

ADB CFC Programme



Ceramics Development and Training Complex (CDTC)

Technology Upgradation and Skill Development Company

Ministry of Industries & Production

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(A company setup under Section 42 of Companies Ordinance 1984 having capital share)

Introduction:

CDTC (The Ceramics Development and Training Complex) is being established by TUSDEC (Technology Upgradation & Skill Development Company) in Attawa, a suburb of Gujranwala. The project is sponsored under the Asian Development Bank (ADB) CFC Programme and has been approved by Government of Pakistan. It targets Pakistan's main Sanitaryware Cluster located in and around Attawa. For an accurate need assessment of this sector of the ceramics industry, a series of visits to the factories were carried out followed by meetings with industrialists, experts and academics. The following emerged:

- The staff was found generally not sufficiently educated for technical jobs
- The use of inefficient and ill-designed kilns wasting lots of heat energy
- The use of substandard clays, Plaster of Paris and other materials
- A general absence of laboratories for testing of raw materials, finished products and for quality assurance
- A lack of motivation to improve quality
- Rewards to workers and working environment was not to industrial standards
- The existing vocational institutes serving this industry were found ineffective due to financial constraints

Due to the above problems, the industry is unable to capitalise on its strengths without a major intervention. Inefficient production technology is a vicious circle which increases the cost of production due to losses and reduces profitability. According to the survey, about 25% of the material is wasted due to these poor production facilities.

Productivity has also suffered directly due to the lack of skilled labour and Industry Sources indicate a reduction of 5 to 10%. The existing technical vocational training system has been unable to cater to the challenges or meet the dynamic training requirements of trade and industry. Furthermore, these institutes have now become obsolete due to their remoteness from the industrial clusters. Except a few, almost all of the current human resource has learned on the job without any formal training. A productive and innovative workforce is an essential for the success of an industrial sector in today's era of globalisation. This low productivity and lack of skills has resulted in failure to produce competitive products or to enhance quality or increase productivity. Of great concern is the increase in sanitaryware imports into the country.

An intervention in the form of a Common Facility Centre near or in the industrial cluster will not only prevent further decline but will help meet the challenges through constant interaction and bring competitiveness to the sanitaryware industry of Pakistan.

Vision:

Set up a 'Common Facility and Training Centre' with the name 'Ceramic Development and Training Complex' (CDTC) to provide practical 'factory level' training facilities and equipped with a state-of-the-art kiln, associated equipment, testing laboratory, R&D facilities as well as an up to date library. The Common Facilities will demonstrate energy efficient kiln technology to enable adoption and bring improvement in the local sanitaryware cluster to develop a competitive edge in the local and global market.

To regain lost ground and upgrade to contemporary technology the cluster member industries wish to upgrade by investing in technology and hiring trained manpower, but face major problems in finding an institute able to assist them in overcoming the lack of contemporary know-how and be a source of skilled technicians and labour.

CDTC is to address this problem and will provide need-based human resource development; demand-based technical assistance and support to the industry. This includes technical training with a focus on manufacturing and management training in various disciplines.

The trained manpower and engineering services provided will enable the industry to produce quality products, with the added advantage of reduced turnaround time and costs. The project will match the "Engineering Vision" adopted by the Government of Pakistan. Furthermore, the centre will contribute towards poverty reduction as it will produce a skilled workforce so that they can move to good value employment.

Objective:

The Ceramic Development and Training Complex will provide common facilities to the sanitaryware cluster and produce trained technicians, diploma holders and skilled workers. It will house modern equipment, machinery and an energy-efficient kiln. This machinery and equipment will be used for replication as well as for training and for providing exposure to contemporary technology through hands-on experience which can be applied in their own factories. The efficient kiln will enable the industry reduce energy losses (current energy losses are between 30-50%) and also facilitate production of better quality products at lower cost. This will contribute towards making local products globally competitive.

It will also have R&D facilities for product and process innovation, pattern and mould-making & design as well as testing laboratory for ceramics. CDTC will be home to a forum of experts for assistance to industry

Teaching of Students:

A major skill output of CDTC will be ensured by inducting 30 students annually. These students will be trained for a 3-year diploma in ceramic technology, along with 'on the job training' in all disciplines of sanitaryware production. The diploma course is scheduled to start after 2 years of operation.

Training for Workers:

CDTC will provide training in different skills to workers and the schedule will cover all areas of sanitaryware production. The duration of training courses will range from 3 months to 1 year. A total of 256 ceramic professionals will be trained on a double shift basis (7AM to 2PM & 2PM to 10PM) each year.

