



#### Address

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**Scouted by**  
Sundaram Verma



## Trench digging machine<sup>20</sup>

### GENERAL MACHINERY NATIONAL SECOND

**Radhey Shyam Tailor** (62) was born in Shishu, a village in Sikar district of Rajasthan. He is a Commerce graduate and has worked for 40 years in the designing and drafting of several implements. He owns a workshop at Sikar. He knows a number of languages like Rajasthani, Punjabi, Oriya, Bihari and Bengali.

After completing his higher secondary education from Kaladera in Jaipur, he went to Calcutta to do his graduation. Initially he joined Modern Construction Co. Ltd., Shodhpur in the crane division as a supervisor. Three years later, he joined another company 'Mains Fields Ltd. Sealdah Industrial Area as a Supervisor. There he worked on gas hot plate manufacturing. He also worked for Hindustan Tyford Ltd., Bahadurgadh in Haryana for seven years where he gained experience in the complete fittings of the plant and machinery. After leaving Bahadurgarh, he came back to Sikar and joined 'Om Shiv Shakti Cement Plant Pvt. Ltd.' and served for 17 years as a maintenance officer.

**Nathulal Jangid** (43) is also a resident of Sikar. His family has been in Sikar for the past three generations and has been involved in the farm tool machinery business. He has studied up to the fifth standard and got married at the age of 13 years. After that he started helping his father in the workshop. He has worked for 20 years in various jobs. He has four daughters and a son who are studying. Nathulal specially acknowledges his uncle Rameshwarlal Jangid, a resident of Jaipur who helped him financially as well as provided moral support. Nathulal would like to start a business of his own if he gets some financial support.

**Genesis** On a trip to Jaipur, Jodhpur and Delhi in 1997, Radheyshyam and Nathulal came across labourers digging trenches manually. Laying cables for telephone or electric lines sometimes takes months to complete when done manually. Radhey Shyam and Nathulal were deeply affected by the plight of these people working in harsh weather. The idea of developing a machine that would be able to do this work came to them. They took up the challenge of developing a machine that would do the same work with greater efficiency and in a more cost effective manner. This would also give the labourers some respite during their work.

The first prototype of the Trench Digger was developed in September 1999. The machine was developed as an attachment for the tractor so that the desired output could be obtained with a minimum of investment. It took the innovators three months to make the first machine but now it takes only about 25 days. The first prototype has been used in Sikar and also on the Gujarat border for telephone cable laying. Radhey Shyam and Nathulal have received several orders for more units. NIF in coordination with GIAN- N has sanctioned an amount of Rs. 18,529 from the Micro Venture Innovation Fund for product development and market estimation of the machine.

### **The Innovation**

Tailor and Jangid have developed a trench digging attachment that can be retrofitted to a modified 35-40 HP tractor and can dig in one hour, a pit 65 metres long, six feet deep and fourteen inches wide with a fuel consumption of 2.5 liters of diesel per hour. A frame is attached to the body of the tractor to support the structure of the digging machine. The arrangement consists of a planetary gear system and motion converter unit to deliver power from the tractor, a chain gear and roller system and a belt with sharp trench digging blades of high carbon steel. The machine has a long arm with a rotating chain over it and sharp edged blades (spades) mounted over the chain to shovel the earth that has been dug and level it on either side of the cut trench. This chain is supported by a large wheel at the rear end of the arm and two mini wheels framed up on the main-frame slot. As the manipulation of the machine requires strong hydraulic levers, the rubber tubes supplying the oil have been replaced by metal tubes to withstand the high pressure.

The material used for the machine is mainly cast iron, but the roller chain is tempered MS steel. The machine is fourteen feet long and the total weight is one ton (1000 kg). A weight of 90 kg has been placed in the front to counterbalance the heavy rear end to prevent the tractor from toppling. However in this machine, the tractor can't be separated and used independently.

The machine is essentially driven by a tractor. The gear drive system slows down the rotary motion of the tractor wheels without affecting its efficiency since the tractor axle still would run on its normal speed. With the help of the motion converter, the horizontal rotation of the shaft is converted into the rotation of another shaft at right angles to the original shaft. This second shaft is connected to a chain gear and a roller chain passes over it. This digs the ground and throws out the soil as the chain rotates continuously. At the rear end of the shaft, the chain is attached to a smaller gear wheel and it imparts a rotating action to this third shaft. The third shaft then with the help of attached helical blades shovels the dug earth. A hydraulic lever is used to

elevate the main frame to control the digging depth. These levers also help to maneuver the machine while driving.

This trench cutter can be used for digging earth or trench cutting, for laying cables for electric and telephone lines and also for laying pipes etc. The device is ideal for digging narrow but deep channels. The machine can work on hard as well as soft soil. With this device it is now possible to cut a trench very evenly.

### **Advantages**

Presently earthmovers are widely used in India for trench cutting but this is quite expensive. The earthmovers used in India are manufactured by Larsen & Toubro, Essar Group and Voltas. The earthmover currently used can dig a trench of 2 km length and depth of 3 feet in one hour whereas the main advantage of the trench cutter of Radheyshyam and Nathulal is that it can dig trenches very fast up to a depth of 6 feet 14 inches. About 20 litres of diesel is required to run the earthmover for one hour whereas the trench cutter consumes only 2.5 litres of diesel in one hour. Hence it is extremely fuel-efficient. The earthmover first digs the trench and then brings the soil up which is a time consuming and tedious exercise. The Trench digger can on the other hand dig and shovel the soil simultaneously thus saving manpower and time. So it is cost effective. The cost of laying telephone lines could be reduced by half from Rs.25/m to Rs.12/m. The cost of the currently used earthmover is about Rs10, 00,000. The Trench digger on the other hand costs Rs. 1.6 lakhs and even with the tractor and accessories it costs less than half of any competing models. Further these accessories are easily supplied and serviced locally. If there is no trenching work to be done, the tractor attached to the trench digger can be used for some other purpose. The earthmover also occupies more space thereby causing inconvenience to the public

### **Other innovations by the duo**

*Pit digging machine*

Tailor and Jangid have also worked together to develop a device which performs digging, in gardens, parks etc., for planting trees, in an aesthetic manner. This device makes a two by two and a half feet hole in 15 seconds.



It can be attached to a 40-50 HP tractor. It is cheaper and faster than existing alternatives and costs Rs.55,000.

#### **The desire to serve**

*"I would like to earn my living through fair means, without compromising my integrity",* says Radhey Shyam Tailor. All his life, Radhey Shyam has been interested in the welfare of the physically challenged and he has been instrumental in establishing around 10 small units in Sikar district for their welfare to enable them to utilize their "different abilities." Whenever he sees some kind of disability in any person, he claims that he is also able to see some kind of ability in them and hence he tries to give them the support to make use of their potential.

*"I learnt this from my father and grandfather. I have followed in their footsteps and reached this stage",* says Nathulal Jangid. In future, Nathulal wants to develop a hydraulic rickshaw for the physically challenged which would take lesser effort to run. He also has ideas for a harvesting machine and a silent cooler. He reveals a mind full of ideas, that he would like to implement, to make life easier for people around him.