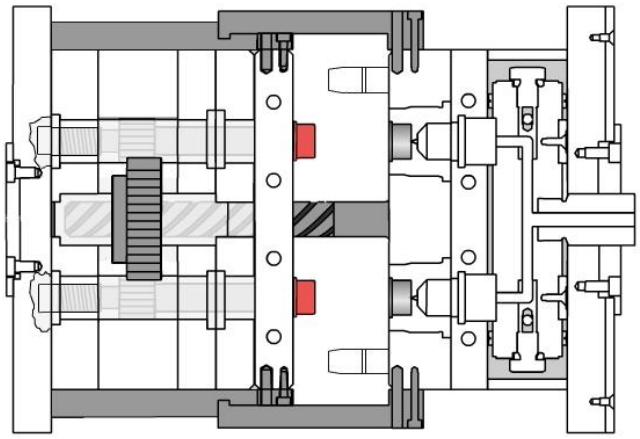


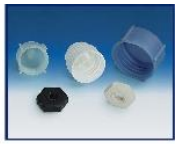
PLASTIC INJECTION MOLDING MACHINE

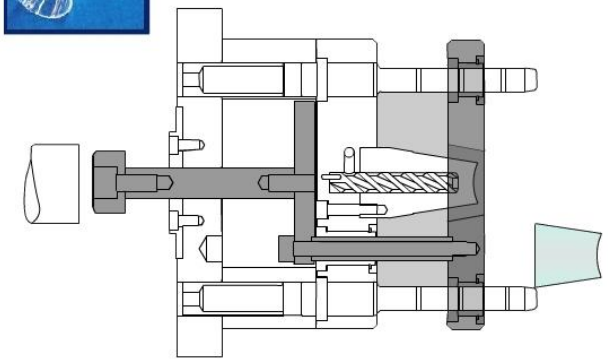
predmet: Projektovanje alata za plastiku

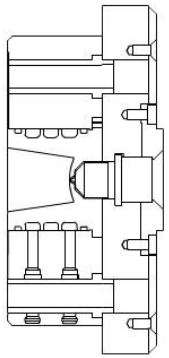








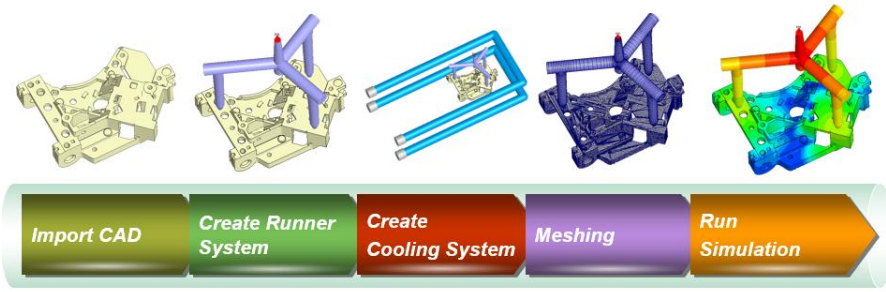




SOFTVERSKI PAKETI

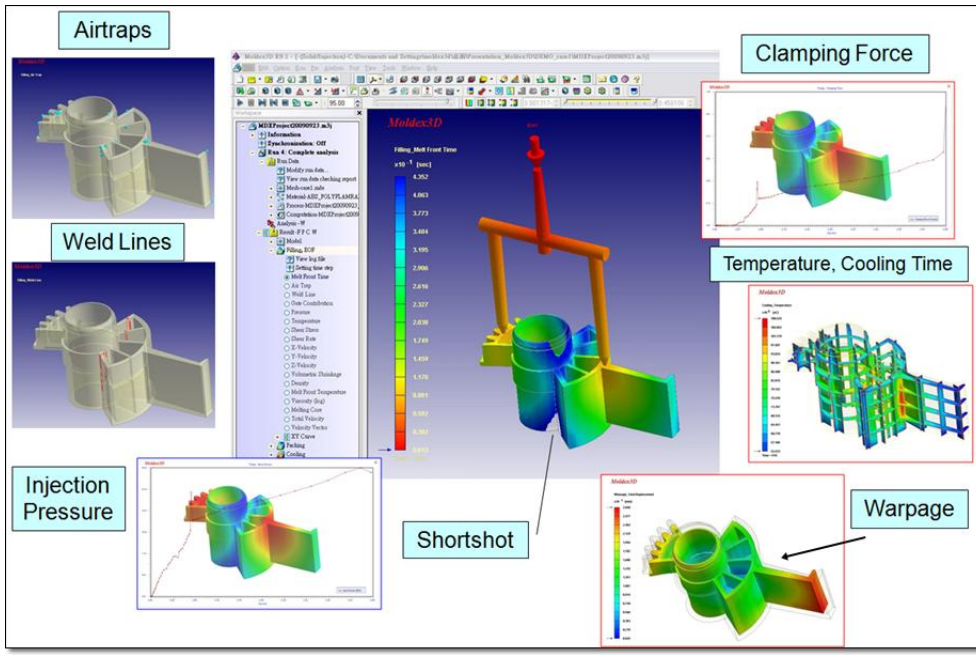
1. Programski paketi za automatizovano projektovanje (CAD modelovanje alata i delova):

