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Saksham – Capacity Building Program for Up - gradation of Knowledge and Skill of Indian Artisans for Make in India

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Abstract

In India traditionally there are 12 artisans which are integral part of village or town. Author discussed the status of experience Artisan and need of capacity building. A program title as Saksham is designed for the Capacity Building of the Experience Artisans. Term Saksham means *Competent* amongst all to do the task, *Efficient* to do the task in time, *Equal* to the best one and *Capable* to give the desired output with quality. Saksham will make them to understand science & engineering behind their trade so that they will be competent to do the task in a better way. The common and detail syllabus and training module for plumber and ETP and WTP operator are given. Potential of the learned and experienced corporate members of The Institution of Engineers (India) will be used for "Saksham" program. It is an opportunity to transfer knowledge and experience to artisan to make them capable to "Make in India" dream a reality.

Keywords: Institution of Engineers, ETP and WTP Operator, Make in India, Saksham

1. Introduction

India is known for its art and Artisan. Traditionally there are 12 artisans which are integral part of any human habitation. These artisans learn their skill from senior member of family. It is more of transfer of knowledge and experience from one generation to other generation. In modern days there are institutes like ITI that imparts training to the students in defined curriculum for selected trade. They do get hand on training however they are not fully competent to do the task in the field. Another group of artisans start their working as helper and over a period of time they become the artisan. This is a self-training by an individual. There are companies who recruit the person with minimum qualification and train them for specific trade. This group of artisans works in unidirectional. National Skill Development Corporation is having ambitious program to encourage skill development for youth. Till date 1400844 students are trained and 914904 are successfully passed. Many of them are started working and some are waiting for the good opportunity. The program is conducted for fresh students to get trained in the specified trade. After few years of experience the task become a routine for the Artisan. Same time he do remember the basics he has been taught during his training. However it is observed that either they are ignorant or unaware of science and engineering behind their

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trade and task, for example physical, chemical and biological property of material being handled by the Artisan. The market is coming with new material with different properties. The new offshoots of trade are requiring specific skill. Green plumbing is the new offshoot of plumbing where experience plumber needs additional knowledge to do the task. Due to rapidly changing scenario experience artisan feels incompetent to do the task. In the daily routine neither an Artisan gets time nor the facilities provided to him/her to learn more. Then it becomes likely cause of not to mark quality output, excessive resource utilization, more wastages and accidents at shop floor. The result the experience Artisan becomes incompetent. There is a need to educate the artisan with science and engineering of their trade. If physical, chemical and mechanical properties of the material are known to artisan, he/she will be able to handle it properly. Author has discussed the status of capacity of the experience Artisan and proposed a capacity building program for them title as Saksham It means Competent amongst all to do the task, Efficient to do the task in time, Equal to the best one and Capable to give the desired quality. The paper discusses need of rise in the competency of the artisans so that they will be competent to do the task in a better way. The present and future demand of the "Saksham" artisan is given. The detail of syllabus & module of trade plumber and ETP and WTP operator is given. Potential of the learned and experienced corporate members of The Institution of Engineers (India) can be used for "Saksham" program. It is an opportunity to transfer knowledge and experience to artisan to make them capable to 'Make in India" dream a reality.

2. Traditional Indian Artisan

India may be an incredible country but the people who had always toiled and are toiling hard to give the country a beautiful place in the world map are however not shining. Traditional India has the artisans which suffices the duly requirement of an individual and society. The surname use to indicative skill their family has. The skill is handed over from one generation to other. The knowledge acquired from earlier generation is transferred to next generation with addition/ deletion, modification and or up gradation. It is the assimilation is based on the capacity of the receiver. There is no documentation or work book of the job with any such of traditional artisan. For example; the gold smith has no device to measure the temperature of the heated metal. The guess is made on the basic of the color of the metal. Table 1 gives some of the traditional trade in India along with the surname and operating parameters being followed

3. Traditional Artisan and Change in Quality of Life

Decrease in number of traditionalartisan is due to change in quality oflife.Some of the artisans are

Table 1. Traditional Artisan in India

Sr. No.	Trade	Common Surname	Operative Parameter
1	Black smith	Lohar	Color of the heated metal by and its softness
2	Gold Smith	Sonar	Use of Ammonium chloride, Nitric Acid, etc.
3	Mason	Gavandi	Visual observations
4	Carpenter	Sutar	Using the fingertip to know the sharpness of the knife

now no more required due to mechanization. For example Black Smith (Lohar) who is now rarely seen &confined to smaller town or village where their skill is still required for agricultural activities. Another artisan like color dyer may get shifted to museum. After economic liberalization India has witnessed, tremendous change in the people requirement. The traditional artisan became outdated & new trades are created. The change in the use of materials and system for Mason and Carpenter is as given below.

