Sistemul de alimentare cu energie electrica

Curs 4

Cuprins

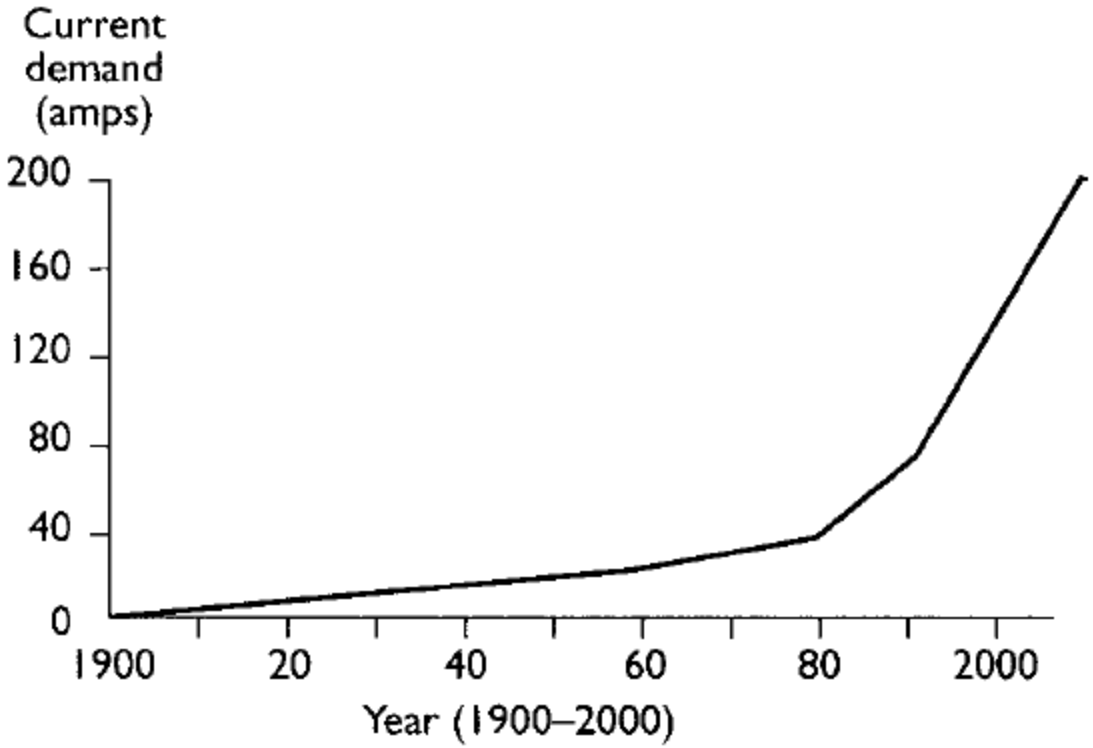
•Cerinte asupra SAEE
•Sarcina electrica a autoveh.
•SAEE generalitati
•Alternatorul auto
•Alternatoare cu excitatie electromagnetica – constructie
•Redresarea curentului alternativ

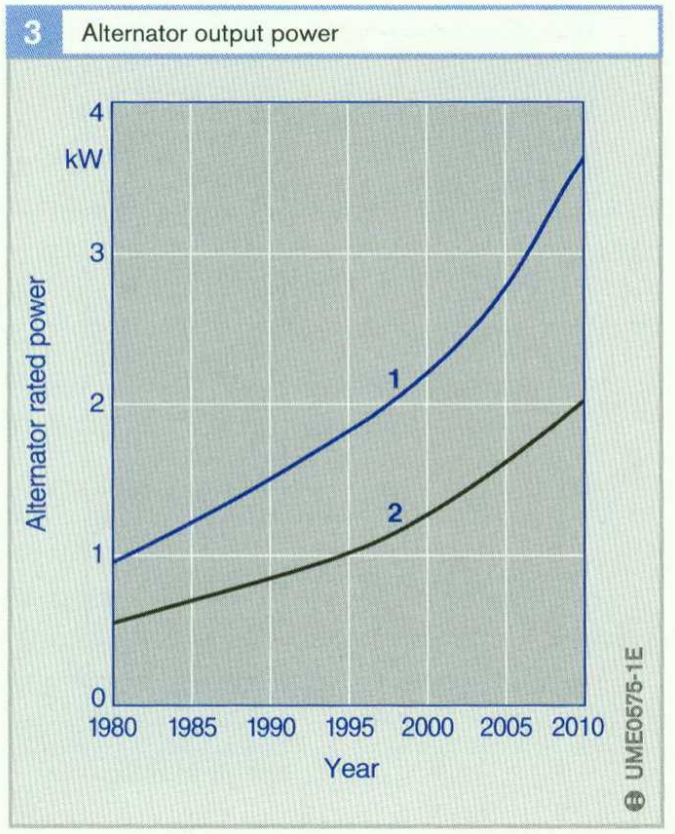
Cerinte asupra SAEE

Sa asigure:

- necesarul de energie electrica pentru consumatorii auto
- necesarul de energie electrica pentru incarcarea bateriei
- debiteze energie electrica la turatia de ralanti
- tensiune constanta in toate conditiile
- raport putere/masa, putere/volum eficient
- fiabil, silentios, rezistenta la contaminare
- intretinere redusa
- indicarea functionarii corecte (sau incorecte)

Sarcina electrica a autoveh.





G Whiz

Ford (Motorcraft) Alternators Generations by Mustang Years

Gen.	Model Years	Amps.
1G	65-85	40-55
2G	86-93	65-75
3G	94-95 96-98 4.6L 2V	130
4G	96-02 4.6L 4V	130
6G	99-04 4.6L 2V 02-04 4.6L 4V	105

Source: PA-Performance

Sarcina electrica a autoveh.

Sarcina continua	Putere [W]	I la 14V	I la 28V
Ignition	30	2.0	1.0
Fuel injection	70	5.0	2.5
Fuel pump	70	5.0	2.5
Instruments	10	1.0	0.5
Total	180	13.0	6.5

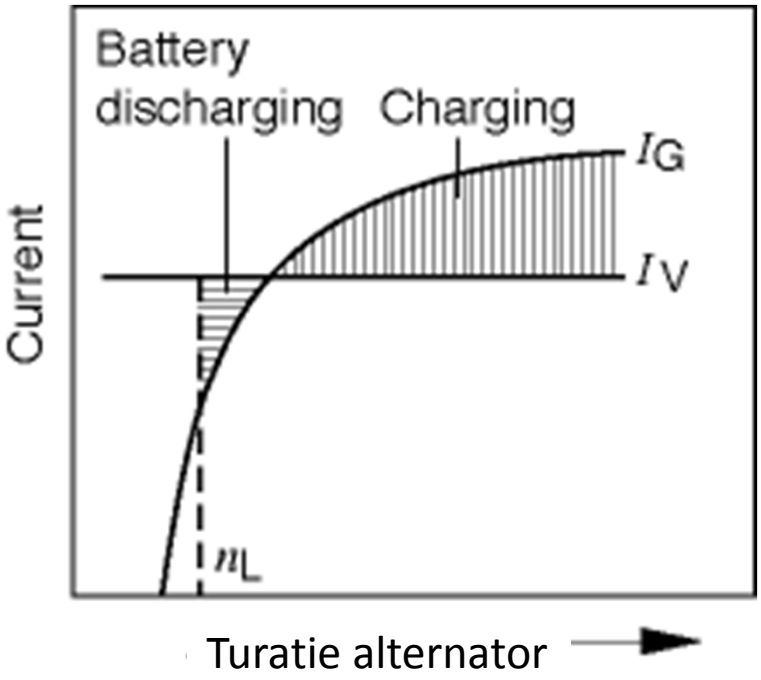
Sarcina prelungita	Putere [W]	I la 14V	I la 28V
Side and tail lights	30	2.0	1.0
Number plate lights	10	1.0	0.5
Headlights main beam	200	15.0	7.0
Headlights dip beam	160	12.0	6.0
Dashboard lights	25	2.0	1.0
Radio/Cassette/CD	15	1.0	0.5
Total (Av. main & dip)	260	19.5	9.5

180 + 260 + 170 = 610W (43A la 14V)

Sarcina intermitenta	Putere [W]	I la 14V	I la 28V
Heater	50	3.5	2.0
Indicators	50	3.5	2.0
Brake lights	40	3.0	1.5
Front wipers	80	6.0	3.0
Rear wipers	50	3.5	2.0
Electric windows	150	11.0	5.5
Radiator cooling fan	150	11.0	5.5
Heater blower motor	80	6.0	3.0
Heated rear window	120	9.0	4.5
Interior lights	10	1.0	0.5
Horns	40	3.0	1.5
Rear fog lights	40	3.0	1.5
Reverse lights	40	3.0	1.5
Auxiliary lamps	110	8.0	4.0
Cigarette lighter	100	7.0	3.5
Headlight wash wipe	100	7.0	3.5
Seat movement	150	11.0	5.5
Seat heater	200	14.0	7.0
Sun-roof motor	150	11.0	5.5
Electric mirrors	10	1.0	0.5
Total	1.7 kW	125.5	63.5