- AutoCad/Mechanical
- Pro/Engineer
- Catia
- UGS NX
- SolidEdge...



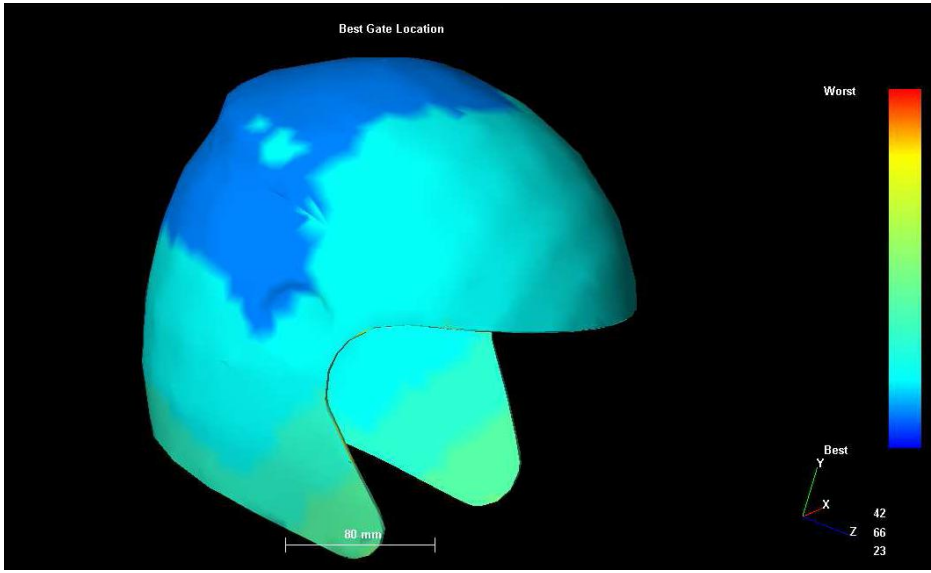
2. Softverski paket za simulaciju procesa oblikovanja (CAE analiza) – MOLDEX3D

