Key investment projects

CAPACITY UPGRADE AND RAMP-UP AT TALNAKH CONCENTRATOR

Norilsk Industrial District, Krasnoyarsk Territory (Polar Division)

In April 2014, massive reconstruction of Talnakh Concentrator entered its main stage. In January 2015, Stage 1 was commissioned, followed by the launch of Stage 2 in May 2016. Decision on launching Stage 3 will be made in 1H 2018.

Highlights

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Maintaining existing capacity at 7.5 mtpa;</td>
<td>- Ramping up capacity from 7.5 mtpa to 10.2 mtpa</td>
<td>- Ramping up capacity from 10.2 mtpa to 18 mtpa;</td>
</tr>
<tr>
<td>- Reconstructing existing flotation capacities and replacing flotation machines that are beyond their useful lives and building a new tailings pit (first phase)</td>
<td>- Upgrading equipment;</td>
<td>- Building the second phase of the tailings pit.</td>
</tr>
<tr>
<td></td>
<td>- Increasing nickel content in nickel-pyrrohite concentrate from 5.8% to 9.5%;</td>
<td>- Investment decision on launching Stage 3 expected in 1H 2018.</td>
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<tr>
<td></td>
<td>- Total CAPEX of ca. RUB 33.7 bn (USD 671 mln)</td>
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</table>
Skalistaya mine

Norilsk Industrial District, Krasnoyarsk Territory (Polar Division)

Increasing ore production from 1.8 mtpa to 2.2 mtpa in 2018 and to 2.4 mtpa by 2024 by stripping and extracting rich cupriferous ore reserves of the Talnakhskoye and Oktyabrskoye Fields.

**Highlights**
- Ore reserves: 65.9 mt
- 2017 CAPEX of ca. RUB 13 bn (USD 216 mln)
- 2018–2024 CAPEX of ca. RUB 65 bn (USD 1.1 bn)

**Average metal content**
- **Ni**: 2.7%
- **Cu**: 3.1%
- **PGM**: 8.0 g/t

**PROJECT SCHEDULE**
- **2016**
  - Production ramp-up to 1.75 mt
- **2017**
  - 152 m sinking of ventilation shaft–10 (total of 1.9 km out of 2.1 km)
  - 322 m sinking of skip-cage shaft–1 (total of 1.7 km out of 2.1 km)
  - Drifting of 4,519 m
- **2018**
  - 500 kt capacity commissioning
  - Completion of ventilation shaft
- **2019**
  - Completion of skip-cage shaft–1 construction
- **2020**
  - Completion of infrastructure construction
- **2024**
  - Production ramp-up to 2.4 mt

Taimyrsky mine

Norilsk Industrial District, Krasnoyarsk Territory (Polar Division)

Increasing ore production from 3.6 mtpa to 3.8 mtpa by 2020 by stripping rich copper-nickel ores at the Oktyabrskoye Field.

**Highlights**
- Ore reserves of: 63.0 mt
- 2017 CAPEX of ca. RUB 5.4 bn (ca. USD 93 mln)
- 2018–2023 CAPEX of over RUB 22 bn (ca. USD 371 mln)

**Average metal content**
- **Ni**: 2.3%
- **Cu**: 3.5%
- **PGM**: 7.3 g/t

**PROJECT SCHEDULE**
- **2016**
  - 300 kt capacity commissioning
- **2017**
  - 1.8 km of underground workings completed and 100 kt of new capacity completed
- **2018**
  - Capacity commissioning (500 kt of rich ore)
  - Upgrading the hoist system at skip shaft No. 3
- **2019**
  - Capacity commissioning (200 kt of rich ore)
- **2020**
  - Capacity ramp-up to 3.8 mt
- **2021**
  - Capacity commissioning (400 kt of rich ore)
Oktyabrsky mine

Norilsk Industrial District, Krasnoyarsk Territory (Polar Division)

Increasing ore production to 5.2 mtpa by 2023 by stripping high-grade, disseminated and cupriferous ores at the Oktyabrskoye Field.

**Highlights**

- Ore reserves of 96 mt
- 2017 CAPEX of ca. RUB 4 bn (ca. USD 69 mln)
- 2018–2025 CAPEX of ca. RUB 6.0 bn (ca. USD 95 mln)

**Average metal content**

<table>
<thead>
<tr>
<th></th>
<th>Ni</th>
<th>Cu</th>
<th>PGM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0%</td>
<td>3.1%</td>
<td>7.6 g/t</td>
</tr>
</tbody>
</table>

**PROJECT SCHEDULE**

- **2017**
  - 7 km of underground workings completed,
  - Capacity ramped up by 250 kt of disseminated ore and 100 kt of rich ore
- **2019**
  - Capacity commissioning (150 kt of rich ore and 700 kt of cupriferous disseminated ore)
- **2020–2025**
  - Capacity commissioning (300 kt of cupriferous ore)

Komsomolsky mine\(^1\)

Norilsk Industrial District, Krasnoyarsk Territory (Polar Division)

Increasing ore production to 3.8–4.0 mtpa before 2020.

\(^1\) excluding Skalistaya mine.

