

VOCATIONAL TRAINING REPORT

Industrial training through GKS

NAME OF THE COLLEGE:

L. D. COLLEGE OF ENGINEERING, AHMEDABAD

Name of the Training Institute:

Central Glass Ceramic Research Institute (CGCRI), Ahmedabad

Name of the Training:

Manufacturing of Ceramic Tiles

Branch: Chemical engineering

Number of students: 20

Fees per Participant : Rs 11,800/-

Planned Expenses : Rs 2,36,000/-



**Name of the Institute: Central Glass Ceramic Research Institute (CGCRI),
Ahmedabad**

Name of the training: Manufacturing of Ceramic Tiles

Date: 31 / 07 / 2023 - 04 / 08 / 2023

Total hours: 40 Hours

Name of students who attended from L.D.C.E., Ahmedabad

Sl. No	En No	Name	Branch
1	210280105001	Krish Hitendrabhai Bhimani	Chemical Engg.
2	210280105009	Zeel Patel	Chemical Engg.
3	210280105006	Navneetkumar Singh	Chemical Engg.
4	210280105017	Sujal Sapariya	Chemical Engg.
5	210280105046	Singh Foram Kumendrakumar	Chemical Engg.
6	210280105055	Channa Jaydeep Rajeshkumar	Chemical Engg.
7	210280105036	Dey subhankar Swapan	Chemical Engg.
8	210280105058	Chaundhary happy Bikhabhai	Chemical Engg.
9	210280105011	Tailor Megh Bipinbhai	Chemical Engg.
10	210280105037	Savaliya Vaidehi Vinodbhai	Chemical Engg.
11	210280105022	Chhodavadiya Harshkumar Hareshbhai	Chemical Engg.
12	210280105064	Mayankkumar Rathva	Chemical Engg.
13	210280105015	Godhani Jayraj Nileshbhai	Chemical Engg.
14	210280105050	Tirth shah	Chemical Engg.
15	210280105024	Vekariya Dixit	Chemical Engg.
16	210280105003	Pansuriya Dhruvan Dineshabhi	Chemical Engg.
17	210280105010	Urvi Sharma	Chemical Engg.
18	210280105027	Pethani Harshail Shaileshbhai	Chemical Engg.
19	210280105008	Mangroliya uttam	Chemical Engg.
20	210280105028	Sabhgya Prince Nileshbhai	Chemical Engg.

Training Schedule

Time	Program Description	Name of Person / Team members
Day 1 – 31/07/2023 (Monday)		
Day 1 09.30-10.30 AM	Registration, Attendance	Dr. ATA
Day 1 10.30-11.30 AM	Welcome address Inauguration of the program by lamp lighting. Information about CSIR CGCRI	SIC, Team CGCRI NC
Day 1 11.30-01.30 PM	Lecture - Introduction to dust-pressed ceramic tiles	HKK, PA
Day 1 1.30-2.00 lunch	Lunch break	
Day 1 2.00-4.00 PM	Lecture- Various raw materials used in the production of ceramic tile bodies	Dr. ATA, Alpesh, Sanjoy
Day 1 4.00-4.15 PM	Recess	
Day 1 4.15-6.15 PM	Quality Specifications and Testing of tiles as per standard BIS, ISO test methods – Part I	Mr. Abhijit Prasad, Mr Rajesh Parekh
Day 2 – 01/08/2023 (Tuesday)		
Day 2 9.30-12.00 AM	Lecture- Body composition of different types of tiles and Tile manufacturing process flow chart	PA, HKK
Day 2 12.00-1.30 PM	Demonstration- Batch making, weighing of raw materials, moisture correction, batch charging, blunging for wall tile and ball milling for vitrified tiles, grinding	Alpesh, Rajesh, PA
Day 2 1.30-2.00 PM	Lunch	
Day 2 2.00 -4.00 PM	Demonstration continued Lecture- Different Equipment used in slip house, Ball milling process and its efficiency	HKK, PA
4.00-4.15	Recess	
Day 2 4.15-6.15 PM	Demonstration- granule preparation Lecture- working of spray dryer	Dr PA, Alpesh, Naresh
Day 3 – 02/07/2023 (Wednesday)		
Day 3 9.30-01.30 PM	Lecture & Demonstration- unloading checks prior to the unloading of body, liter wt. residue fluidity, PSA, unloading, and sieving, demagnetizing, aging of slurry, dewatering by filter pressing, spray drying, storing and ageing of granules, moisture checking.	Dr. ATA, PA, Sanjoy, alpesh,
01.30-2.00	Lunch Break	
Day 3 2.00-3.30	Pressing of tiles and its process control parameters	Alpesh / Parvesh/ Naresh
3.30-3.45	Recess	