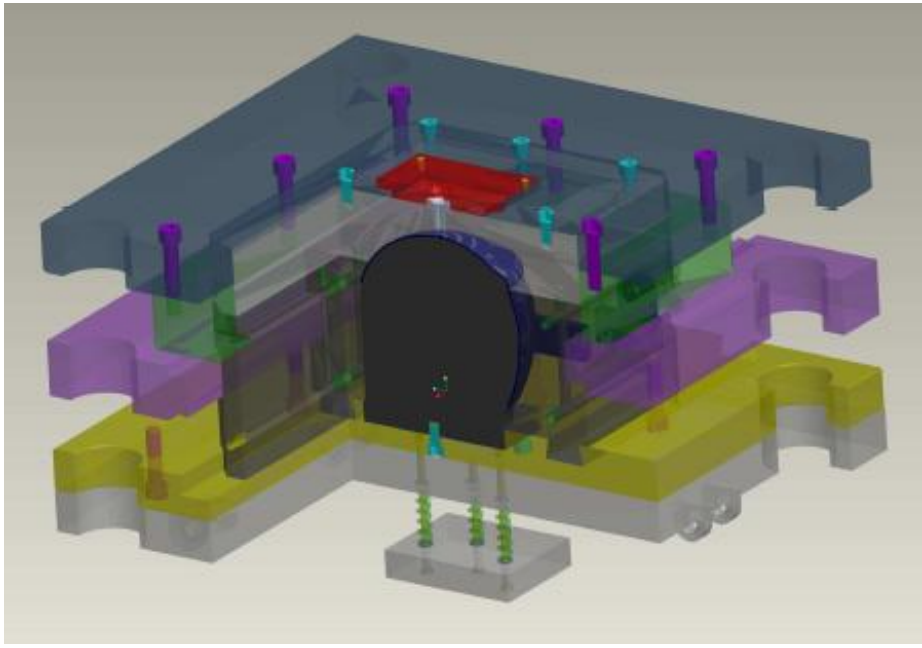
- *Provera mesta ubrizgavanja*
- *Linije spajanja*
- *Kvalitet otpreska*
- *Analiza napona*
- *Toplotna analiza*
- *Tečenje materijala*
- *Greške*



3. Softveri za CAM, CAPP

… jedan Master rad iz predmeta Projektovanje alata za plastiku

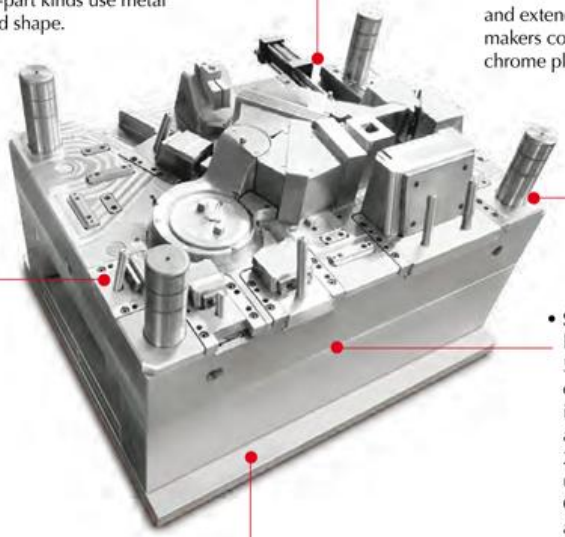




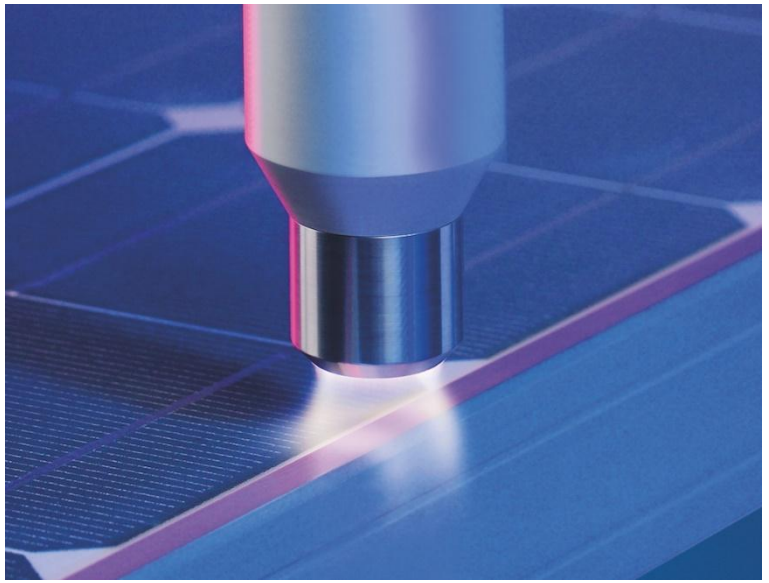
predmet: Termička obrada savremenih alata