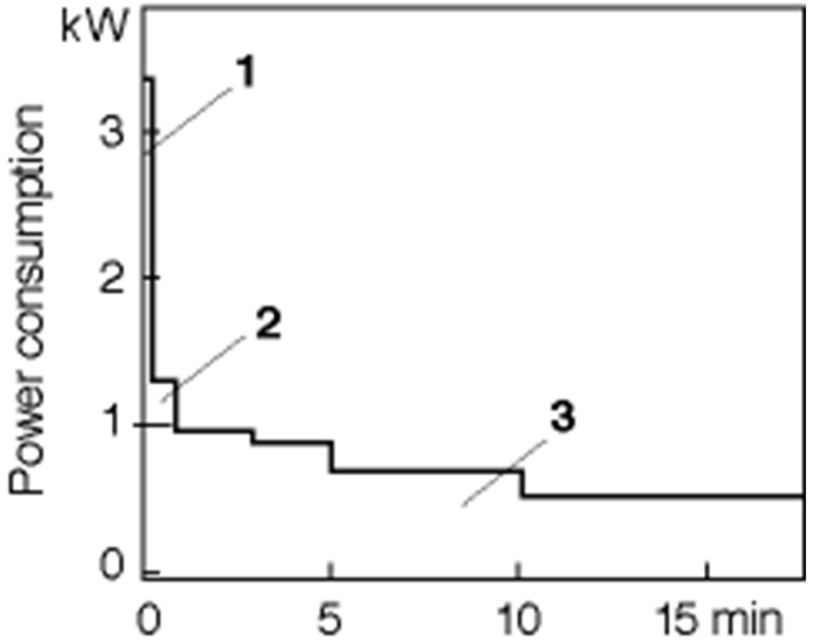
Consum mediu: 10% x Total = 0,1x1,7 kW= 170 W

Caracteristica de debit



n_L – turatia ralanti
I_G – curent generat de alternator
I_V – curent absorbit de sarcina

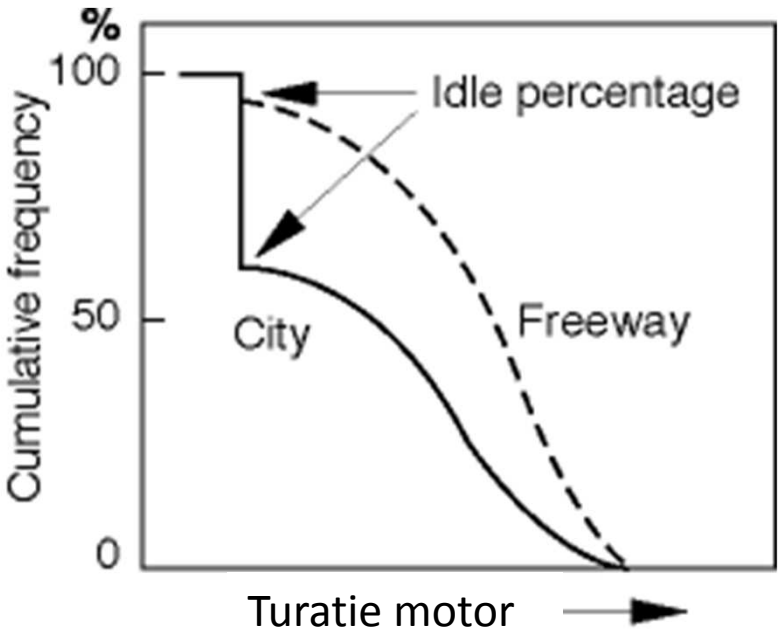
Puterea electrica utilizata ca functie de timpul de conducere (functionare)

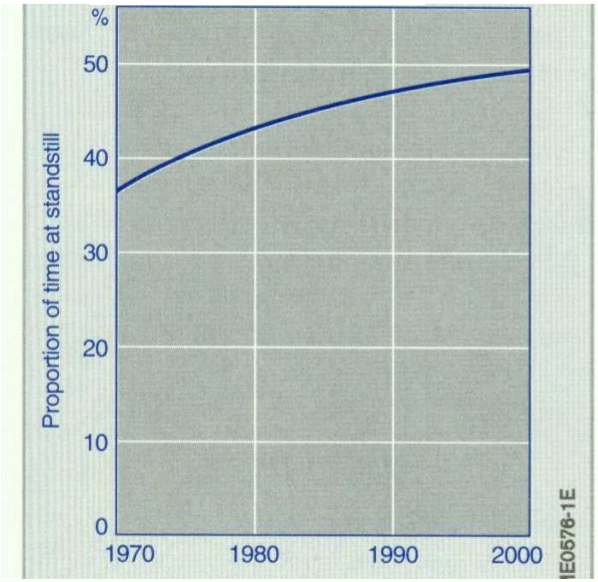


Timp functionare

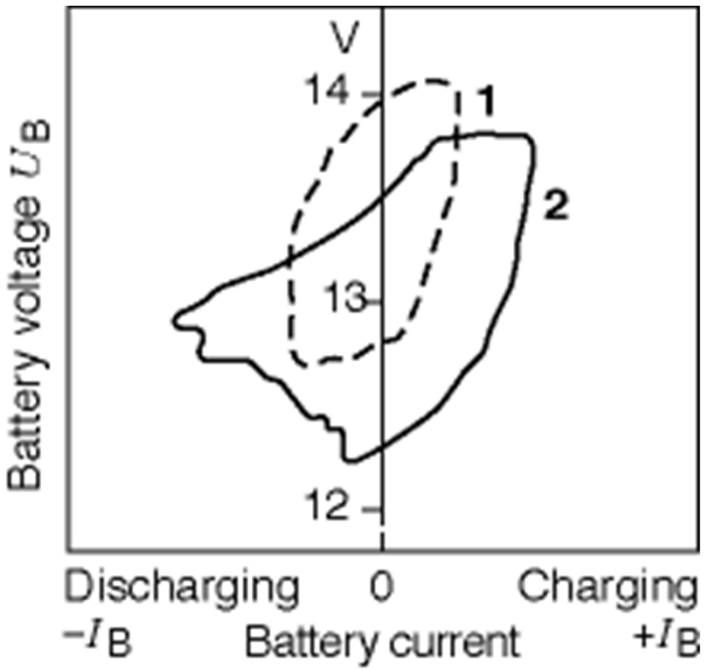
1 incalzitor catalizator
2 turbina secundara de aer
3 incalzitor, ventilator, managementul motorului,

Frecventa cumulata a turatiei motorului pentru regim urban si extraurban





Caracteristica dinamica a sistemului baterie, alternator, sarcina, turatie, raport transmisie mot./alt.

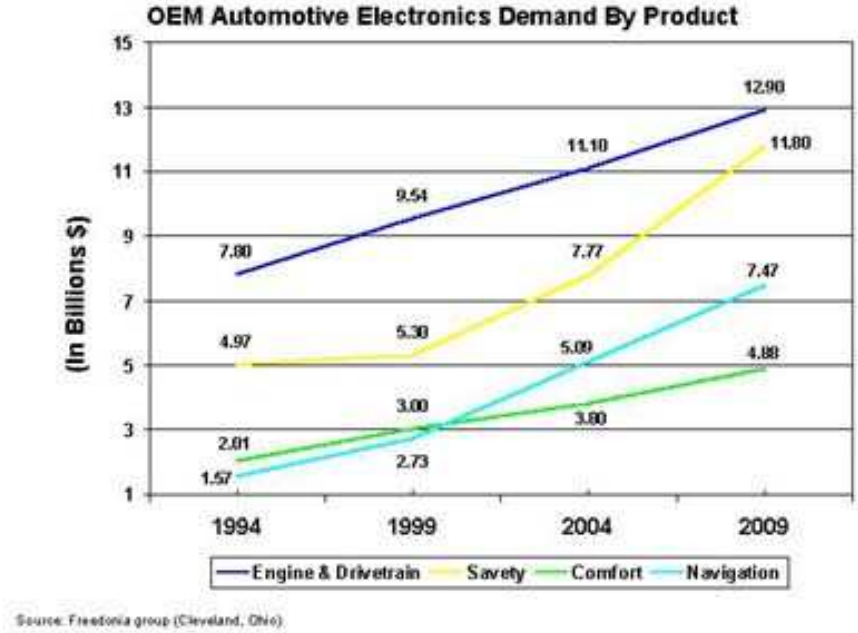


Anvelopa pentru regim urban:
1 – “alternator mare, baterie mica”
2 – “alternator mic, baterie mare”

U_B – tensiunea bateriei
$-I_B$ - curent de descarcare a bateriei
$+I_B$ – curent de incarcare a bateriei

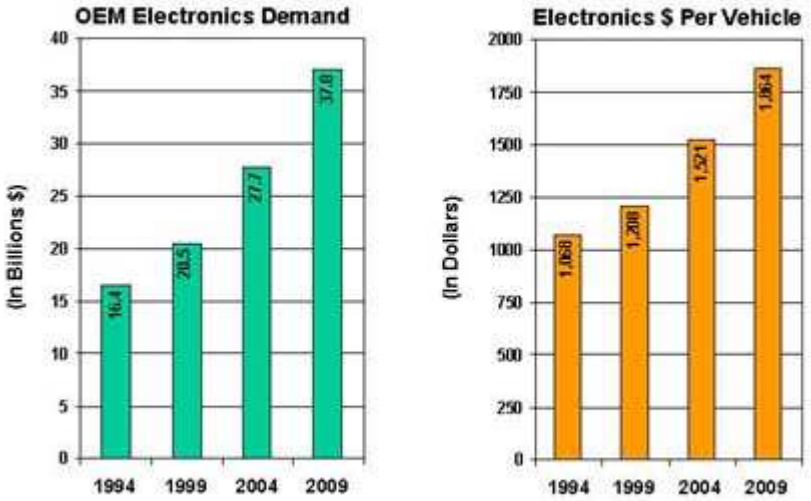
Sarcina electrica a autoveh.