Mason

UCR masonry > Brick wall > Gypsum dry wall

Carpenter

Teak Wood > Ply Wood > Particle Board > MDF Board

Either the traditional artisan has to learn new technology or go out of arena. Initially change was gradual however last two decade has witness fast change. Electronic industry is going through the fastest change. After every six months new version of Cell phone is coming into the market.

4. Traditional Schools of Skill Development

The traditional artisan found tough to accept the changes and the next generation found new ways for their livelihood. The outcome of this many carry only the surname indicating the trade however never works for it. The traditional development of kill artisan is almost gone to dormant phase. The new methods evolved in development of Artisan to satisfy the demand. The issue also becomes important as the prevailing higher education system in India is not churning out skilled individuals and thereby affecting the employability quotient. There is also a dearth of quality institutions as compared to the number of students coming out of secondary schools and joining higher education. Thus, in such a scenario, vocational education can prove to be a lucrative option for students as it will skill them and provide them with jobs. Main five alternative methods of skill development are listed below.

The artisans are having developed in either of following.

- *Elevation from unskilled to helper to skill artisan*

It is time consuming and laborious. The career begins with unskilled labor, gradually gets elevated to assist the artisan and finally if it clicks one can become a skilled artisan. The inherent drawback is lack the theoretical knowledge and its capacity is developed with limited ability of the trainer and trainee.

- *Industrial Training Institute*

After $10^{th}$and 12^{th}one can join the institute and get trained in the trade (welder, plumber, motor winder etc.) he/she likes. The institute gives the theoretical and practical training. However further refinement of their skill is done when they join the job. Further progress is totally depends on the individual ability to learn and grasp.

- *National Skill Development Program*

Good efforts through national skill development program for under privilege are goingona big way. For example the efforts are made to trained tribal girls to become Airhostess.

- *Company Training Cell*

Company has their own training cell. Person with basic qualification are taken as apprentice. The training is given by the training cell or it is outsourced to other. Once the person gets trained he joins the job. The training is limited to only the specific job.

- *Manpower supplier*

The supplier recruits unemployed young male and female for specific job and duration. The training may or may not be given. The skill is acquired from other and by observations. Their skill is generally

used in process or assembly line for specific job. Their further up gradation is almost ruled out.

5. Demand of Skill Manpower

Modernization/ atomization are the need of today. However the employees of Indian industry have gone through the stress fall phenomenon of manpower cut. This has happen due to replacement of manpower by machine or inability of manpower to work in the new system. On the other hand the outsourcing is adopted as employer does not want to have the large numberof manpower on their role. For example biggest services provider Company BVG India Limited is having client list that includes TATA, Mahindra, Reliance and even Pune Municipal Corporation. It has created the demand of skilled labor to operate and maintains the infrastructure including the industry.Building industry is no more exception to this. The promoter developers outsource the job to contractor. Contractor gives it to subcontractor. Subcontractor gets the work done through the skill artisan. The engineer or supervisor is on the task to get the quality work in the schedule time.

Residential complexes are fitted with many gadgets and need Operation and maintenance. Though many jobs are simple, people do not havetimeso they need the artisan to do the task. Besides gadgets like washing machine etc. needs the artisan for its repair or maintenance. The concealed plumbing made the task further complicated for the plumber. Table 2 gives the example of plumber requirement, example

Skill developments, vocational education, strengthening the Industrial Training Institutes (ITIs), skilled manpower are some of the top priorities of the Government as well as the industrial set-ups. The decision makers in the education space have realized that India has demographic dividend over many other countries because of 75 per cent of its population fall in the age group of 15 to 59 years. This bracket of the population needs to be skilled and made ready for the market if the country wants to maintain 7 to 8 per cent GDP growth rate. The Prime Minister's office is taking keen interest in encashing this demographic dividend and has decided to skill 500 million people by the year 2022. Presently the untrained or partly trained manpower is being forced to do the task[1]. Water supply department is thinking in big way to supply metered water. The many Indian and foreign company are eager to supply the various type of water meter. However a serious thought is not given to have trained manpower to fix, operate and repair the meters.