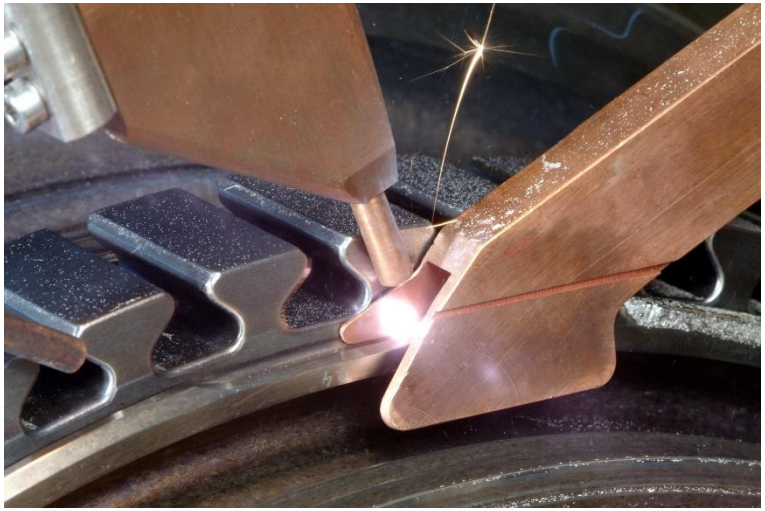
Typical features

- **Construction:** Suppliers make independent parts that can be integrated into a seamless whole for products such as showers. Single-part kinds use metal and adopt a cuboid shape.
- **Finish:** Polishing is the common treatment, with mirror polishing employed in the high end. To increase the hardness level and extend the life span, some makers conduct nickel or chrome plating.
- **Material:** High-quality die steel is widely employed. A popular choice is the S136H, which can be sourced locally and features 30 to 35HRC, even reaching 55HRC after heat treating. Upscale products often use imported counterparts such as the P series from the US and the 2738 from Germany. Inputs for metal injection can be in aluminum or zinc alloy.