OEM Automotive Electronics Demand in North America



Source: Freedonia group (Cleveland, Ohio)

OEM Automotive Electronics Demand in North America



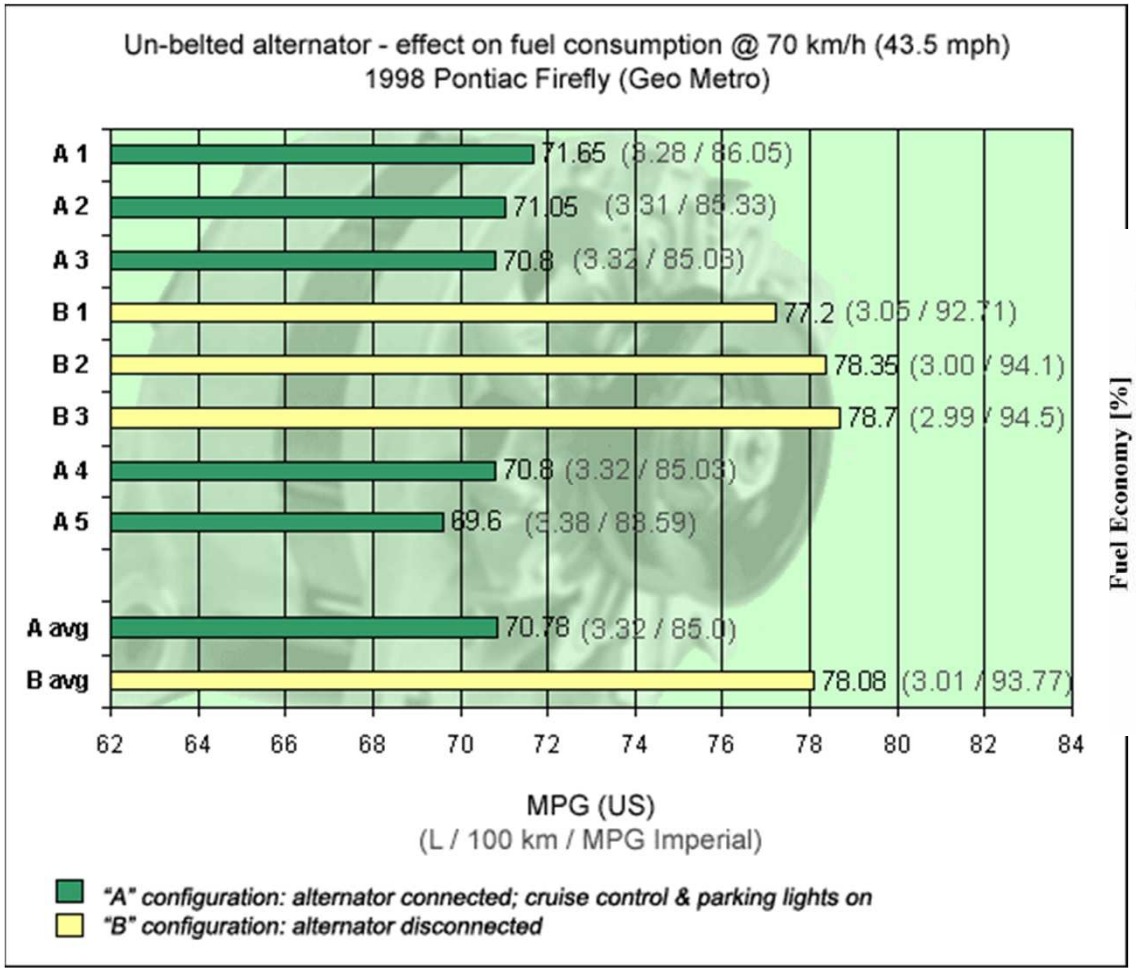
urce: Freedonia group (Cleveland, Ohio)

Global Production of Vehicles with 42-Volt Systems

Year	000's
2002	46
2003	155
2004	606
2005	871
2006	2,823
2007	4,497
2008	7,010
2009	10,402
2010	12,891

Source: Standard & Poor's DRI

Sarcina electrica a autoveh.



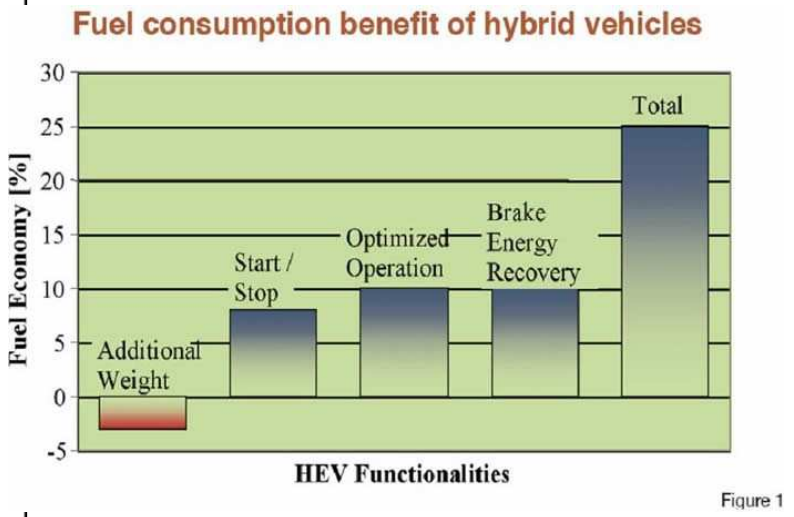
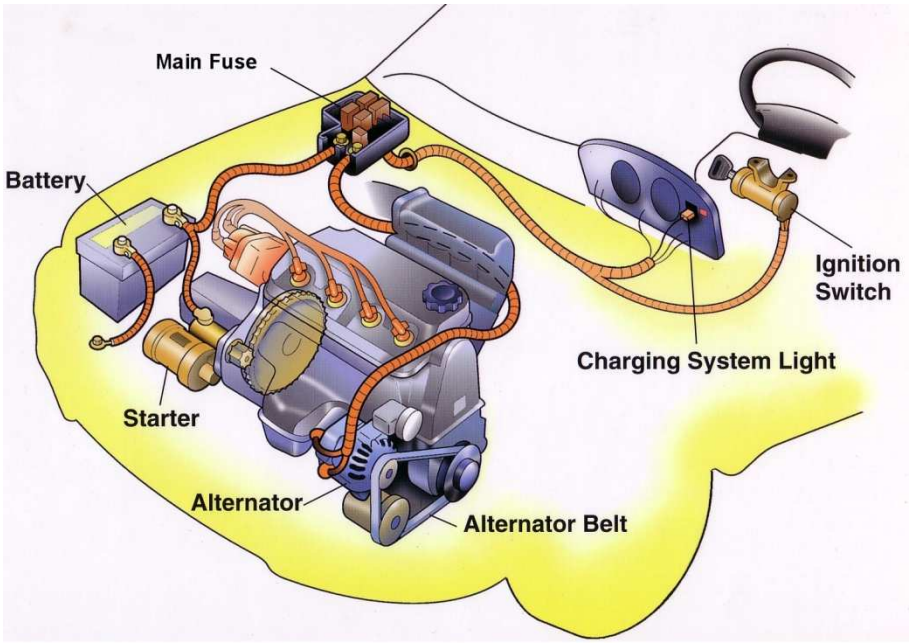
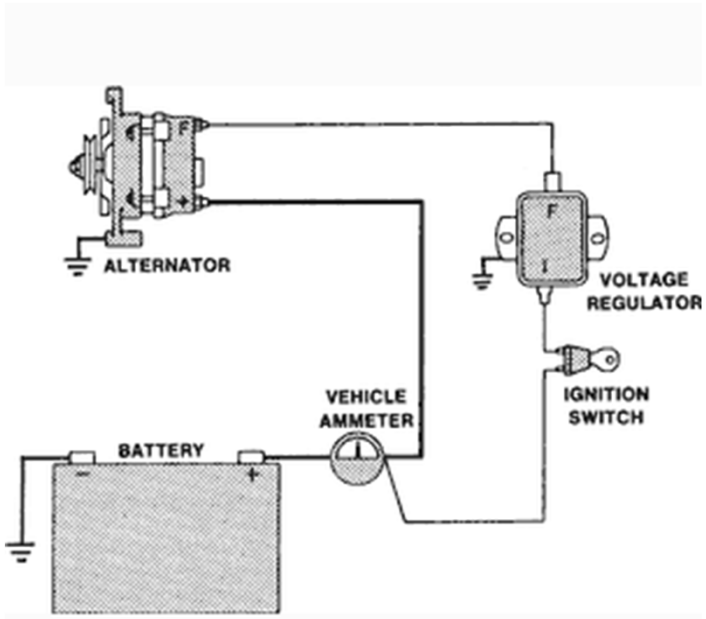