Time	Program Description	Name of Person / Team members
Day 3 3.45-5.15	Demonstration- Pressing of tile specimens, small die and Gabrielle both, Granulometry, moisture control, operation of tile press, specific pressure, pressing of tiles, pressing expansion, storing of articles for drying.	HKK, PA, Rajesh, Naresh
Day 3 5.15-6.15 PM	Demonstration- Biscuit firing in roller kiln	Abhijit, Alpesh
Day 4 – 03/07/2023 (Thursday)		
Day 4 9.30-12.00 AM	Lecture- Glaze and engobe raw materials for tiles their functions and application of glaze. Demonstration- application of glaze and engobe by spraying, dipping	Dr. Asha Sanjoy Alpesh
Day 4 12.00-01.30 PM	Lecture- Effect of heat on the ceramic body	PA, Abhijit, Sanjoy
1.30-2.00	Lunch break	
Day 4 2.00-3.00 PM	(Lecture) Different types of kilns used in tiles manufacturing; roller and tunnel, kiln construction and their important features	Abhijit Alpesh Parvesh
Day 4 3.00-4.00 PM	Demonstration- Glost firing in roller kiln	Do
4.00-4.15	Recess	
Day 4 4.00-6.15 PM	Quality Specifications and Testing of tiles as per standard BIS, ISO test methods – Part II	Mr Haresh Kundariya, Mr Abhijit Prasad, Mr Rajesh Mr Sanjoy
Day 5 – 04/07/2023 (Friday)		
Day 5 9.30-10.30 AM	Lecture-determination of firing schedule by TG DTA, irreversible dilatometry	ATA, PA
Day 5 10.30-12.30 AM	Lecture and Demonstration of General Measurement System for TILES	Dr. AGJ, Naresh, Sanjoy
Day 5 12.30-1.30 PM	Lecture- different decoration techniques, vitrified tile polishing, cutting and rectification, defect analysis	HKK,
1.30-2.00	Lunch	
Day 5 2.00-4.00 PM	Assistance for employment	PMS
Day 5 4.00-4.30 PM	Evaluation / exam,	ATA, PA
Day 5 4.30-6.00 PM	Concluding session; feedback, certificate distribution	Team CGCRIN C

About the tile manufacturing training:

- Lecture based on the tile manufacturing: - raw materials such as plastic & non-plastic raw materials.
- Plastic raw materials contains:-
 1. China clay (primary clay)
 2. Ball clay (secondary clay)
 3. Fire clay
- Non-plastic raw materials such as:-
 1. Calcium silicate minerals such as calcite, dolomite & wallastonite
 2. Feldspar such as soda, potash, calcium feldspar
 3. Quartz & sandstone
 4. Sodium carbonate used as a deflocculates
 5. Sodium silicate
 6. Talc (magnesium silicate)
 7. Zircon
- Understood the standardization according to BIS, IS standards for plastic & washed plastic clays (as per IS4589:2002) and classification of dust pressed tile based on water absorption in IS15622:2017.
- Then, basically two types of tiles manufacturing: -
 - Ceramic tiles-
 1. Floor tiles
 2. Wall tiles
 - Vitrified tiles-
 1. Glazed vitrified tiles
 2. Double charged vitrified tiles
- Further, batch preparation for tile which includes selection of raw materials, weighing, ball milling or grinding of materials.
- After grinding the materials some properties of slurry were analyzed such as particle fineness, litre weight, fluidity etc.
- Various types of equipment were used in slip house which includes vibro sieves, electromagnets, big size ball mills, slip pumps, spray drier and weighing balances.
- Dry pressing of the granules which are suitable for making tablets which content moisture about of 5-6 % & the pressed at specific KN loads in die pressing machine.
- Explained about the spray drier for making granules from the slip and discussed the working principle and construction of drier.