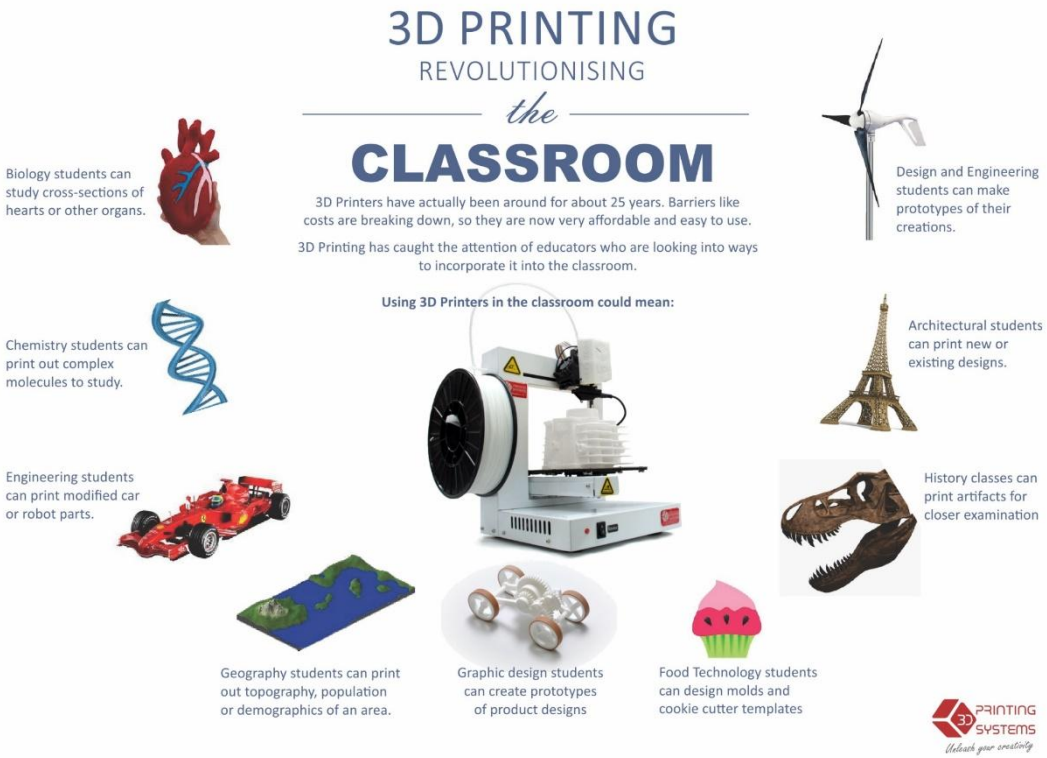


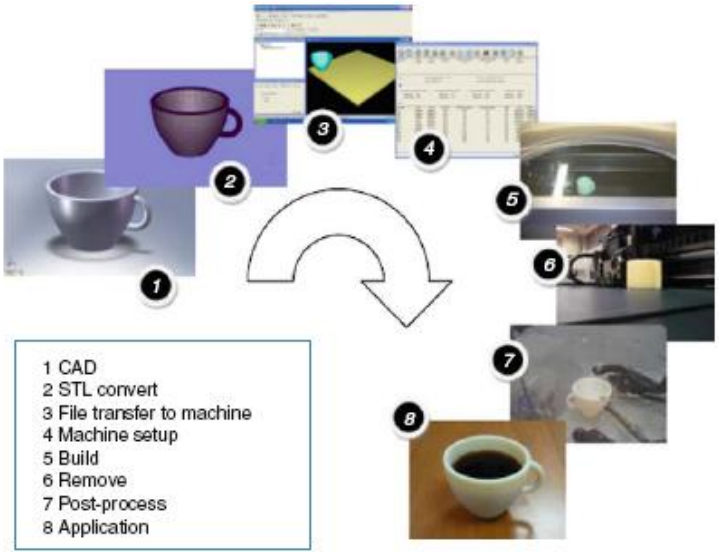
- **Service life:** The average life span is 300,000 to 500,000 shots. Makers are extending this by using imported die steel such as the P20H, 718H and 2738, which could support up to 700,000 shots. Chrome and nickel plating also prolongs the mold's service life.
- **Hardness:** The mainstream range is 20 to 50HRC. Suppliers are raising this to 45 to 55HRC.