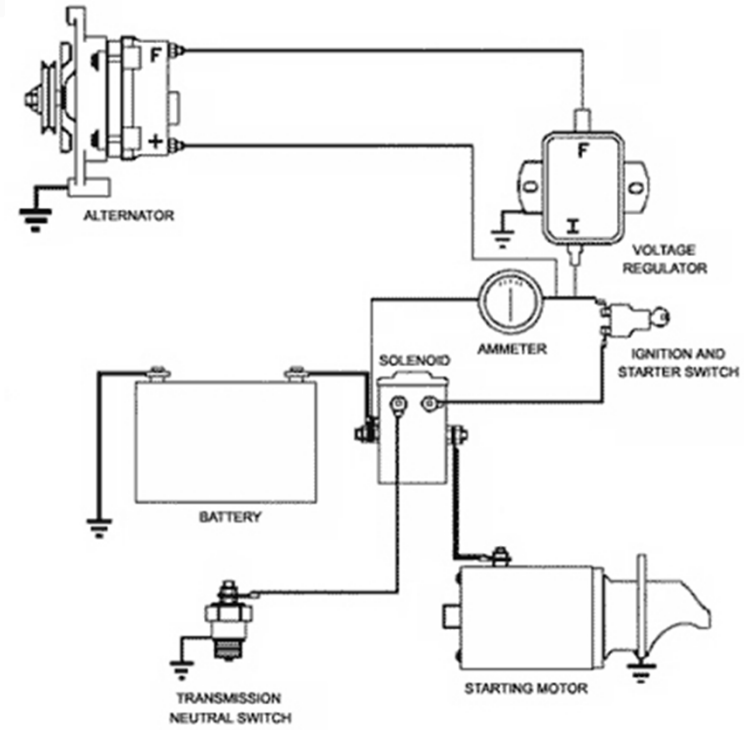
Figure 1

Consum mediu de combustibil: pt. 10kg – 0,1 l/100km; pt. 100W – 0,1 l/100km

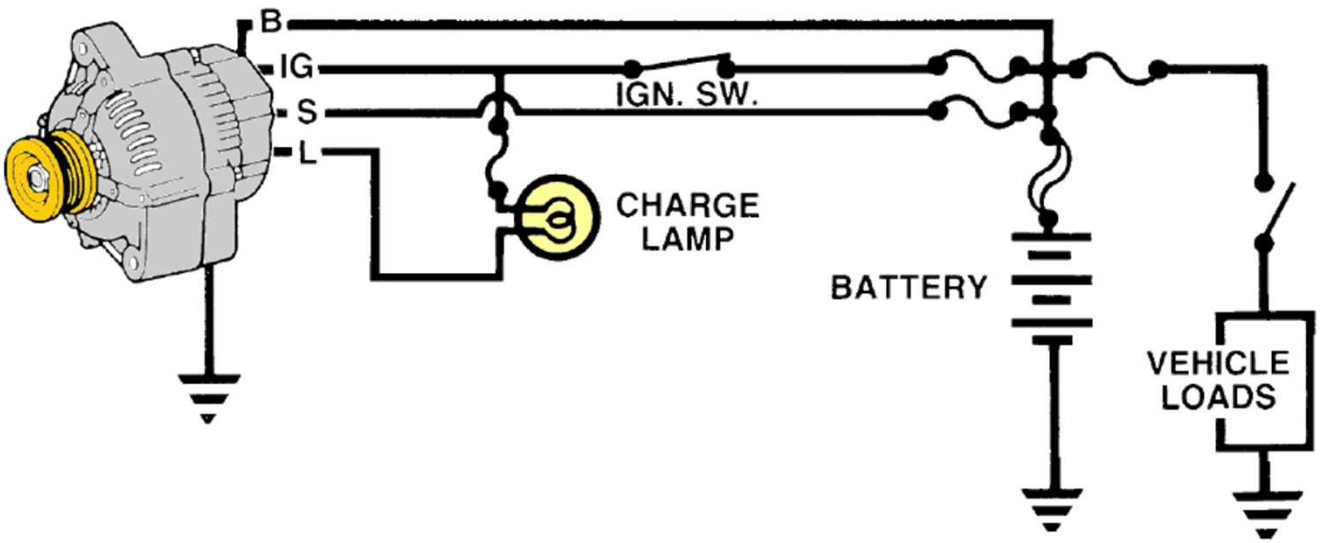
SAEE - generalitati







Tensiunea de incarcare: 14,2 ± 0,2V
(incarcare cu tensiune constanta)



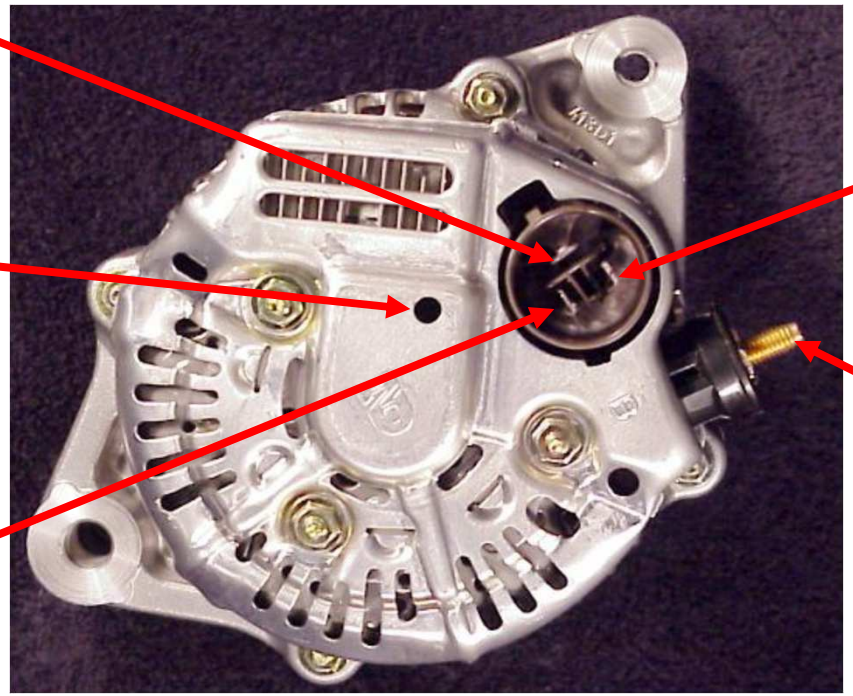
Four wires connect the alternator to the rest of the charging system.

B is the alternator output wire that supplies current to the battery.

IG is the ignition input that turns on the alternator/regulator assembly.

S is used by the regulator to monitor charging voltage at the battery.

L is the wire the regulator uses to ground the charge warning lamp.



"S" Terminal
Senses Battery Voltage

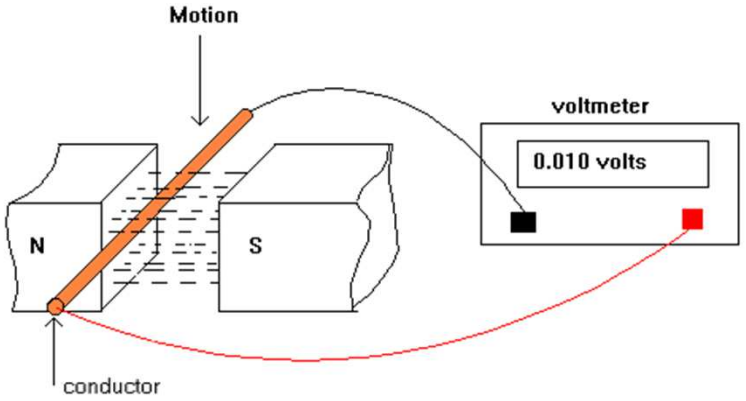
"F" Terminal
Regulator Bypass
Full Field Testing

