



## Auto compression sprayer<sup>74</sup>

### CONSOLATION

**Arvindbhai Patel** (48) hails from Vanch, a village 10 km from Ahmedabad in Gujarat. The youngest in a family of three sons and three daughters, Arvindbhai had only his own motivation to pursue his studies as no one else in his family had any formal education. After completing school in 1972, he got admission at Shri Vivekanand College, Ahmedabad for the undergraduate course in Commerce. After struggling hard for a year trying in vain to cope up with college studies in English medium he had to eventually quit. For two years, he worked in an automobile garage in Ahmedabad where he received practical training as an automobile mechanic. In 1980, he got an opportunity to travel to Saudi Arabia, where he worked on the latest models of automobiles. After finally coming back to India in 1984, this accomplished technician and fabricator has been pursuing his passion for innovations.

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**Scouted by**  
GIAN-West



**Genesis** In case of conventional sprayers, spraying is done by continuous pumping by hand. This monotonous work tires the user after some time. In addition shortage of labour is a big problem for farmers especially as spraying has to be done at a particular time, failing which the pest attacks can be a serious problem.

Arvindbhai tried to think of some means by which the monotonous job of hand movement could be avoided. In conventional sprayers the basic means of oscillation is done by hand. He observed that during walking, parts of the body also generate different kinds of motion and he felt that this motion could be utilized for the oscillation of the piston in the cylinder. Arvindbhai hit upon the unique idea of magnifying these jerks by using some additional weight. So he used a spring and additional weight to magnify these jerks to generate the requisite pressure in the tank to spray the pesticide. This device thus works on the concept of dead-weight oscillation which causes the reciprocation of the piston and results in spraying action.

### The Innovation

Arvindbhai used an iron tank to store the liquid. He chose iron, because the pressure generated in the tank is very high and a weaker material may not be able to withstand that pressure. A piston assembly is attached in the middle of the tank with an extended spindle coming out of the tank. A spring is provided on this extended portion of the spindle. The piston is attached to a weight of almost 5 kg on the upper side, which rests on this spring.

The sprayer is mounted on the back of the user, like a regular knapsack sprayer. When the user walks with the sprayer mounted on his back, jerks are transmitted to a dead weight, which rests on the spring. Due to the jerks of walking, the spring is compressed, pushing the piston downwards. Once the spring reaches the bottom, it bounces back /rebounds and pushes the weight upward, thus pulling the piston upward and one stroke is completed. The cycle continues and pressure is generated in the tank due to subsequent strokes of

the piston. This pressure is used to spray the liquid in the tank through the nozzle of the dispensing unit.

Arvindbhai has now modified the configuration of the auto – compression sprayer and made a new model in which the oscillation rate of the dead weight is intensified. Two storage tanks have replaced the single one as used in the previous design. The dead weight is placed in the intermediate gap between the tanks connected by a common pipe. To avoid alignment problem the dead weight is hung at the bottom instead of the top as in the previous design. In this new model, a pipe guides the spring to avoid oscillation. Each tank has a capacity of seven and a half litres and thus the total capacity of the device is 15 litres. The cost of this sprayer is expected to be around Rs. 3500.

#### **Advantages**

The main advantage of the device is that it does not require any extra energy/torque for spraying. It is extremely energy efficient, easy to operate and produces an extremely fine spray. It is also easy to repair and requires less maintenance. There is no comparable pump available in the market which works on a similar principle. This device eliminates the tiresome and repetitive manual pumping action needed in standard back mounted pump-sprayer units.

#### **Current status**

Patent application has been filed by NIF. The technology has been licensed with the help of GIAN (W) to an entrepreneur in Ahmedabad on non-exclusive basis. The entrepreneur is helping Arvindbhai to convert the crude model into final working prototype. It is possible to license this technology to other entrepreneurs as well.

Arvindbhai also has plans to provide two spray nozzles to get double the output after increasing the pressure by piston-chamber optimization. Then the operator can cover two parallel rows simultaneously and thereby cut down the operation timing by half.

#### **Innovative works of Arvindbhai**

##### ***Harnessing the Sun***

One day in 1978, while on his way from Ahmedabad to his village, Vanch, Arvindbhai met Prof. A.R.Patel of

L.D. Engineering College, Ahmedabad. During the course of their conversation, the topic of solar energy cropped up. Arvindbhai developed a fascination for solar energy, which drove him to fabricate a 50-litre solar water heater in 1985. He used HDPE/PVC for the storage tank and straw of *bajra* (pearl millet) for insulation. Between 1985 and 1990, he made eight different models for trying out different materials and correcting the flaws or deficiencies he came across until he was fully satisfied. He has sold two-dozen solar water heaters of different capacities- 50, 100, 200 and 500 litres.