Predmet: BRZA IZRADA PROTOTIPA I ALATA

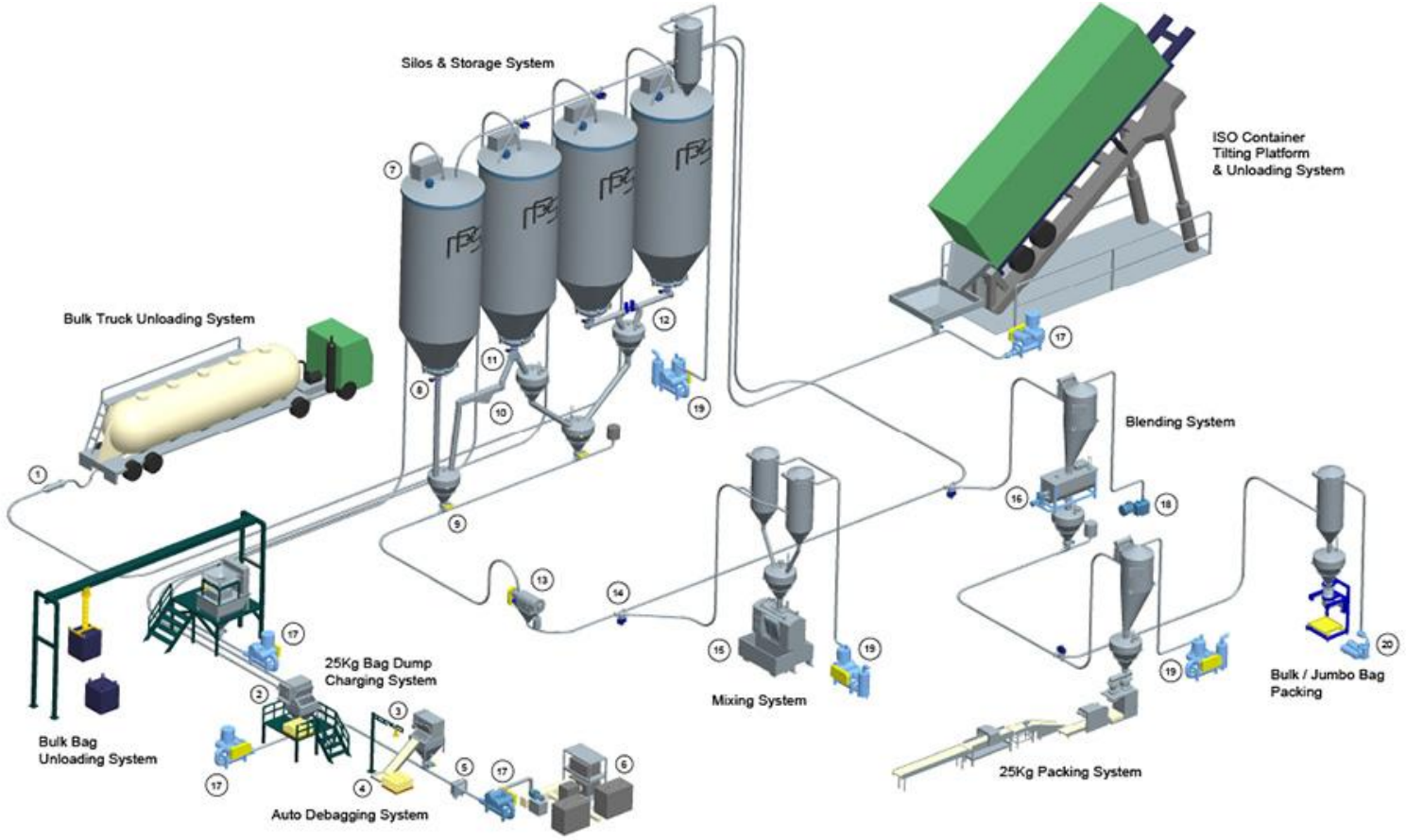


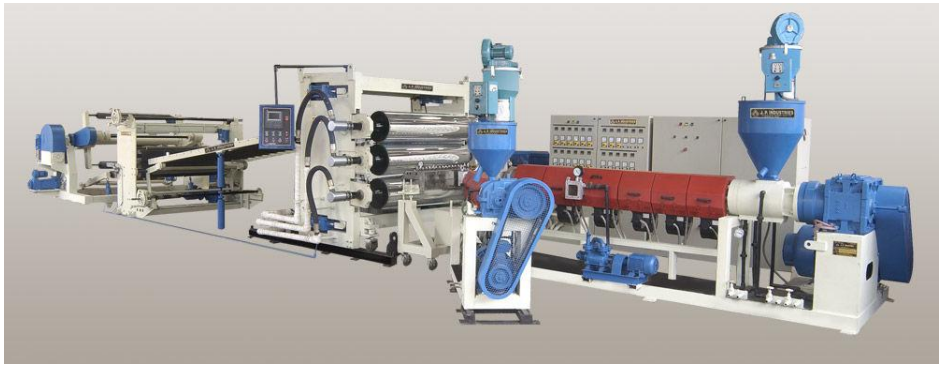


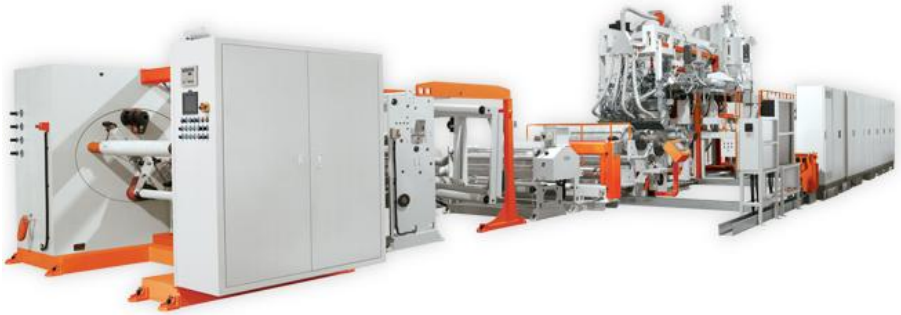
How does FDM compare with traditional processes for Lamborghini Lab?

