AI 3401 TRACTORS AND ENGINE SYSTEMS

UNIT I NOTES

TRACTOR

Tractor is a self propelled power unit having wheels or tracks for operating agricultural implements and machines including trailers. Tractor engine is used as a prime mover for active tools and stationary farm machinery through power-take off (pto) or belt pulley.

TRACTOR DEVELOPMENT

he present tractor is the result of gradual development of machine in different stages. History of tractor development is given below.

1890- The word tractor appeared first on record in a patent issued on a tractor or traction engine invented by George H. Harris of Chicago

1906- Successful gasoline tractor was introduced by Charles w. Hart and Charles H. Parr of Charles City, Iowa 1908- First Winnipeg tractor trails were held

1911- First tractor demonstration was held at Omaha (Nebraska)

1915-1919- Power take off was introduced

1920-1924- All purpose was developed

1936- 1937 – Diesel engine was used in tractor and pneumatic tires were introduced

1950-1960- Manufacturing of diesel tractors on extensive basis throughout the world was taken up 1960-1961 – Tractor manufacturing was started in India by first manufacturer M/s Eicher Good Earth 1962-1970 – Manufacturers like Tractor and Farm Equipment , Madras ,

Hindustan tractors at Baroda, Escorts Tractors at Faridabad and International Harvester in Bombay started work during this period.

CLASSIFICATION OF TRACTORS

Tractors can be classified as,

A. According to design:

a) Riding type, four wheel type

b) Walking behind tractor or two wheel power tiller

B. According to traction:

a) Track type

i. Full track

ii. Half track

b) Wheel type

i. Two wheel type

ii. Tricycle

iii. Four wheel

C. According to utility:

i. General purpose

ii. All purpose

iii. Orchard

iv. Industrial v. Garden

Two wheel tractor:

Single axle walk behind tractor is known as power tiller guided by hand and used in rice growing area. Recently, riding type power tillers have been developed and are being manufactured and have better operator comfort. These are more useful for small land holders

and popular in rice fields, hilly areas. Power tiller are also used for seed preparations, sowings, hauling, pumping, transporting and other stationary works. Power tiller is equipped with rotary tiller and powered by horizontal single cylinder engine of 5hp to 15hp.

Three wheel type tractor

: It's also known as tricycle type tractor. Front two wheels of this tractor are much closed. Row crop tractor is suitable for intercultural purpose. The tractor manufacturer Farmall was famous for tricycle type in 1930 to 1970.

Four wheel tractor:

A prime mover which is designed to pull, push, carry and operate implements used for agricultural work is farm tractor. These includes row crops, high crops and utility tractors. The row crops and high crops have adjustable treads that allow careful navigation through crop rows. It has two large traction wheel at rear and two small wheels at front. Used for ploughing, tilling, harrowing, planting, pushing, lifting, hauling transporting and provide PTO work such as rotavations, drilling, harvesting, pumping, threshing, levelling, etc. Power range of farm tractor is 10kW to 75kW and maximum speed is 35km/hr. rear roll bar frame and rollover protective cab provided on tractor to prevent the operator from any accident or over turn of tractor.

Four wheel drive or 4WD have been designed to get more traction drawbar power and pull. In such type tractor power is transmitted at front wheel as well as rear wheel to get more traction and better stability. In this traction tyres are provided on the front also. These may be smaller or equal in size of rear tyres. Power range of these tractors is from 15kW to 100kW .

Tract type tractor:

Have limited use in agriculture. A tractor which have endless iron tract passing round driving sprocket and pinion are known as tract laying or crawler tractors. They have the following operations: i. Commercial orchard cultivation and maintenance ii. Farm operation in hilly areas iii. Land cleaning and earth moving works. Tractor performance can be improved by using tracks rather than wheels and tyres. The weight of tractor is spread over a large area between track and soil, thereby improving traction. In agriculture work more drawbar power, pull and reduced soil compaction is achieved with crawler tractors. Power range of these tractor is

from 20kW to 100kW and maximum road speed is about 10km/hr in agriculture work. Tracked machine is limited to heave pull jobs only.

UTILITY TRACTORS

i. Compact utility tractor (CUT): This type of tractors are designed specially for landscaping and land management only. Compact utility is a small model four wheel drive tractor.

ii. ii. Garden tractor: used in domestic operations like gardening, grass cutting etc. They have strong axles, frame and transmission. These tractors have very low ground clearance and are designed for light duty work. iii. Orchard tractor: they differ little from a utility tractor. Mainly they are used in orchard area. iv. Industrial tractors: it is limited to work for loading, unloading, lifting etc. in industries