**Highlights**

- Ore reserves of 22.9 mt
- 2017 CAPEX of ca. RUB 1.2 bn (ca. USD 18 mln)
- 2018–2022 CAPEX of over RUB 14 bn (ca. USD 234 mln)

**Average metal content**

<table>
<thead>
<tr>
<th></th>
<th>Ni</th>
<th>Cu</th>
<th>PGM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.5%</td>
<td>1.8%</td>
<td>5.5 g/t</td>
</tr>
</tbody>
</table>

**PROJECT SCHEDULE**

- **2017**
  - Power supply system completed at the southern ventilation shaft
  - Ca. 3 km of underground workings completed
  - 100 kt of rich ore capacity commissioned
- **2018**
  - Completion of the western backfilling shaft reconstruction
  - capacity commissioning (200 kt of cupriferous ore)
- **2019**
  - Capacity commissioning (175 kt of rich ore)
- **2020**
  - Capacity commissioning (225 kt of rich ore and 200 kt of disseminated ore)
The Sulphur Project is the umbrella name for an environmental programme to achieve a reduction in aggregate sulphur dioxide emissions across Polar Division by 75% by 2023 vs 2015.

Developed by a Russian engineering company and based on domestically produced equipment and technologies.

**Copper Plant and Nadezhda Metallurgical Plant (NMP), Norilsk Industrial District, Krasnoyarsk Territory**

**Method of double contacting (double absorption)**

1. Sulphuric acid preparation
2. Venturi device
3. Oxidation of sulphur dioxide to sulphur trioxide over catalyst, and absorption of sulphur trioxide to produce sulphuric acid
4. Wet gypsum is disposed of to waste dumps
5. Feeding sulphuric acid to the lime slurry
6. The resulting gypsum slurry is then vacuum-filtered
7. Reduction of SO₂ concentration to 12–14%
8. Fine cleaning
9. Sulfuric acid neutralization
10. The method of double contacting (double absorption)

**Washing tower**
 Sulphur dioxide content in feed gases of 25–30%.
Nadezhda Metallurgical Plant will have new facilities capturing sulphur-rich gases, while sulphur acid will be neutralised with natural limestone, with waste gypsum produced as a result. In addition, a revolutionary continuous copper matte converting unit will be built. Its emissions will also be used to produce sulphur acid.

Copper Plant

Meanwhile, Copper Plant will see its elemental sulphur production capacities ramped up and the entire converter section shut down.

Highlights

- 2017 CAPEX of ca. RUB 2.2 bn (ca. USD 37 mln)
- Less sulphur dioxide emissions: 75% by 2023
- Estimated project costs of ca. USD 2.6 bn (according to the feasibility study)
- Completion scheduled for 2022

Video about the Sulphur Project
**TANK-HOUSE REFURBISHMENT**

**Severonickel Plant, Monchegorsk, Murmansk Region** *(Kola MMC)*

Tank-House 1 saw refurbishment of buildings, equipment, and utility and ventilation systems. The project was completed in 2016. Tank-House 2 is to be transformed into an advanced, cost-efficient cathode nickel facility by introducing the technology of nickel electrowinning from chlorine dissolved tube furnace nickel powder.

### Highlights

**Tank-House 1**

- Capacity commissioning of 45 ktpa
- CAPEX of ca. RUB 0.8 bn
- Project completed in 2016.

**Tank-House 2**

- Increasing the capacity from 120 ktpa to 145 ktpa of nickel
- Increasing the nickel recovery rate for converter matte by more than 1%
- 2017 CAPEX of ca. RUB 7 bn (ca. USD 120 mln)
- CAPEX outstanding of ca. RUB 14 bn (ca. USD 236 mln)
- Progress: ~40%

**CONSTRUCTION OF A COPPER-NICKEL ORE CONCENTRATE SHIPMENT FACILITY**

**Zapolyarny, Murmansk Region** *(Kola MMC)*

The new facility will enable the Company to split its copper-nickel concentrate into low-grade and high-grade.

No low-grade concentrate processing will lead to significant cuts in sulphur dioxide emissions in Nickel. By re-arranging shipments of low-grade concentrate from Kola MMC to a third-party processor, the Company will be able to decommission ore-thermal furnace No 3 in the smelting shop and cut the operating costs.

### Highlights

- Dried high-grade concentrate unit with a capacity of 150 ktpa
- 2017 CAPEX of RUB 0.8 bn (ca. USD 14 mln)
- Outstanding CAPEX of RUB 4 bn (ca. USD 71 mln)

**PROJECT SCHEDULE**

- **2017**
  - 42 electrolysis cells upgraded at Tank-House 2 to support chlorine leaching

- **2018**
  - Gradual capacity commissioning

- **2019**
  - Reaching the design capacity and performance targets

**PROJECT STATUS**

- **September 2017**
  - Contract for engineering and equipment supplies signed with Outotec;
  - Check-ups and surveys completed, preparation for utility systems dismantling and relocation in progress.

- **Q4 2018**
  - Constraction works of the project to be completed

- **Q2 2019**
  - Output of key equipment
Constructing an open pit and a mining and processing plant to utilise untapped reserves, constructing a railway and power lines, building a camp.

### Average metal content

- **Cu**: 0.7%
- **Fe**: 23%
- **Au**: 0.9%

### Highlights

- **Output of**: 10 mtpa
- **Ore reserves of**: 333 mt
- **2017 CAPEX of over**: RUB 26 bn (ca. USD 449 mln)
- **Project CAPEX of over**: RUB 89 bn (USD 1.6 bn)
- **New jobs for**: 3 thousand employees

### Annual production volumes at design capacity (2021+)

- **Cu (concentrate)**: ~65 kt
- **Fe (magnetite concentrate)**: 2.1 mt (Fe — 66%)
- **Au (concentrate)**: 220 koz