Method	Cost	Lead Time
Traditional process	$40,000	120 days
FDM Technology	$3,090	20 days
Savings	**$36,910 (92%)**	**12 days (80%)**

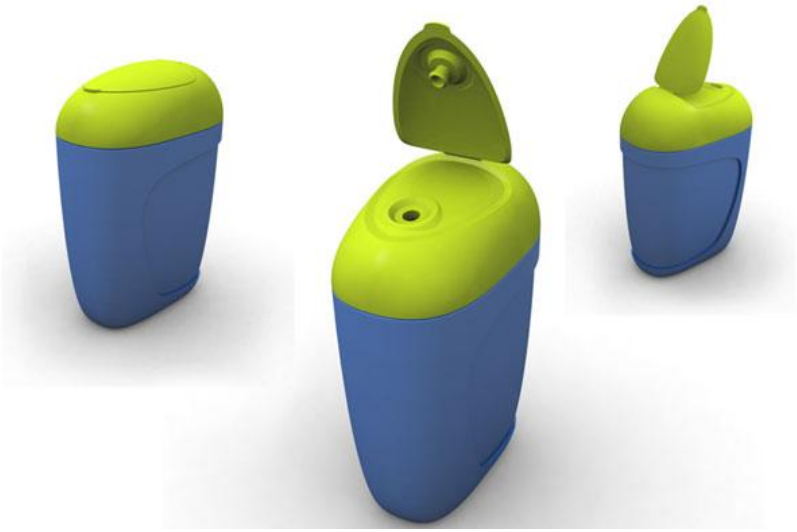
predmet: Savremeni obradni sistemi za preradu plastike