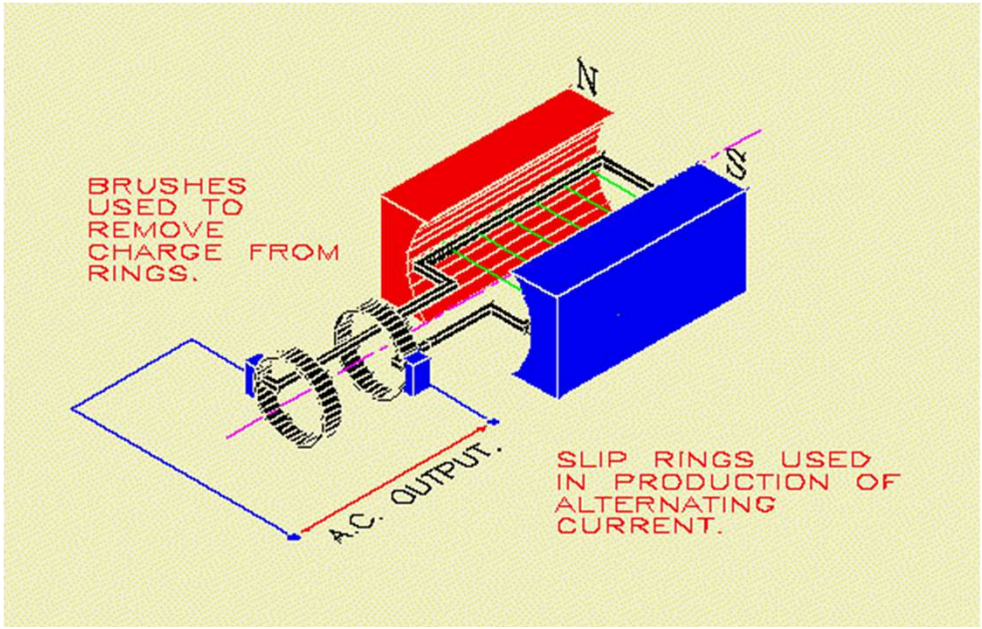
"IG" Terminal
Ignition Switch Signal
Turns Regulator ON

"L" Terminal
Grounds
Warning Lamp

"B" Terminal
Alternator Output
Terminal to Battery

Alternatorul auto



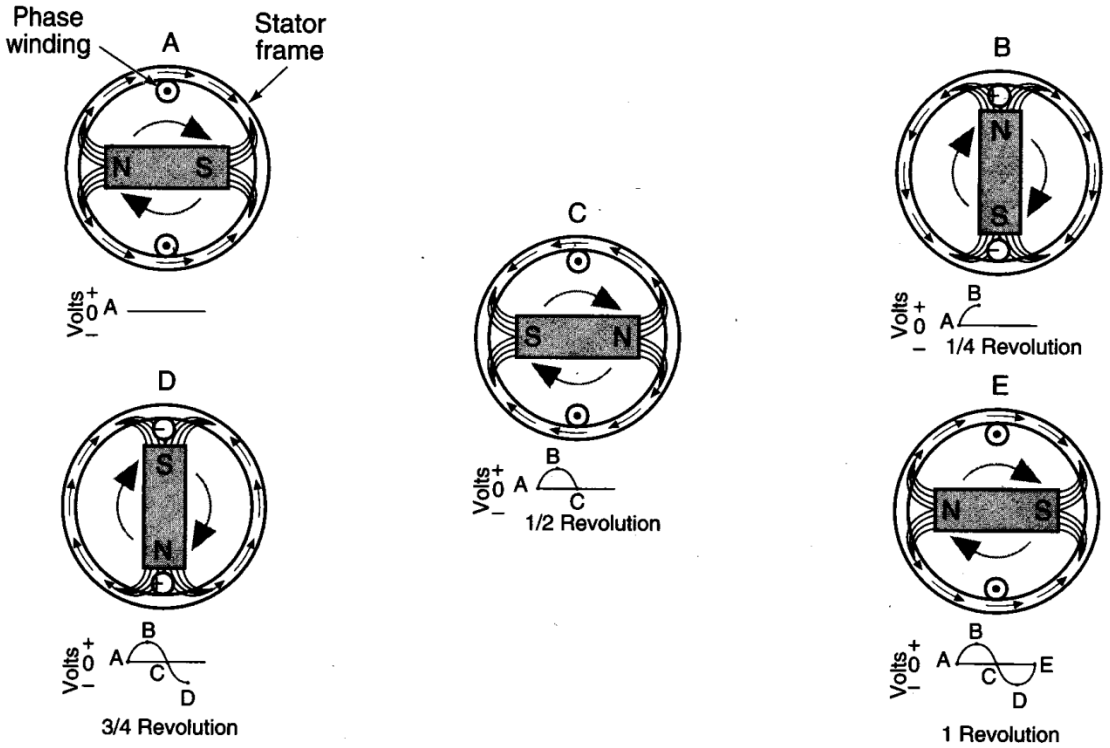


Def.: masina sincrona ce lucreaza in regim de generator avand indusul-stator, inductorul-rotor si redresor incorporat

Clasificare:

a) Dupa tipul excitatiei:
   - Cu excitatie electromagnetica
   - Cu magneti permanenti

b) Dupa numarul de faze:
   - Monofazate
   - Polifazate



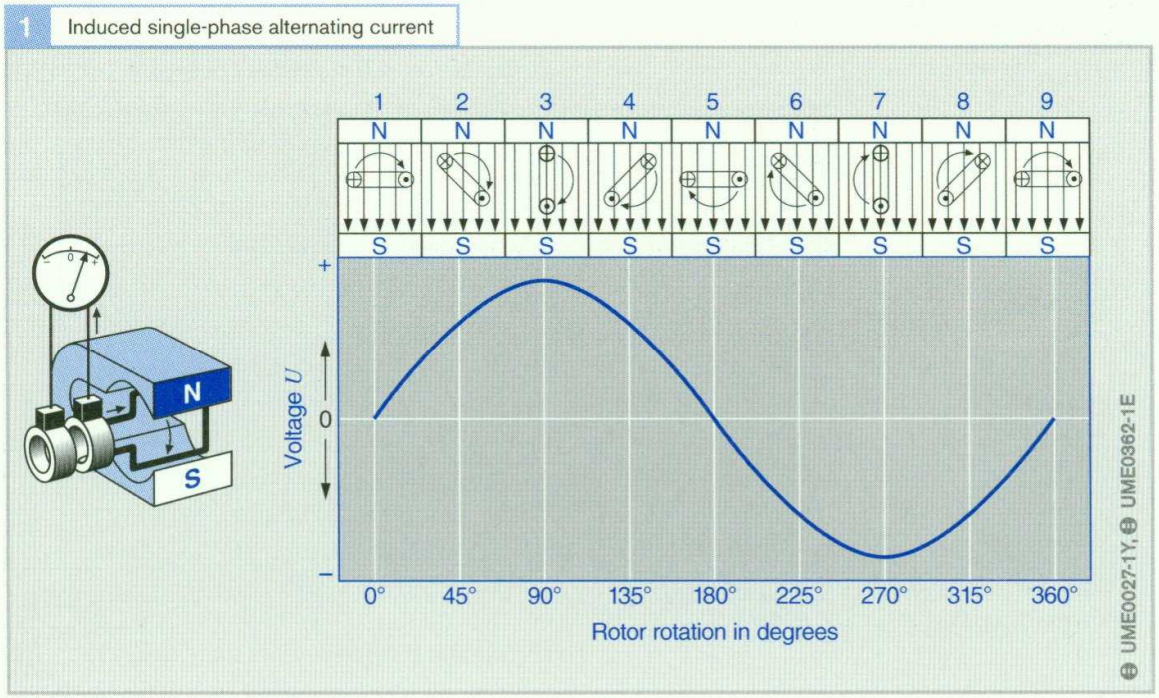


Fig. 1
Voltage curve generated during one full revolution of a winding rotating in a magnetic field.
The position of the rotor on the left corresponds to position 3.