Hence, in a span of three years, the complex will provide 768 trained workers possessing various important skills to the industry to help enhance competitiveness and productivity.

Testing and Design Laboratory:

The laboratory will be equipped with latest equipment for testing ceramic raw materials and finished products. The laboratory will train students to carry out tests and will also be engaged in testing of materials and finished products.

There will be a product design section to assist industry in developing new products using contemporary CAD/CAM techniques. New product patterns and moulds will be fabricated and after trial production, made available to the industry. Such facilities are virtually non-existent at the moment and will enable the industry to achieve consistent quality and meet international standards which is a pre-requisite for export.

Forum of Experts:

A forum of experts available in the CDTC will provide consultancy services to local industry as required, ranging from new product development to trouble-shooting daily quality and production issues. This forum will hold seminars, conferences, meetings on ways to enhance productivity, improve product quality and on new developments.

Building:

Offices, Design & Precision Laboratory and Teaching Area:

A Pre-Engineered Building (concrete foundation supporting a steel structure) with a total covered area of approx 50,000 sq ft or 4,650 sq mtrs will be constructed.

The Office, Precision Laboratory and Teaching Areas will be on 2 floors (mezzanine and ground) using an open-plan modern layout with the conference rooms and classrooms partitioned using glass/transparent panels. The office upper floor will overlook the workshop area using glass/transparent panels. The lower floor will also allow viewing of the workshop area as well as provide personnel access. This area will also house the sensitive laboratory

testing equipment as well as the CAD/CAM based design centre. This area will also house the cafeteria and library.

The area will be constructed using closer span steel columns within a full single span building and be air-conditioned through Central HVAC or localised air-conditioners. As the CDTC location suffers from dust storms and is otherwise dusty, the building will be protected from dust incursion

Workshop Area:

The workshop area will be divided in two portions: One, to house equipment and machinery such as kilns, automated facilities for sanitaryware mould preparation, injection casting machines and benches, battery casting systems etc. The other, for the Testing Laboratory capable of testing composition and analysis of raw materials, strength, breakage, gloss tests and other tests for ceramic materials and finished products. It is envisaged that any precision equipment and the CAD/CAM design centre for mould and pattern-making will be located in the office areas.

The workshop will be a single span area on one (ground) floor. It will include areas for stores, facilities/utilities, goods inwards/outwards, loading and unloading dock etc. The goods/inwards loading dock gate (motorised sliding gate with manual operation in absence of electricity) will allow a container-laid vehicle to enter. The flooring will be epoxy painted and the foundation designed for the machinery and equipment loads.