Table 2. Plumbing Job requirements

Type of Task	Example	Payment	Demand	Need of other Skill
Simple Task	Leaking taps - replacing the washer or taps	Low Paid	High	Nil
Complex task	Replacing the ball cock, repairing the WC flush	Medium Paid	Medium	Nil
Skill full complicated task	Replacing of the concealed pipeline for water	Highly Paid	Low	Mason and tile Cutter

6. Status of Experience Skill Manpower

At present the skilled manpower is rarely graduate or diploma holder. In India skill job is accepted by default due to either of the reason a. Transfer from father to him, b. Cannot afford to get educated further, c. No interest in going to school/college, d. Financial situation force him to opt the job

Though Skill job is most important link in the development is not considering on prestigious one. It is considered as monotonous, laborious, and non intellectual. Therefore the qualified graduates/ diploma holders do not take this job. In realty the earning of plumber is more than a fresh civil engineer at site. The Existing Skill Manpower is from any of the Traditional five schools of Artisans in India. Most of them have crossed 35. Most of them are facing one or more problems as listed below.

- Academic qualification is not adequate to understand and quickly grasp.
- Unaware of physical, chemical & biological, toxic and hazardous properties of the material
- Fear/reluctances to use new material and technology.
- Artisan finds it difficult to switch over to new operating practice.
- Change is coming up the faster rate which is beyond his/her assimilative capacity.
- Calculation for optimizing resource consumption or reduction in material wastage is not known.
- Quality control is not the part of his job.
- Standard operation practices are either not known to him or he/she made it on its own with limited knowledge. He is not accustoming with use of personal protective device

7. Need of Up-gradation of Experience Skill Manpower

The existing skilled manpower has to get upgrade after every 5 years to handle new type of material and do the task in different way. The manufacturer and system developer are coming up with new material and concept with aim and objective of a. Reduction in Cost, Time, Carbon foot print, Water foot print, Energy consumption, b. To provide better goods and more comfort to end users, c. To remain ahead with players in the market

Material of construction for Pipes to be used for water handling is changed from traditional GI/ CI pipes to Polymer base PVC, HDPE, PP, Now the composite pipes are being used. Similarly there is revolutionary change in pipe fitting. The changes are faster exclusively after 1990.The new type of plumbing is costing more however the option is selected on reduce time of installation and makes the operation and maintenance easy. The skilled plumber has to do the changed job. The manufacturer of the product put their efforts to train the plumber however it is not their thrust area, Table 3 gives some of the skills that need up gradation.

8. Up-gradation (Saksham) of Experience Skilled Manpower

Saksham is a Capacity Building program to make he/ she Competent, Efficient, Equal and Capable to do the task / profession as defined below

Competent Amongst all to do the task Efficient To do the task in time

Table 3. Trades, Skill and need of up-gradation

Trade	Skill	Need of Up gradation
Mason	Dry Wall	Combination of metal work and Gypsum board without any part of wood
Plumber	Green Plumbing	Understanding Water saving gadgets and their fixing.
Electrician	Green Energy for green building	Maintenance of solar panel and battery and switch over from MSEB to Green Energy
Operator	Reuse of waste water	Operators to operate Tertiary and quaternary Treatment plant

Equal To the best one Capable To give the desired quality

The person will understand Science and engineering behind the task he is doing as a routine work. This will inspire him to do the work in a better way. Indigenous potential of science and technology with IEI can be used for Technical Capacity Building. The advantages of up-gradating are a. Capable do the job better way, b. Improvement in efficiency, c. Not thrown out of the job, d, Get acquainted with safe handling of material, e. Become trained to upgrade their colleagues & transfer the knowledge to new comer.

9. Role of The Institution of Engineers (India)

Population of 1.3 billion, of which about 0.8 billion in the working age - India in 2020 is surely something the world can look forward to. According to economic predictions, that time would be the golden 'Growth' era in the demographic dividend. We would not only have enough manpower to meet our needs but we can help the rest of the world as well. PMO (Prime Minister's Office) has distributed the job to various ministries and departments and also created several bodies for this purpose[2]. One of the most important bodies thus constituted is the National Skill Development Corporation (NSDC) along with the industries and it has been given the target of skilling 150 million of the 500 million. The Institution of Engineers (India) is largest organization of the Engineers from 16 different disciplines. Knowledge andexperience of the honorable members can be used for Saksham Program. Knowledge and experience of corporate members is the asset for the Saksham Program Implementation. Table 4 gives few examples for some of engineering discipline for implementation of Saksham Program

10. Common Syllabus for Saksham Program

Almost all trades can be covered under this syllabus. Specific points can be added where ever required.

- Introduction to Basic Math, Physics andChemistry related to the trade
- Physical property and determination methods for Specific gravity, Bulk Density, Viscosity, Surface tension, Melting point, boiling point, freezing point, fire point and flash point, conductance and resistivity.
- Use of Tables for the weight, volume area etc.
- Material of Construction - Physical, chemical and mechanical property
- Chemical and biological hazards, impact on health and the precautions to be taken during handling the materials.
- Standard BIS, ASTM and National Building code. Specification and its importance and relevance to the job.