Tractors can be classified into three classes on the basis of structural design

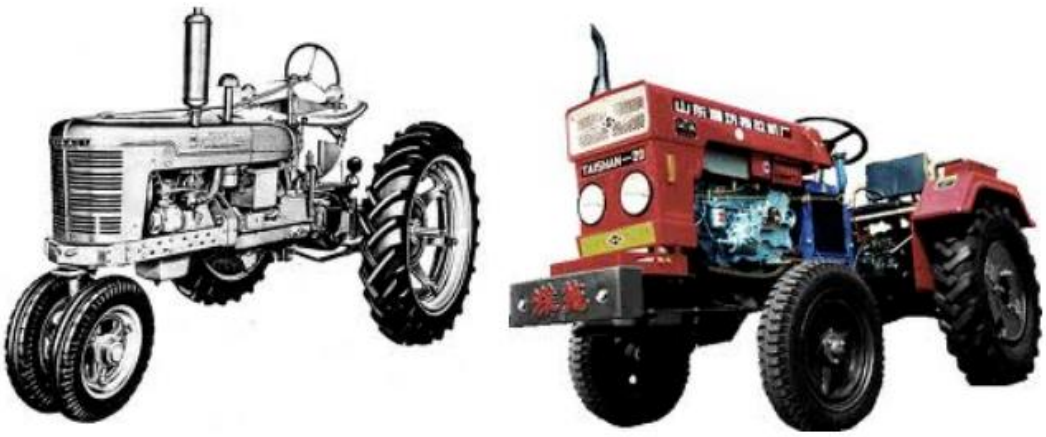
1. Wheel tractor

2. crawler tractor

3. walking type tractor

Wheel tractor

Tractors having three or four pneumatic wheels are called wheel tractors. Four wheel tractors are popular everywhere.



Three wheel tractor

Four wheel tractor

Crawler tractor

This type is also called Track type tractor or Chain type tractor. In such tractors , there is endless chain or track in place of pneumatic wheels.

Power tiller

Power tiller is a walking type tractor. This tractor is usually fitted with two wheels only. The direction of travel and its controls for field operation is performed by the operator, walking behind the tractor

Power tillers

Classification of wheel tractors

On the basis of purpose, wheeled tractors are classified into three groups a. General purpose tractor b. Row crop tractor c. Special purpose tractor

a)General purpose tractor

b) It is used for major farm operations such as ploughing, sowing, harvesting and transporting works. Such tractors have i) low ground clearance ii)Increased engine power iii) good adhesion and iv) wide tyres

General purpose tractors

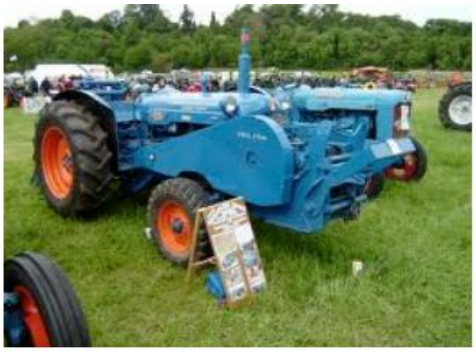
b) Row crop tractors

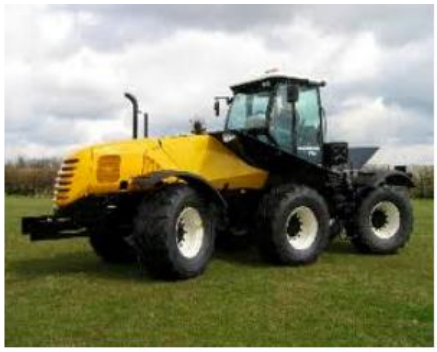
It is used for row crop cultivation. Such tractor is provided with replaceable driving wheels of different tread widths. It has high ground clearance to save damage of crops. Wide wheel track can be adjusted to suit inter row distance.

Row crop tractors

c) Special purpose tractor

It is used for definite jobs like cotton fields, marshy lands, hill sides, garden etc. special designs are there for special purpose tractor. Eg. a) Tractor with winch unit b) multi drive tractor c) tractor for golf grounds etc.





SELECTION OF TRACTOR

Selection of tractors depend up on following factors

1.Land holding: Under a single cropping pattern, it is normally recommended to consider 1 hp for every

2 hectare of land. In other words , one tractor 20-25 hp is suitable for 40 hectare farm 2. Cropping pattern: Generally 1.5 hectare/hp has been recommended where adequate irrigation facility are available and more than one crop is taken. So a 30-35 hp tractor is suitable for 40 hectare of land.

3. Soil condition: A tractor with less wheel base , higher ground clearance and low overall weight may work successfully in lighter soils buy will not be able to give sufficient depth in black cotton soils

4. Climatic condition: For very hot zone and desert area , air cooled engines are preferred over water cooled engines. Similarly for higher altitude air cooled engines are preferred because water cooled engines are liable to be frozen at high altitudes

5. Repair facilities: It should be ensured that the tractor to be purchased has a dealer at near by place with all the technical skills for repair and maintenance of the machine.

6. Running cost: Tractors with less specific fuel consumption should be preferred over others so that the running cost may be less.

7. Initial cost and resale value: While keeping the resale value in mind , the initial cost should not be very high, otherwise higher amount of interest have to be paid

8. Test report: Test report of tractors released from farm machinery testing stations should be consulted for guidance