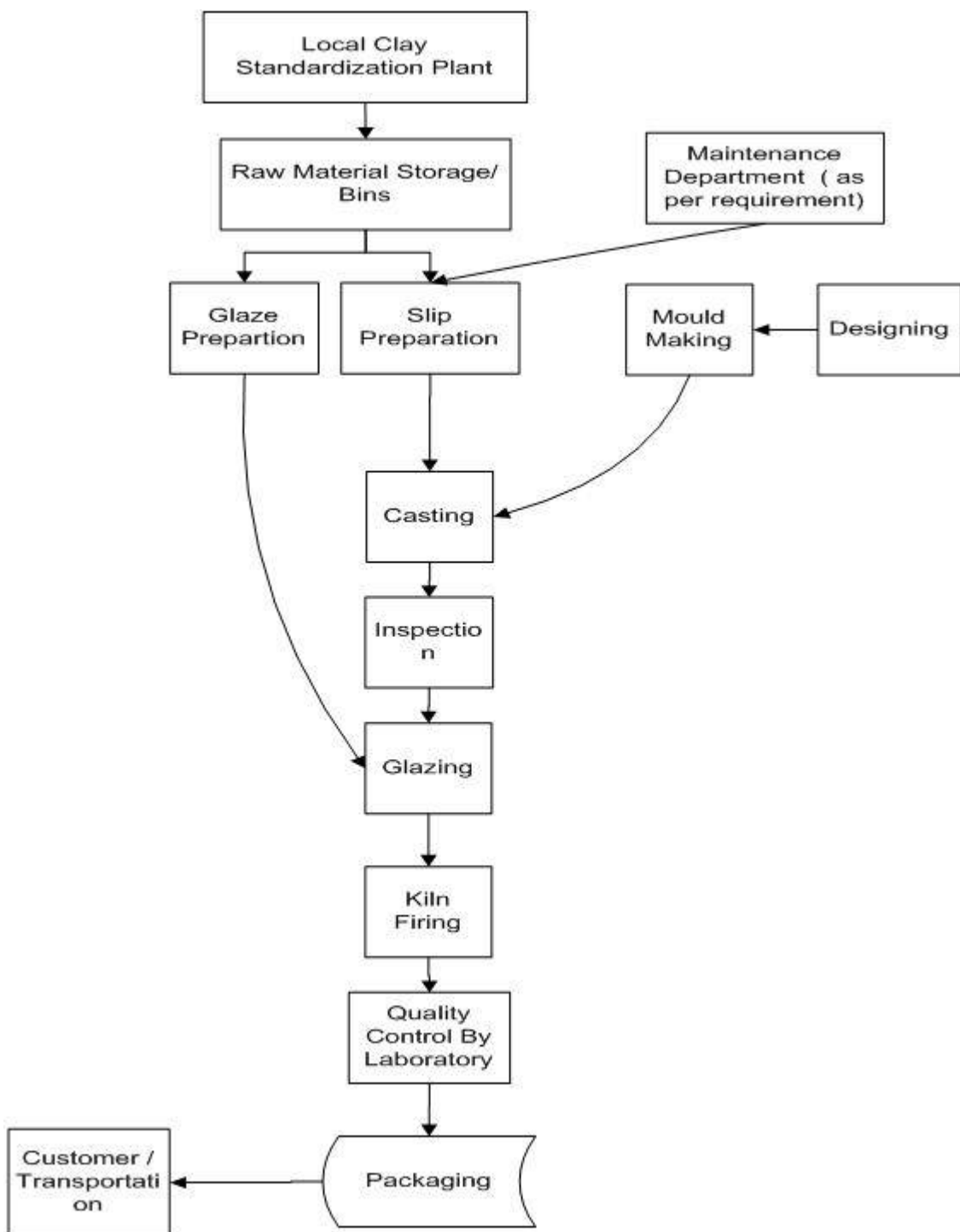
The walls and roof will be suitably insulated using polyurethane insulation or equivalent sandwiched through pressure injection between galvanised high-resilient steel sheets. The working environment will be controlled by exhausting heat and any dust producing activity. Heat generated will be conserved for other applications.

Others:

An external water storage and supply well will be constructed. The raw material bulk storage will be external under appropriate sheds. Sewage disposal will be via a soakage pit.

Facilities:

Manufacturing Process Flow for Sanitaryware



Sanitaryware Production Flow Diagram

As the CDTC is a CFC for the improvement of the cluster, it will house contemporary equipment to provide not only common facilities but also serve as a benchmark for the cluster. The center will focus on helping remove the following technical weaknesses of the cluster:

- Inefficient firing of kiln
- Primitive techniques for plaster mould preparation
- Poor casting techniques
- Lack of testing facilities

The CDTC will assist the cluster in countering the above mentioned problems by:

1. Housing a modern, efficient, well-designed 'economy of scale' Shuttle Kiln that will provide efficiency to the process. This will help industry in cutting down firing costs by demonstrating reduction in losses, improvement in the quality and optimal utilisation of the process.
2. Automated facilities for plaster mould preparation. This will enable the cluster to produce complicated and innovative designs, improve dimensional control and help in increasing product strength.
3. High pressure injection casting machine is state-of-the-art machinery which is non-existent in Pakistan. It improves the product quality and brings efficiency to the production process.
4. Casting benches will introduce new casting techniques to improve product quality by bringing uniformity and increased production rates.
5. Increased productivity through an implemented Battery Casting System will be demonstrated for use and replication
6. Testing facilities for composition and analysis of the raw material and strength, breakage and gloss tests for the final product.
7. Product design using CAD/CAM techniques to reduce 'time to market' and speed up the pattern making and mould-making process.