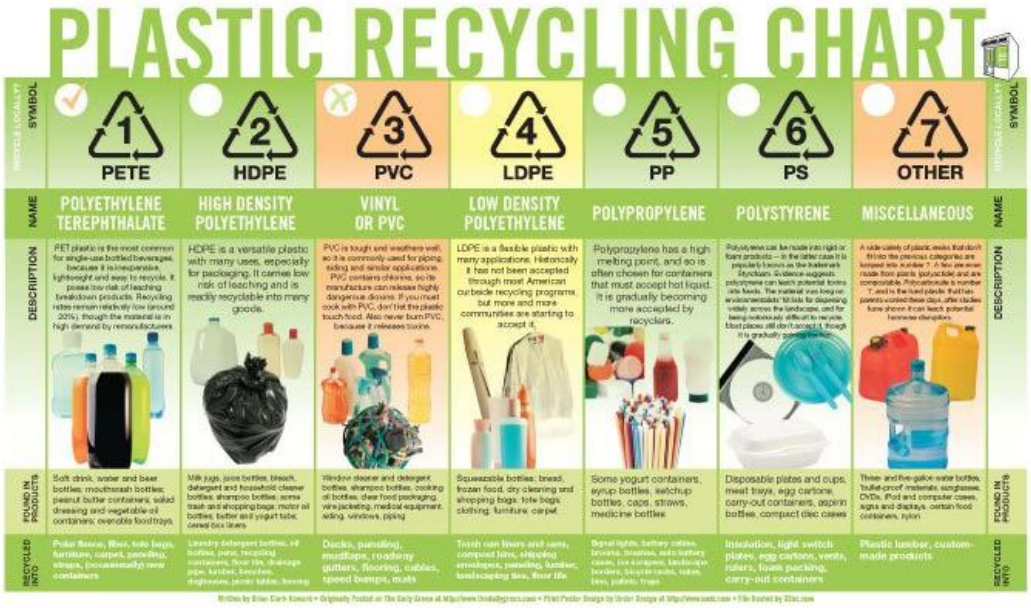


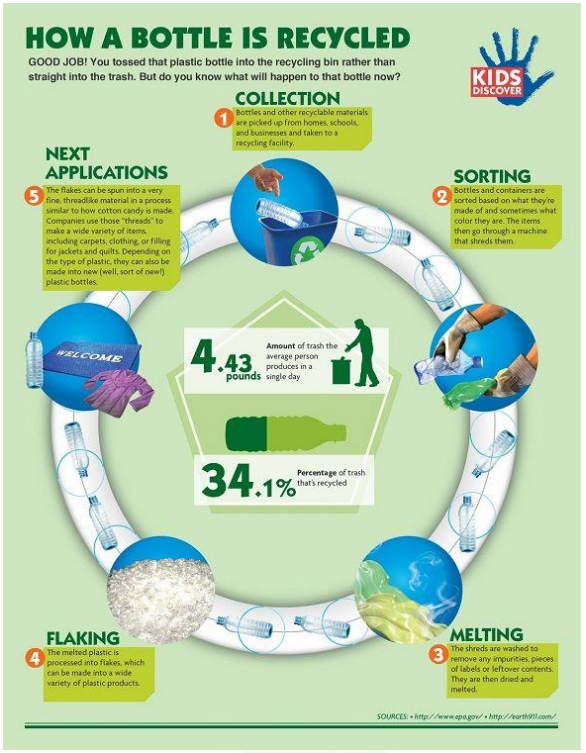


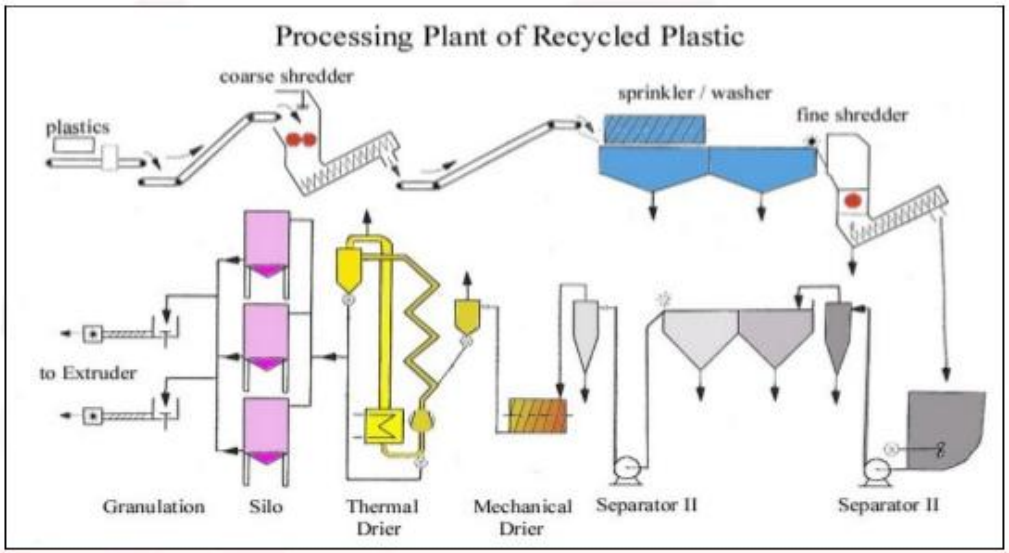
predmet: Dizajn i funkcionalnost proizvoda



predmet: Plastika i zaštita životne sredine







Zašto ovaj modul?

- ogroman asortiman proizvoda na bazi polimera (plastika, guma, itd.)
- uzlazni trend proizvodnje i prerade polimera u svetu
- značajna proizvodnja delova od plastike u našoj zemlji
- kontinuirana zamena metalnih delova komponentama od plastike
- svakodnevni razvoj novih materijala na bazi polimera (kompoziti, nano-materijali, biopolimeri itd.)
- tehnologije prerade polimernih materijala veoma su zastupljene u malim i srednjim preduzećima
- mogućnost naučno-istraživačkog, poseta fabrikama, stručna praksa i radno angažovanje tokom studija…
- **NA TRŽIŠTU RADA POSTOJI NEDOSTATAK INŽENJERA OVOGA PROFILA, A POTRAŽNJA ZA NJIMA JE PERMANENTNA!!!!!!!!**

На ФТН-у најсавременија Лабораторија за полимере


ФОТО: Компанија Neofyton


ФОТО: Медија центар ФТН

GDE SE ZAPOSLITI?!

- Hipol - Odžaci
- Aling Conel – Gajdobra
- Hemofarm – Vršac
- Minakva – Novi Sad
- Inmold – Požega
- Peštan – Aranđelovac
- Apatinska pivara – Apatin
- Norma group -Subotica
- Grundfos – Inđija
- Hemovent - Beograd
- Sintelon, Tarket – Bačka palanka
- Texo - Indjija
- Neofyton – Novi Sad…….