TECHNICAL REQUIREMENTS

For projection of distributor and 4 feeders of Glass Furnace No. 5

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| Item | List of Requirements and General Information | | General Information |
| 1 | Basis for work | | Disposal of RATM Holding N91 of 26/06/19 |
| 2 | Name of the industrial site of the facility | | 8a, Dargomyzhskogo Str., Novosibirsk |
| 3 | Name of the facility | | Glass furnace No. 5 (building 21, tag No. э 0244534) |
| 4 | Objective | | Production of 375 tons / day brown glass (brand KT), the launch of the production line 5.0 |
| 5 | Facility specification | 5.1 | The production complex for the production of glass containers made of amber glass (KT), green glass (ZT), flint (BT), which includes a glass furnace - 1pc, production lines - 4 pcs. |
| 5.2 | Product type: 0.1–1 l glass containers manufactured from KT, ZT, and BT glass by PB, BB, and NNPB methods in the double-gob mode and triple-gob mode. |
| 6 | Design basis | 6.1 | Type of furnace - regenerative with horseshoe-shaped flame direction. Capacity - 375 t / day |
| 6.2 | Location: Glass Manufacturing Complex (GMC-3), lines 3–10, D-J  The layout of all feeders and furnace is shown in the attached drawing СК-21.19.02.000ТП  It is planned to upgrade the existing distributor and feeders of lines 5.1, 5.2, 5.3, as well as to attach a new feeder for the new machine 5.0. |
| 6.3 | Glass type: KT, ZT, BT soda-lime glass.  The ratio of batch and cullet-70: 30 |
| 6.4 | Heat transfer medium: natural gas, Hu = 8300 kcal/Nm3 |
| 6.5 | Glass parameters:  Amber glass  - The total light transmission is not more than 33% at a wavelength of 600 nm on a sample thickness of 3mm  Dark amber glass  General light transmission, average value not higher than 30% at λ = 550 nm for thickness 2-mm;  Green glass  The total light transmission is 30% at wavelengths-520-560 nm on a sample thickness of 3 mm  Flint glass  The total light transmission is not lower than 80% at wavelengths of 400-700nm for a sample thickness of 3mm. |
| 7. | Requirements to distributor and feederss | 7.1 | Development of the design of the distributor, with the provision of conditioning glass to the required temperature level in a given range of feeders performance according to claim 7.2 in the production of glass grade flint, green, amber. Exclusion of stagnant zones worsen the uniformity of the color of glass in the production of the grade of amber and green.  The design of the working channel: - must provide conditioning of the glass melt to the required level of temperatures in a given range of performance of feeders in accordance with claim 7.2 for the production of brown, dark brown, green and flint; - should exclude the formation of stagnant zones worsening the color homogeneity of the glass mass. |
| 7.2 | Planned performance of feeders:  Feeders 5.1, 5.2, 5.3 – 65-95 t / day  Feeder 5.0 – 100-150 t / day  The required temperature at the inlet of the feeder 1160 – 1260°C  The required temperature of spout (gob) 1130-1160°С |
| 7.3 | To cool the glass, use only radiation cooling or indirect cooling of the glass through the bottom or through a partition to avoid direct contact of the cooling air with the glass.  Provide separate temperature control of the right and left sides of the feeders.  Coefficient of homogeneity of the glass of the grade of amber and green in the feeders more than 96%.  Coefficient of homogeneity of the glass of the grade of flint in the feeders more than 96%.  Use of mixers in the last section of the feeders.  Provide an opening for the laser level transmitter in the distributor.  use in each feeder unit for drainage (option).  Give a conclusion on the need to transfer the entrance to the feeder 5.2. on the right side of the distributor channel. |
| 7.4 | Temperature measurement by thermocouples loaded in glass melt, with temperature indication, with accuracy of 0.1°C.  Providing automatic maintenance of temperatures in a given range with an accuracy of ±0,5°C, the ability to work in manual mode.  Ensuring that the gas / air ratio is maintained over the entire operating range with an accuracy of 0.1%O2 for new equipment.  Ensuring the constancy of the glass level, when changing the performance of the feeder within the limits specified previously, no more than 10 mm in the bowl.  Using of three triple thermocouples in the last section of the feeder.  Automatic calculation of homogeneity factor.  The temperature homogeneity of the glass in front of the bowl is determined by the values of 9 points (3 PCs.\*3-level thermocouples installed in front of the spout according to the formula - THI = (1- sum of horizontal abs differences and vertical highhest and lowest triplexs differences/highest value of centre triplex)\*100.  Possibility of remote access to the control system interface for monitoring and analysis without the possibility of mode adjustment.  Plotting graphs with arbitrary data and arbitrary scales.  Alarm on the output of adjustable parameters beyond the specified limits.  The control system must be operated by a single operator. |
| 7.5 | Checking the effectiveness of design decisions by the results of mathematical modeling |
| 7.6 | Specification of delivery:   * design documentation of refractory masonry * design documentation of metal structures * design documentation of gas supply, air and power supply * description and schema of the automatic control system * manual in Russian * automatic control system of the distributor and feeders * heating feeder feeder 5.0. and extension of the distributor (gas manifold, feeder’s burners, connecting hoses ) * gas-regulating installation of the feeder 5.0 and extension of the distributor * gas-mixing station of the feeder 5.0 and extension of the distributor complete with fans * technical solutions for the modernization of the control system * technical solutions for the modernization of equipment (heating system, cooling system of the upper structure, etc.) * final report on the results of mathematical modeling of feeders in different modes of production   The estimated cost of modernization the distributor and feeders:   * refractory masonry * metal structure * modernization of the control system * modernization/replacement of equipment (heating system, cooling system of the upper structure) * - spare parts for 1 year trouble free operation. |
| 8. | Need to save | 8.1 | Existing supporting metal structures of distributor and feeders 5.1, 5.2, 5.3 |
| 8.2 | Existing gas-mixing station of the distributor and feeders 5.1, 5.2, 5.3 |
| 8.3 | Existing gas-lines, gas collectors, hoses and burners |
| 8.4 | Existing service platforms |
| 9. | Chief installation, debugging and training | 9.1 | Documentation must be in Russian |
| 9.2 | Provide necessary chief installation of refractories and metal structure |
| 9.3 | Gas-using equipment must be certified in the territory of the Russian Federation |
| 9.4 | Measuring equipment must be entered in the state register |
| 9.5 | Provide supervision of heating-up of the distributor and feeders, adjustment and starting to work |
| 9.6 | Provide the training of operating personnel |
| 10. | Project implementation period | | January - February 2020 |