CDTC Machinery and Equipment

S/No	Process and Machinery
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	Slip Preparation
1.	Ball Mills (6 * 6) feet
2.	High Speed Blunger
3.	Slow Speed stirrer
4.	Vibration sieves
5.	Shifting pump
6.	Piping
7.	Overhead tanks
8.	Balance
9.	Ferro Filter
	Glaze Preparation
10.	Ball Mill (4 *4) feet
11.	Ball Mill (3*3) feet
12.	Ball Mill (3*3) feet
13.	Pot Mill
14.	Ferro Magnet
15.	Sieve
16.	PVC Plastic Tanks
17.	Glazing Booths

S/No.	Process and Machinery - continued
	Casting Benches
18.	Casting Benches
	Mould Making / Model Making
19.	Modelling wheel
20.	Plaster mixing machine
21.	Modelling tools
	Others
22.	Glazing Guns
23.	De-dusting booths
24.	Set of tools for inspection
25.	Digital scale (200, 100, 5, 1 kg)
26.	Jaw Crushers
27.	Dis integrator
28.	Drying stands
	Clay Standardization Plant
29.	High Speed blunger
30.	Vibration sieves
31.	Filter press
32.	Pump
33.	Filter cloth
34.	Piping
35.	Over head tank
	Casting Plant
36.	Battery Casting
37.	High Pressure Casting
38.	Accessories
39.	Automated Casting Benches
40.	Plaster Mould Making Machines
41.	Drying Inspection and Glazing Booths
	Firing
42.	Shuttle Kiln

CDTC Laboratory Equipment

List of Laboratory Equipment	
S/No	Item
1	Measurement of water absorption in fired pieces by vacuum method
2	Gallenkamp Torsion viscometer for viscosity of slips and slurries
3	Optical microscope
4	100 ton hydraulic press
5	Laboratory ball mill
6	Particle size distribution analyzer
7	zeta potential meter
8	Brookfield viscometer for viscosity of slips and slurries
9	Strength testing equipment
10	Thermal shock resistance testing apparatus
11	Electric furnace for up to 1450 C with 12"*12"*12"
12	Gas fired kiln 24"*24"*24" for up to 1450 C
13	Portable Ph meters
14	X-ray fluorescent analyzer for chemical analysis
15	Lehmann viscometer
16	Differential thermal analyzer (DTA) with TG, TGA for up to 1450 C
17	TGA
18	Flame photo meter
19	Lab bench stirrers
20	Analytical balance with double digit reading
21	Platinum crucible with lid
22	Platinum dish
23	Vernier calipers
24	Digital weight balance (0.0001 gm)
25	Optical pyrometer
26	Blowers
27	Vacuum pumps
28	Sieve sets
29	Large size lab dryer for drying cast cast sanitary ware
30	Modulus of rupture machine
30	Permanent Ferro filter
31	High speed screens with electro vibrators
32	Electro rapid screen velox

Installed Capacity:

In three years of operation, output of the Complex will be:

- **CFC Section**
Around 23,000 machine hours will be available to the industry lying in the Sanitaryware cluster of Gujranwala.
- **Testing Section**
2300 tests
- **Training Section**
Total of 768 qualified workforce will be trained during the three years of operation. Admissions will be given to 30 students for a three-year diploma in Ceramics after two years operation of CDTC.
- **Consultancy**
The center will provide consultancy services/year to the industry as per industry requirement in areas of:
 - Solve production problems
 - Initiate new designs and techniques
 - Keep pace with new developments
 - Improve quality
 - Enhance productivity: optimize costs, reduce wastage

The total number of consultancy jobs will be 50.

Benefits:

Education

CDTC will educate workers on the importance of clean, healthy and safe work environment. One of the prime focus of training will be work ethics. This will enhance the skills and value of these workers resulting in better job prospects and salaries. Ceramics Complex shall train 256 persons and 30 persons having a three year diploma in Ceramics annually.

Self-Sustaining:

CDTC shall generate revenue to contribute towards its recurring expenditure from technical assistance, advisory services and training.

Employment generation:

CDTC will provide direct employment to 41 people. In addition, it will create employment indirectly in other sectors ranging from goods and public transport to suppliers of raw materials. Small vendors and local shops will also benefit. Training at the center will enhance skills of existing industrial workers as well as train new manpower. This will help build a high-value and skilled workforce for the regional industry.

Management:

TUSDEC will form a public-private partnership overseen by an executive committee to look after the operations of PESC composed of one-third members from the public sector and two-thirds from the private sector. The Project Monitoring Unit already established in TUSDEC as part of the ADB CFC Programme will supervise and monitor the project.

Original Concept Paper:

This project was originally conceived as the Ceramics Development Centre (CDC). Later it was transferred as part of the ADB CFC Programme and named the Ceramics Development and Training Complex. The original concept paper may be viewed in pdf format: [[Click Here](#)]