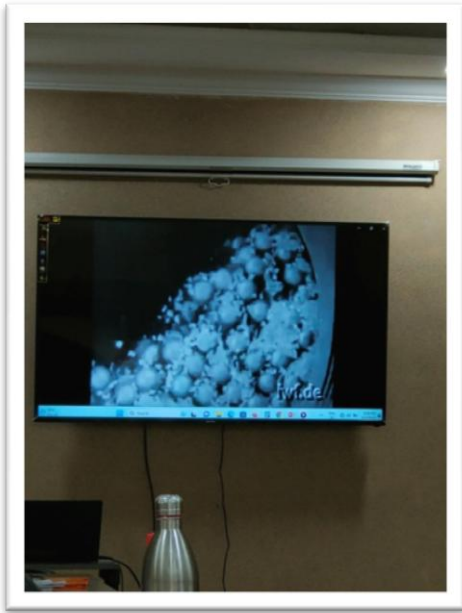
- Learned about the significance of pressing in tile industry, then parameters, types of pressing and after pressing, properties enhancement measured by analyzing physical properties of specimens.
- Brief discussion and explanation about the tunnel kiln and roller-hearth kiln which were widely used in tiles industry but nowadays, most widely used furnace is roller kiln based on various advantages.
- Demonstration on roller kiln operation: - biscuit prepared from die casting and tile pieces with engobe and glaze were applied on upper surface & then, fired at 1080°C in 60 min duration final product is produced.
- Lecture on the engobe and glaze materials & then, its properties, preparation and its application were discussed.
- Learned about the frit glazes and its types & preparation of these glazes.
- Based on BIS, ISO method or testing of tiles grouped into physical and chemical resistances analysis of tiles and glazed tiles.
- Physical test such as MOR, bulk density, water absorption, apparent porosity, deep abrasion of glazed tiles, surface abrasion, hardness etc.
- In chemical testing which includes stain resistance analysis and chemical impact from acids, detergents, soaps and other components was determined.
- Demonstration on the PSA (particle size analysis) for slip to check the particle size and fineness of the slurry.
- Different types of colored glaze, decoration carried out from 3d-printing such as wooden, matt, and glossy and other designs on vitrified tiles & wall tiles.
- Exposure based on cutting & polishing of tiles or slabs in tiles industry by video clips.
- After firing and cycle of firing of tiles which creates defects in sample during heating to cooling stage in furnaces due to many reasons.

Photographs:



- At the conference room for lecture session





• Lecture on ball mill



#lecture on sieving of slip



• Granules of slip from spray drier



#granulator machine



• Taking a lite weight of slip



sieving and demagnetizing of slip



- **Checking fluidity**



- **#roller-hearth kiln firing of samples**



- **Unglazed & glazed samples & tablet for firing**

- **#fired sample with defects**



- **Tablet formation machine demonstration**



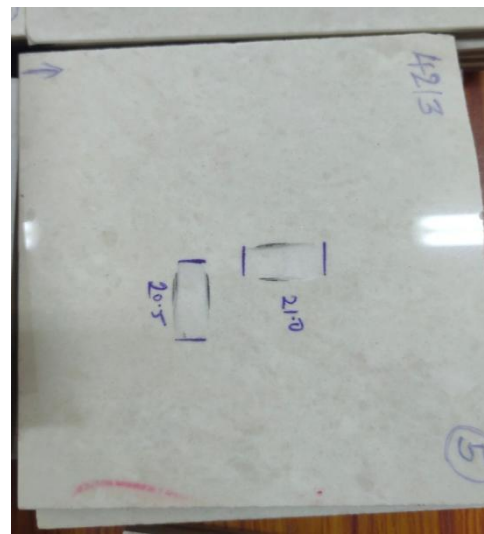
- Exposure on PSA



- #exposure on Micrometer screw gauge



- Surface abrasion sample



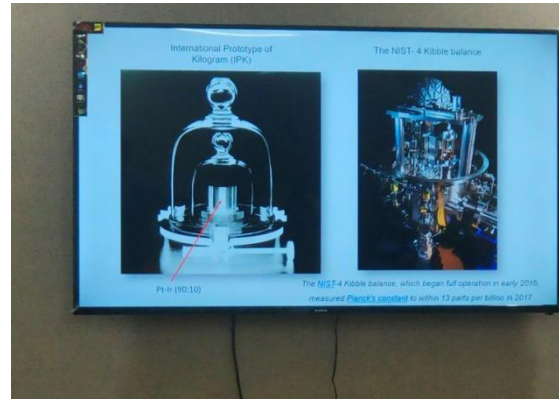
- #Deep abrasion sample



- Warpage, flatness & rectangularity Testing apparatus



- #Hardness checking stone samples for Tiles



- Lecture on SI units

#IPK & NIST-Kibble balance for highly accurate
Weight measurement for 1KG system