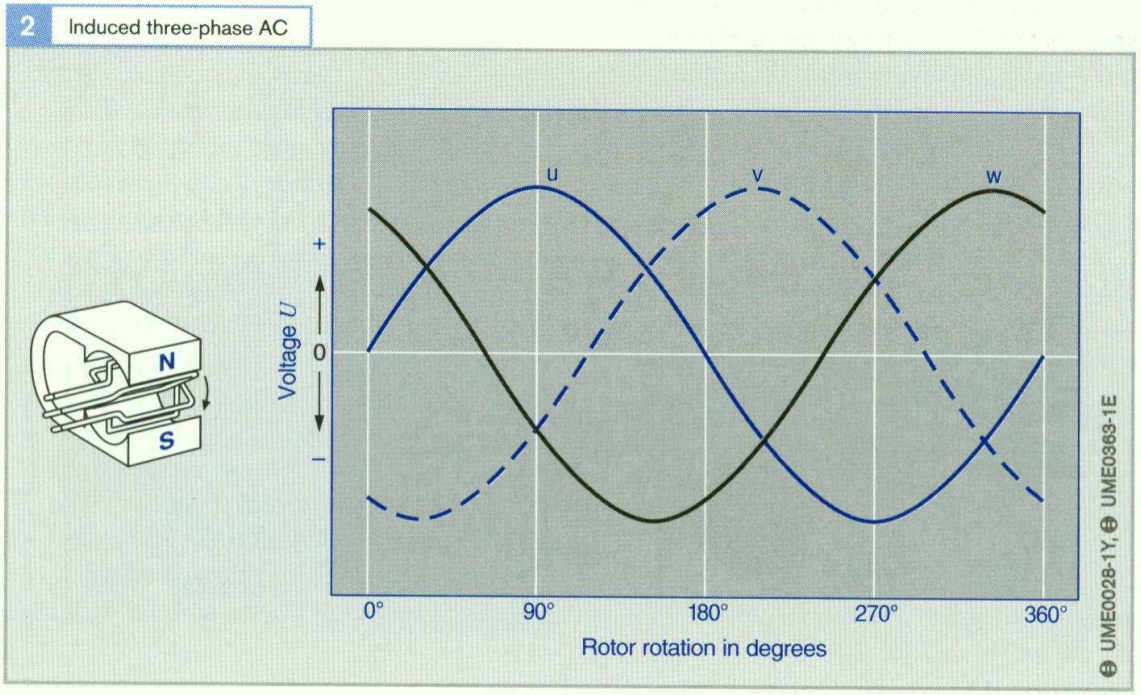
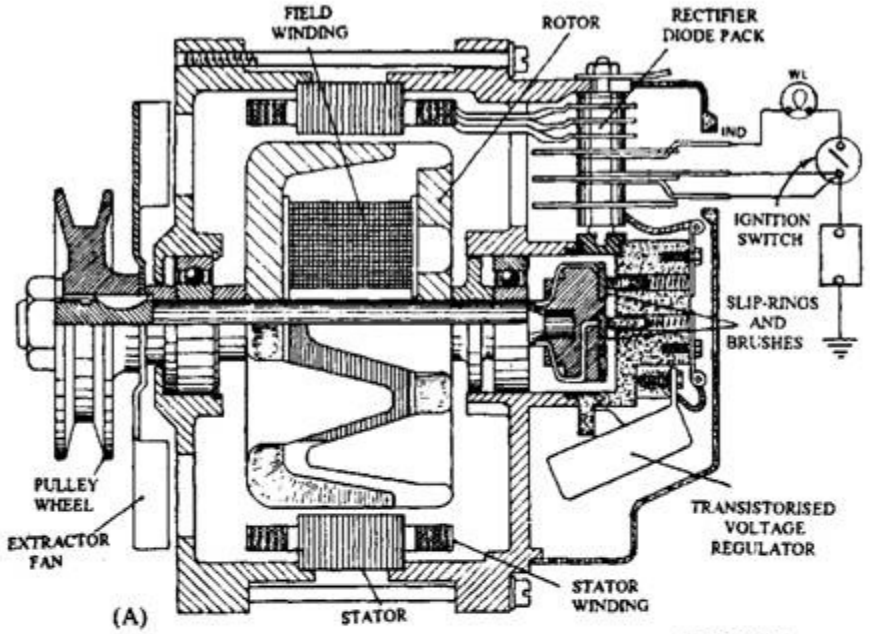
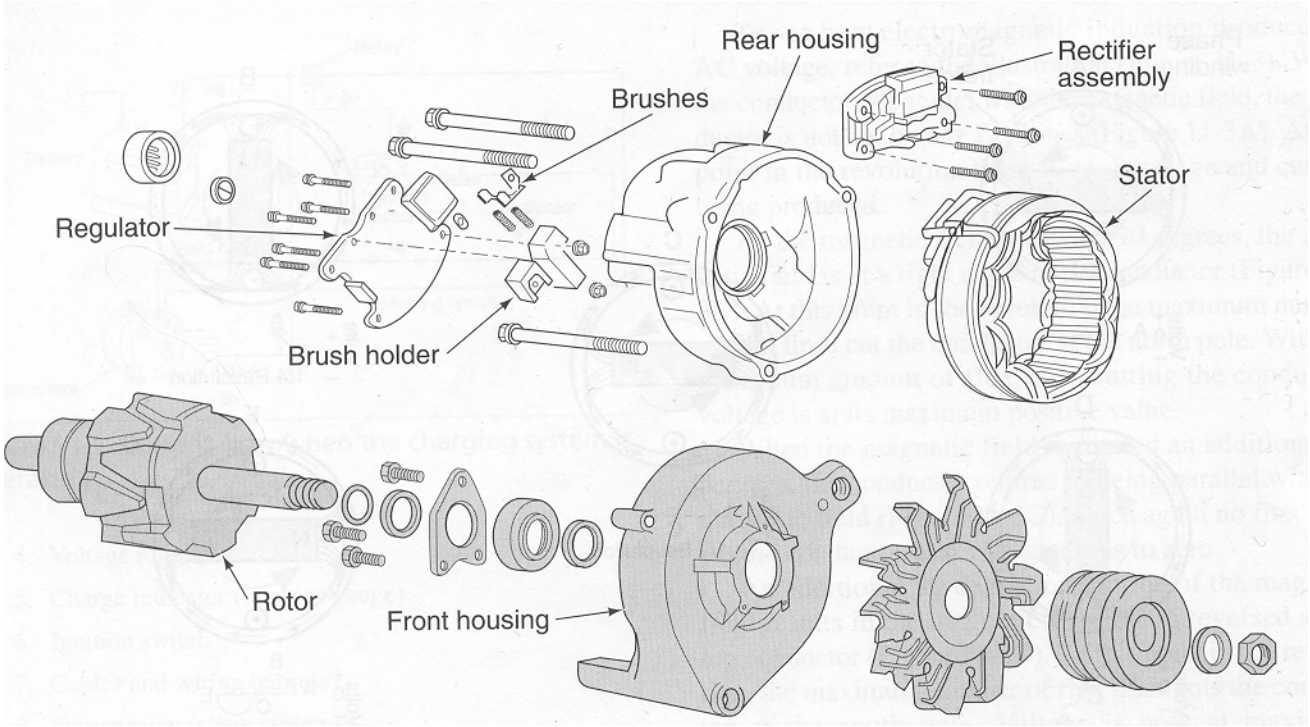
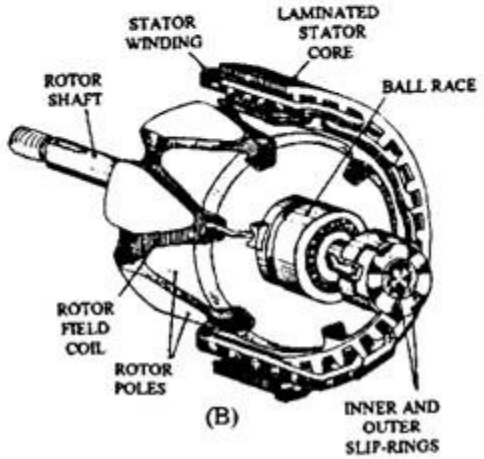


Fig. 2
Voltage curves generated during one revolution of three windings (phases) rotating in a magnetic field. The windings are offset from each other by 120°. The connection of the individual phase voltages results in a 3-phase altemating voltage.

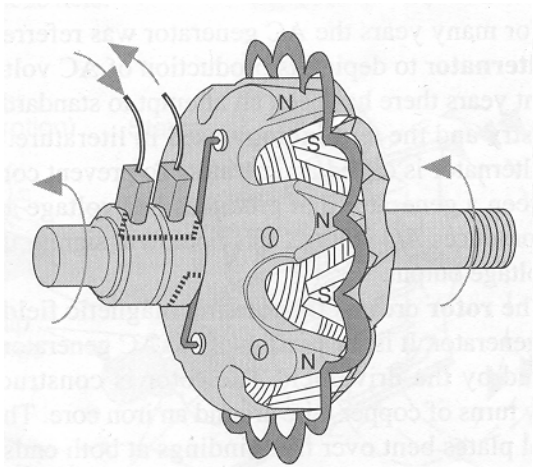
Alternatoare cu excitatie electromagnetica

