Normal operation of gas-consuming equipment at coke plants mainly depends on stable pressure in the line supplying coke-oven gas (the delivery system). The fluctuations of the flow rate and the corresponding change in gas pressure in the coke-oven gas line depend on the operation of the coke batteries and the other gas consumers in the system.

Variable coke-oven gas flow rate associated with switching in the coke-furnace heating system and the operation of other gas consumers leads to considerable pressure fluctuations in the line. The actual pressure fluctuations exceed the permissible value, and hence special means of pressure stabilization are required. Such measures include the introduction of regulators and compensators.

The gas pressure in the lines on the battery side is limited by the sealing of the heating system. On heating by coke-oven gas, as a rule, it is no more than 2.5 kPa. For safety reasons, when the gas pressure in the lines falls to 0.5 kPa, heating is automatically shut down. For normal operation of the coke-furnace heaters, a limiting gas pressure of ~7 kPa is established in the external gas lines.

At coke plants in Ukraine and Russia, the pressure growth of the coke-oven gas in the corresponding supply line is limited by means of regulating gas-discharge units, in which the gas is burned off when the limiting pressure is exceeded. The coke shop at OAO Zaporozhkoks includes four coke batteries with a dust-free coke-supply system: two batteries characterized by 41.6-m³ furnaces, with bottom heating-gas supply and regulation (in operation since 1980 and 1981, respectively); two batteries characterized by 21.6-m³ furnaces, with lateral heating-gas supply (in operation since 1983 and 1984). Coke-oven gas is used for furnace heating. Table 1 presents some coke-battery characteristics.

The gas-distribution system for coke batteries 1 and 2 includes two gas lines along the sides of the batteries, turnoff and switching valves, collectors, connectors with adjustable components, and vertical gas channels. As for the heating channels, there are 32 vertical channels: 16 on the machine side and 16 on the coke side. The switching valves supply heating gas to the even (odd) groups of vertical channels and supply air for soot removal to the odd (even) vertical channels. Every 20 min, the gas flows are reversed, and air for soot removal is supplied to the channels that previously transported the heating gas.

Switching the gas flow takes ~2 min, including the pause: 15 s for closing the valves; a 90-s pause; and 15 s for opening the valves.

At furnaces with lateral gas supply, the distribution of heating gas from the gas lines to the sides of the battery involves a relatively short line that runs from the distributor line (with shutoff and switching valves), passes through a flexible line and a short vertical stand-pipe, to the gas conduits. The flows are reversed every 20 min by a switching winch. The time for the winch to turn is ~60 s. For 15–20 s (the pause in switching), no heating gas is supplied. There are two gas conduits in each wall: one to the even heating channels, and the other to the odd channels. In one part of the switching cycle, heating gas is supplied to the conduit; in another, air is supplied for heating.

At the furnaces with bottom gas supply, reverberation may be noted on switching the fluxes in the gas-supply system. Depending on the conditions, there may be different reverberation patterns, mainly without consequence. In some cases, the coke-oven gas burners in the base of the heating channel may break away, and there may be loss of sealing of joints in the gas system. The reverberation in the system is associated both with its gas tightness and with the hydraulic conditions and the duration of the pause in the switching cycle. With a longer pause, reverberation in the system is less likely when the gas fluxes are switched.
In practice, in response to the sharp pressure rise in the gas line due to the pause when switching the heating-system fluxes, the excess coke-oven gas is burned off at the gas-discharge unit.

For OAO Zaporozhkoks, the limiting pressure at the gas-discharge unit is 7.8–8.2 kPa. The precise value depends on the operating conditions of the system that traps the coking byproducts.

Table 2 presents the furnace runs in batteries 1, 2, 5, and 6 and the gas consumption at the discharge units. It is evident that, for furnace runs from 16.6 to 23.03 h, the mean losses at the gas-discharge units are 4620 m$^3$/h, with fluctuation from 1560 to 10790 m$^3$/h.

To eliminate or minimize the heating-gas losses at the discharge unit, the gas flow rate in heating the coke furnaces is maintained constant by regulating the pause in the switching of batteries 1 and 2 and 5 and 6; or by redistributing the coke-oven gas during the pause in switching from battery 1 (2) to another battery.

The basic conditions when introducing a controlled pause in switching are as follows:

Table 1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Batteries 1 and 2</th>
<th>Batteries 5 and 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furnace-heating system</td>
<td>Dust-free coke supply with bottom gas/air supply</td>
<td>Dust-free coke supply with lateral supply</td>
</tr>
<tr>
<td>Heating gas</td>
<td>Coke-oven gas</td>
<td>Coke-oven gas</td>
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<td>Coking-chamber dimensions, mm:</td>
<td></td>
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</tr>
<tr>
<td>length</td>
<td>16000</td>
<td>13980</td>
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<tr>
<td>height</td>
<td>7000</td>
<td>4300</td>
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<tr>
<td>width</td>
<td>410</td>
<td>410</td>
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<tr>
<td>Useful coking-chamber dimensions, m$^3$</td>
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<td>Number of heating channels</td>
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<td>Distance between the heating-channel axes, mm</td>
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<td>480</td>
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<tr>
<td>Heating level, mm</td>
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<td>700</td>
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<tr>
<td>Number of gas collectors</td>
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<tr>
<td>Number of charging holes</td>
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<tr>
<td>Projected run length, h</td>
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<td>15</td>
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<tr>
<td>Projected coke output (6% moisture content), 10$^3$ t/yr</td>
<td>910</td>
<td>440</td>
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Table 2

<table>
<thead>
<tr>
<th>Month</th>
<th>Furnace run (h) for battery</th>
<th>Gas consumption at discharge unit</th>
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<tr>
<td></td>
<td>1</td>
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<tr>
<td>January</td>
<td>22.41</td>
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<td>February</td>
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<td>June</td>
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<td>July</td>
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<td>August</td>
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<tr>
<td>Mean</td>
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<td>20.18</td>
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<tr>
<td>min</td>
<td>21.96</td>
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<tr>
<td>max</td>
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<td>22.20</td>
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