##### ***Auto air-kick pump***

Arvindbhai has also developed a novel auto air-kick pump, to inflate the tyres of scooters and motorbikes, which uses the built-in kick-start mechanism of the vehicle. The compression obtained in the air in the cylinder of the engine while cranking is utilized and this compressed air is transferred to the tube with the help of this device. It is handy, portable, light in weight, compact in size, easy to use, flexible, self-repairable and the best alternative to a spare wheel. Arvindbhai believes that every scooter or motorbike rider should have this gadget and maintain optimum tyre pressure on daily basis as this contributes to fuel conservation also. He was awarded for this innovation in the second national competition of NIF. GIAN has helped him in commercialising this technology.

##### ***'Natural' Water cooler***

The idea of the water cooler had come to Arvindbhai when he was suffering from severe fever once. His wife used to apply a cold pack to his forehead repeatedly to give relief from the high temperature. He used this vapour-absorption principle for getting drinking water cooled. The cooler is useful for supplying cold drinking water in the hot summer, particularly in areas where the availability of electricity is absent or erratic. Arvindbhai developed his no-electric-power, 'natural' water coolers in three different capacities of 5, 10 and 20 litres. He sized the components to ensure that the temperature of the water at the outlet was at least 5 to 10 degree Celsius lower than the ambient temperature. About 20 units have been sold and are in use. GIAN and SRISTI have helped him in commercialising this novel water cooler.

### ***Harnessing wind power***

The idea of harnessing wind power struck Arvindbhai one day in 1996 when he was looking at clothes drying in the wind. He used a curtain, a rod and an air pump to fashion a rough model of a wind tunnel. After several experiments and fabricating different models, he came up with a horizontal "Low Air Thrust Multi-curtain System". The device, Arvindbhai visualises, can be beneficially used for pumping water, heating water, inflating tyres, drip irrigation and even for running a grinder/juicer. He obtained a provisional patent for this device in 1997.

### ***Kite reel holder***

Even his children have been instrumental in triggering off ideas in Arvindbhai for new innovations. Normally, while one person flies a kite, another person holds the reel, allowing it to unroll as per requirement. Once during the kite festival, his daughter refused to hold the reel for her brother who was flying the kite. To settle the children's quarrel, he designed a new reel holder to wind kite thread. With this new holder, a person can fly a kite without an assistant to hold the reel. The holder, which is made of a light metal, allows the thread to wind and unwind easily and it moves in the direction of the wind.

### ***User-friendly tongs***

When posed with the problem of developing user friendly tongs for the kitchen, Arvindbhai developed some tongs which are very simple and consist of an adjustable knob, guide shaft and holding loops. All the parts are made of aluminium and it is quite easy to handle as well as quite reliable and adjustable with the facility to use the device for variable size of utensils.

### **The struggle for formal support**

Arvindbhai had contacted various agencies, which are supposed to encourage application of renewable sources of energy and assist in the development of equipment in the sector. He appealed to establishments like Gujarat Energy Development Agency (GEDA), Department of Science and Technology (DST) and Council for Advancement of Peoples' Action and Rural Technology

(CAPART) seeking funds for validating and perfecting his innovations. But there was no positive response and he became extremely frustrated.

In May 1998, he saw an advertisement released by the Ministry of Non-Conventional Energy Sources (MNES), Department of Science and Technology, which invited innovators to seek any assistance they desired. He wrote a letter to the department giving details. Unaware of how the bureaucracy functions through countless cogs and wheels, he went to Delhi thinking that it would expedite matters. He went straight to the Prime Minister's official residence where he met one of the personal assistants to the PM. This PA was considerate enough to mark the letter to the concerned ministry. The Central ministry forwarded the letter to GEDA, asking the Agency to look into the matter. Accordingly an engineer from GEDA, Mr. R N Pandey was asked to see the innovations and submit a report to New Delhi and he visited Arvindbhai in August 1998. He also recommended changes to a water-cum-air cooler developed by Arvindbhai and told him to focus on one application. On his advice, Arvindbhai modified his innovation accordingly.

Arvindbhai acknowledges that after his initial struggles, various organisations stepped in and helped him to different extents to realise his dreams. Notable among them were SRISTI, GIAN, Sardar Patel Renewable Energy Research Institute (SPRERI), L D Engineering College and Rural Technology Institute (RTI), Gandhinagar. He says that the last-mentioned three organizations were very helpful in product testing.

Arvindbhai's wife, a schoolteacher who holds an MA and BEd admits that at first she considered him over enthusiastic about his innovations and would often ask him to start on a new job as all this work on innovations did not earn him good money. But her views regarding her husband's zeal for innovation changed once he got recognition from SRISTI, NIF and National Research Development Corporation (NRDC).