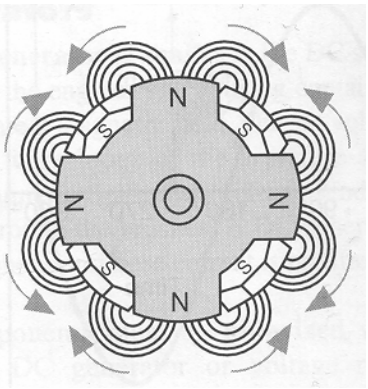


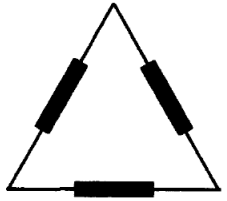




Rotorul

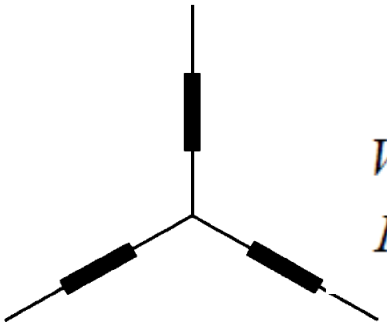






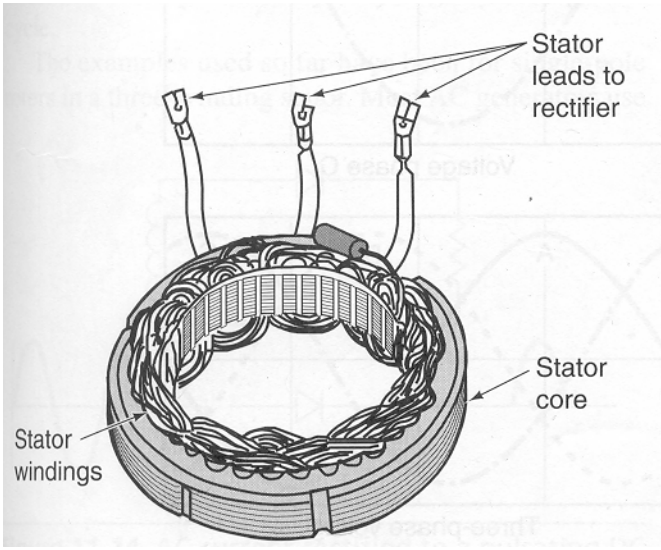
$$V = V_f$$
$$I = I_f \sqrt{3}$$

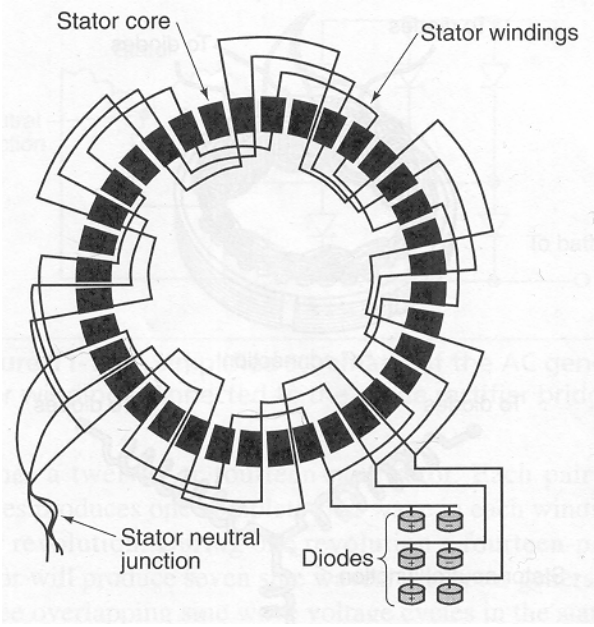
$$f = \frac{pn}{60}$$



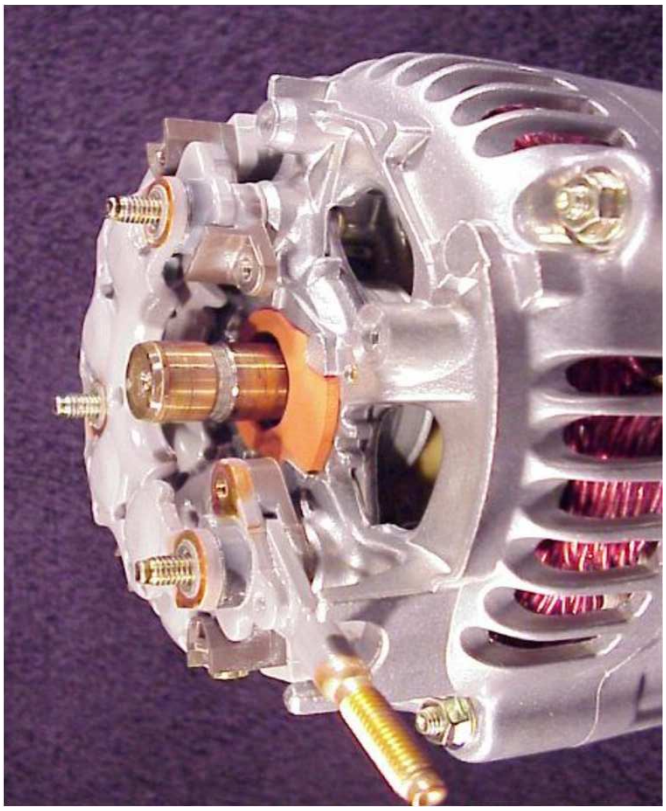
$$V = V_f \sqrt{3}$$
$$I = I_f$$

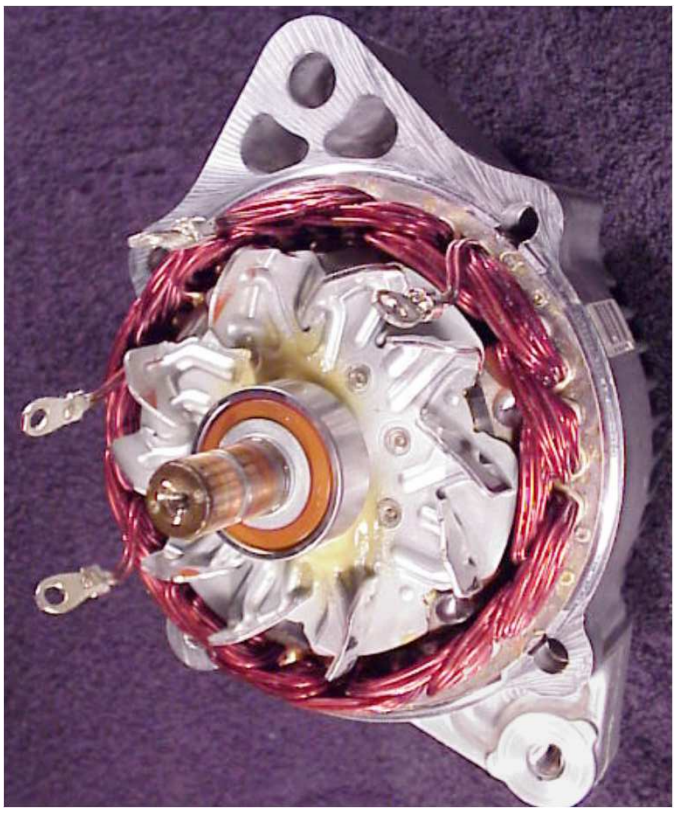
Statorul

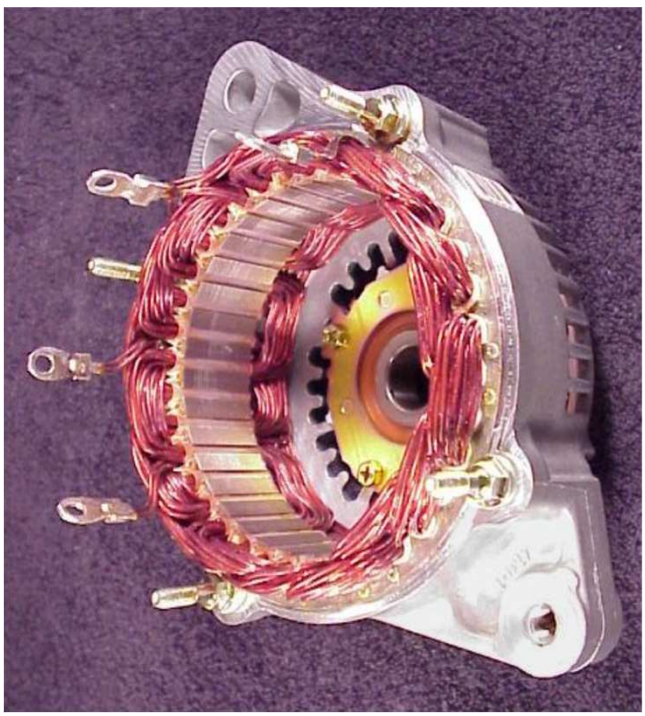


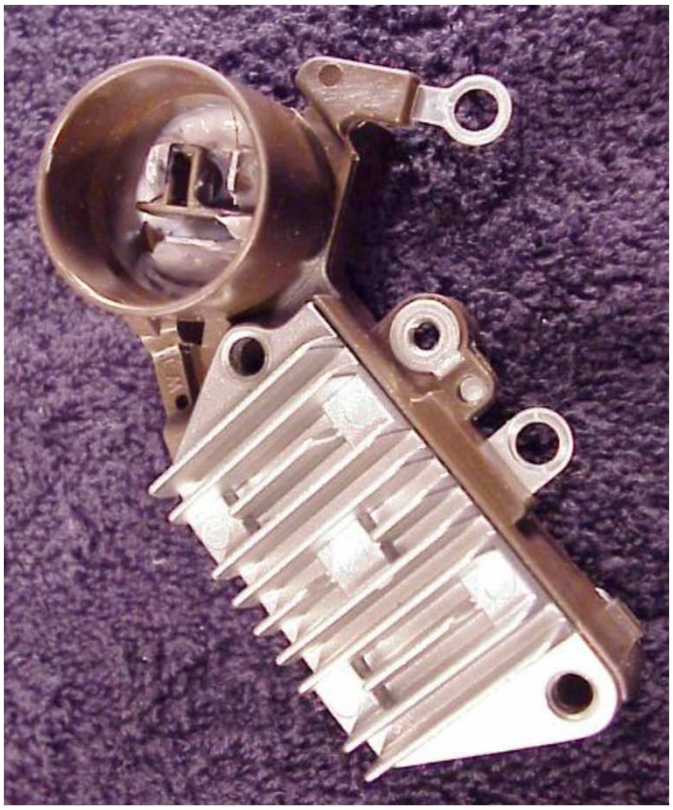