Table 4. Engineering Discipline and Trade

Sr. No	Engineering Discipline	Trade
1	Agricultural Engineers	Food Production, Food Processing, Farming Technology, Soil Maintenance
2	Civil Engineers	Infrastructure Development, Urban Planning, Water Supply, Homes, Sanitation, Roads, Bridges, Buildings, Public Works Agencies, Structures,
3	Electrical/Computer Engineers	Energy, Communication, Computer Technologies, Information Technology Capacity, Electrical Systems
4	Environmental Engineers	Pollution Controls, WTP and ETP operator, , Monitoring, Watershed Management, Land Planning, rural sanitation
5	Production Engineers	Infrastructure Support, Logistics Planning, Improving Productivity, Process operation.
6	Mechanical Engineers	Energy, Machinery, Water Pumping Stations etc.

- Formulae meaning and application
- Unit Process and Unit operation
- Principle behind the Common instruments, probable errors, standardization, operation and maintenance (Thermometers, theodolite etc.)
- Tools and Tackles their quality and Standards
- Data collection, recording, assimilation, interpretation and action plan
- Resource, (including energy and water) conservation, reduction in consumption and waste generation.
- Time Management
- Fault analysis, critical evaluation and corrective measures for improper job/ task
- Recent developments in material, process and system
- Attitude, Acceptability and adaptability for the new skills
- Creativity, Invention and Innovation – How to do it
- Likely cause of breakdown and critical analysis to rectify it
- Safety for man and machine
- First Aid and Occupational Health
- Hazard, risk management and, Disaster Management
- Dress Code and self-presentation
- Writing and presentation skill

Common Syllabus for Saksham ProgramThe syllabus can be further detailed out to suit to site requirement(Table 5).

11. Program Management

Resource Persons for the Program will be Learned and experience Corporate Member of The Institution of Engineers (India) and Training officers of the material / process / system suppliers. For Example Pipe manufacturer for Plumbing

*Program material*will be consist of detail training module, manual and workbook for the program, power point presentation or Video can be made available for the program.

*Practical*must be very simple. A work book is to be prepared for the practical. A tie up can be made with manufacturer/supplier

*Duration of the program*will be minimum 40 hours spread over on the available time Full time - 7 days and part time - 15 days

Table 5. Detail Syllabus for Typical Common Trade Plumber and Mason

Course Title	Plumber	Mason
Basic Chemistry	Physical, chemical and mechanical properties of material being handled. E.g. pipe, pipe fittings, adhesive, etc.	Physical, chemical and mechanical properties being handle. Cement, steal fly ash, adhesives, white cement , POP
Mechanical Property	Effect of pressure, temperature and chemical characteristics on the strength of material. Expansion, contraction, bending etc.	Effect of moisture, quality of material strength and durability
Impact of surrounding environment on material	Causes and remedy for Corrosion, physical, chemical and biological	Erosion , crack development, leakage etc due to weathering effect
Basic definition	Velocity, area, weted area, flow, gravity, pressurized flow, slope, static and friction head, duty point of the pump	Composition of concrete and cement mixture, strength area volume, load bearing wall, curing.
Introduction to current and future concept	24 x 7 water supply , segregation of sewage and Sullage, 3 tier distraction system, Green building, sewage recycling, green plumbing, water efficient gadgets, storm water collection pipelines for high rise building.	Use of fibers in cement mixture, use of surface and body adhesive dry wall, modified BBM and UCR masonry for Green structure, Gypsum board
Basic engineering calculation	Flow, pressure, pipe diameter calculation, duly point of pump, calculation of material required	Volume,height and thickness of BBM wall, calculation of material requirement per unit area/ volume
Additional information of new product	Pipe and pipe fittings. Composite pipesvarious types of fittings, new sanitary wares	Water proofing chemical component FLY ASH brick and boards
Safety and hazard	Professional hazard and use of safety devices	Professional hazard and use of safety devices
Automation	Flow measurement, level control switches, SKADA	Use of machines
Reduction and Carbon and water foot print	Reduction in wastage of pipe and pipe fitting	Use of minimum amount of water / non potable water, reduction in wastage

12. Conclusion

Skill Manpower is required to make mission Make in India a grand success. As per mahatma Gandhi Science and Technology shall be transfer to grass root to make them capable to do the task in a better way. The Institution of Engineers can implement the program of Saksham for the Artisan who came out of five schools of Artisans. It is an opportunity to transfer knowledge and experience to artisan to make them capable to 'Make in India" dream a reality.

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