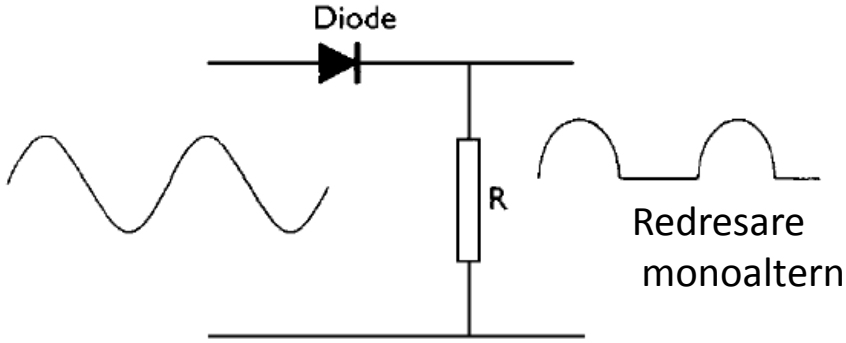




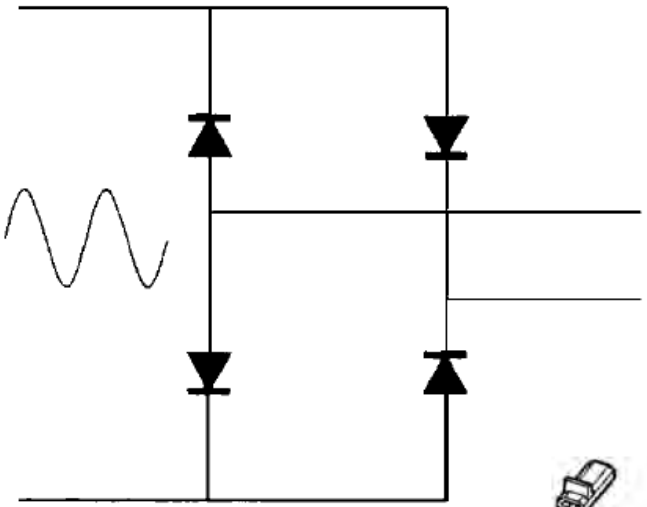




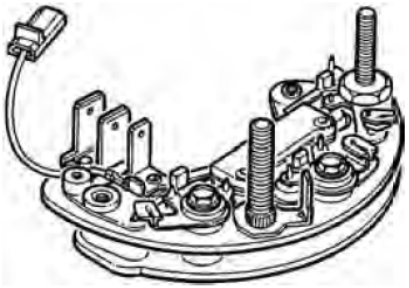
Redresarea curentului electric



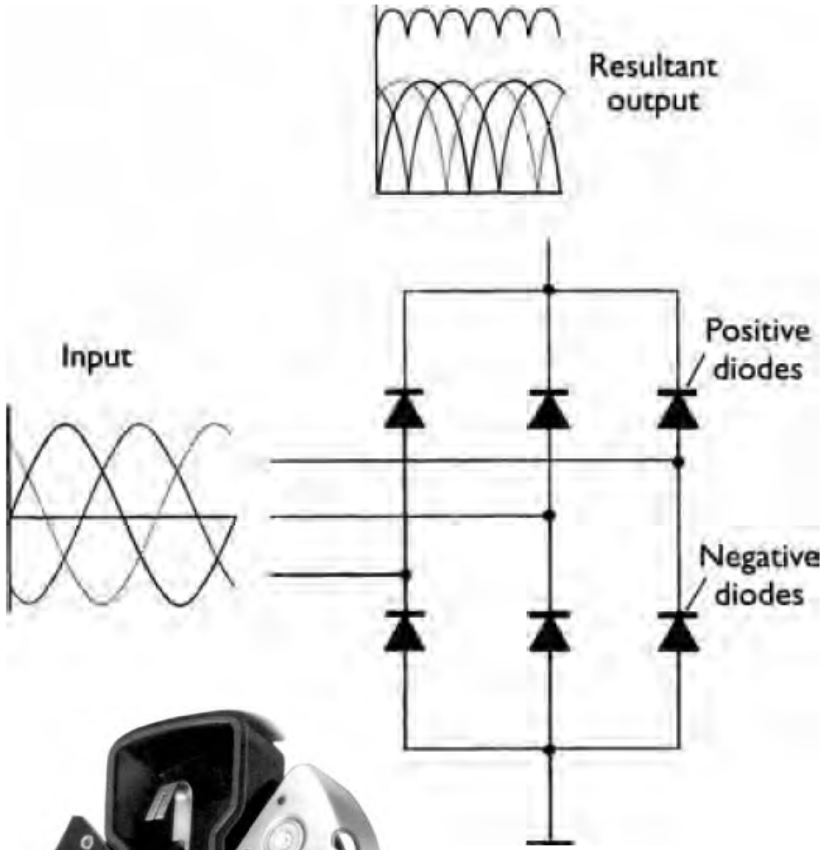
Redresare
monoalternanta

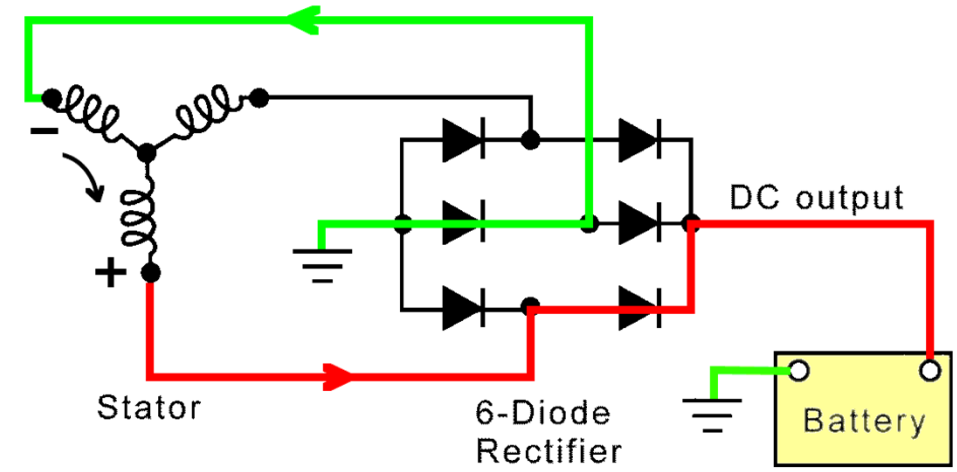


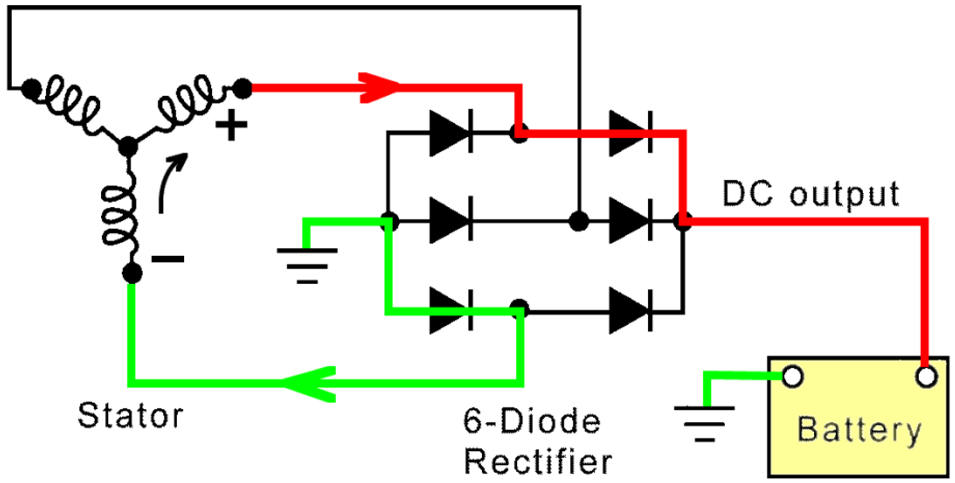
Redresare
bialternanta








DC output
Stator
6-Diode
Rectifier
Battery


DC output
Stator
6-Diode
Rectifier
Battery

Scheme de conectare a excitatiei alternatoarelor

