Short update on the Russian Pulp and Paper markets

Prof. Eduard Akim

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FOREST PRODUCTS TRENDS & DEVELOPMENTS

5 November 2019
15:00 – 18:00
Room XII,
Palais des Nations, Geneva
### Output of market pulp, paper and paperboard in the Russian Federation in 2017-2018 (thousand metric tons)

Sources: Goscomstat of the Russian Federation; RAO Bumprom, *author’s data handling

<table>
<thead>
<tr>
<th>Products</th>
<th>2018</th>
<th>2017</th>
<th>2018/2017, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Market Pulp, Paper &amp; Paperboard</td>
<td>11872*</td>
<td>11232*</td>
<td>105.7</td>
</tr>
<tr>
<td>Market pulp total</td>
<td>2815*</td>
<td>2733*</td>
<td>103.0</td>
</tr>
<tr>
<td>Paper &amp; Paperboard total</td>
<td>9058</td>
<td>8569</td>
<td>105.7</td>
</tr>
<tr>
<td>Newsprint Paper</td>
<td>1527</td>
<td>1440</td>
<td>106.1</td>
</tr>
</tbody>
</table>
Russian exports and imports of pulp, paper and paperboard in 2000-2018 (Million USD)
State of the industry & export

• In 2018 pulp production increased by 3.0%, cardboard and paper - by 5.7%. The production volume of pulp and paper industry in 2018 amounted to 11.872 million tons. Pulp exports exceeded 2.1 million tons, which is 108% of the 2017 level. In terms of value - for 1.506 billion dollars (137.2% of the level of 2017).

• In 2011-2018, exports of pulp and paper products continued to increase. Russian exports as a percentage of production have remained almost unchanged since 1996, while exports account for about 80% of the production for market pulp and about 30-35% for paper and cardboard.

• The main directions of export of these Russian goods are China, India, Turkey, and Ireland. In 2016, for the first time since 2000, the annual trade balance on paper and paperboard was positive, and in 2018, it was about 1.6 billion dollars.
<table>
<thead>
<tr>
<th></th>
<th>Total Output, x 000 t</th>
<th>Market Pulp, x 000 t</th>
<th>Paper, x 000 t</th>
<th>Board, x 000 t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ilim Group:</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Ilim Group (%)</td>
<td>3127 (2951)</td>
<td>1981 (1846)</td>
<td>473 (454)</td>
<td>673 (651)</td>
</tr>
<tr>
<td>Kotlas</td>
<td>905 (945)</td>
<td>289 (299)</td>
<td>473 (454)</td>
<td>487 (471)</td>
</tr>
<tr>
<td>Bratsk</td>
<td>744 (734)</td>
<td>896 (743)</td>
<td></td>
<td>186 (180)</td>
</tr>
<tr>
<td>Ust-Ilimsk</td>
<td></td>
<td>796 (804)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arkhangelsk</td>
<td>()</td>
<td>235 (217)</td>
<td>80 (73)</td>
<td>463 (485)</td>
</tr>
<tr>
<td>Syktyvkar</td>
<td>()</td>
<td>114 (36)</td>
<td>718 (723)</td>
<td>253 (274)</td>
</tr>
<tr>
<td>Svetogorsk</td>
<td>()</td>
<td></td>
<td>377 (384)</td>
<td>104 (101)</td>
</tr>
<tr>
<td>Segezha</td>
<td>()</td>
<td></td>
<td>267 (254)</td>
<td>()</td>
</tr>
<tr>
<td><strong>RUSSIA</strong></td>
<td>10510 (10509)</td>
<td>2494 (2259)</td>
<td>4954 (5041)</td>
<td>3062 (2759)</td>
</tr>
<tr>
<td><strong>Ilim Group %</strong></td>
<td>29.8 (29.3)</td>
<td>79.4 (81.7)</td>
<td>9.5 (9.0)</td>
<td>22.0 (23.6)</td>
</tr>
</tbody>
</table>
The Ilim Group (Ilim Group Joint-Stock Company, Ilim Group OJSC) is the leader of the Russian pulp and paper industry in terms of market share, output and investment, as well as one of the industry leaders in the world. International Paper, the world's largest producer of pulp and paper, is a strategic partner of the Ilim Group. Over the past few years, Ilim Group has invested $ 3.2 billion in the development of its own enterprises, which is an unprecedented indicator for the Russian pulp and paper industry. In 2018, the record volume of sales was achieved at the Ilim Group sites: commercial pulp — 2.1 million tons, paper — 514 883 tons, cardboard — 695 022 tons, container paper — 99 542 tons. Total over 3.4 million tons of commercial products. At present, the Ilim Group supplies its products to more than 70 countries of the world.
Chairman of the Board of Directors of Ilim Group Zakhar Smushkin in an interview with the newspaper “Vedomosti”. New capacities in OJSC “Ilim Group” - “Big Bratsk” (capacity 720 thousand tons of bleached softwood pulp per year) and “Large Koryazhma” (capacity 220 thousand tons of office paper per year and 70 thousand tons of paper per year). The next step - the Great Ust-Ilimsk project includes the construction of a new line for the production of kraftliners.

At the Krasnoyarsk Economic Forum, held in the capital of Eastern Siberia in the last days of March 2019, Krai Governor Alexander Uss and Segezha Group President Mikhail Shamolin signed an agreement on cooperation in the construction of a biotechnological complex for the production of pulp in Lesosibirsk. There it is planned to build a plant similar to the plant launched in 2017 in Finland, in Aanekoske.
PPI of Russia and its place in the world

Pulp exports exceeded 2.1 million tons, which is 108% of the 2017 level. In terms of value - for 1.506 billion dollars (137.2% of the level of 2017). • In 2018, Ilim Group exported about 1.6 million tons of pulp and paperboard to China.

The role of the pulp and paper industry in Russia in the world is important in that Russia supplies only northern coniferous reinforcing pulp, as well as paper and cardboard made only from primary fibers. This facilitates the transition of the world's pulp and paper industry to a circular economy.
Russia Forests - Main Tree Species (mln. Ha)
Pine, Spruce, Larch, Beech, Aspen
Siberian larch (*Larix sibirica*) and Dahurica larch (*Larix dahurica* Turcz)

The Siberian larch (*Larix sibirica*) and Dahurica larch (*Larix dahurica* Turcz) are widely spread in western, central and trans-Ural Russia and may have practical applications not only as renewable cellulose-containing raw material, but also as a source of other biologically active polysaccharides. The presence of large amounts of arabinogalactan (AG) in larch wood (up to 30 wt%) necessitates developing complex waste-free technology of larch wood processing. This technology should allow obtaining purified wood cellulose along with AG and other water-soluble hemicelluloses on an industrial scale.
For 20 years, a new industry has been created in the world and Russia - second-generation biofuel

In 2018, export of pellets from Russia reached 1.5 million tons. The production of second-generation biofuels - wood pellets and briquettes, including charcoal, was created in the Russian Federation over 20 years with virtually no government funding. At the same time, Russia's share in the world trade in forest products for any other type of product does not make up 5-6% of the world market that Russia has today on pellets.

Using imported equipment in Onega, we created a unique technology for the production of pellets from hydrolysis lignin (150 thousand tons per year), which can be successfully replicated in the CIS.

But if the entire production of pellets is based on imported equipment, then today there is a unique briquette technology protected by 4 patents of the Russian Federation by Alexander Pekarets that provides the best quality charcoal briquettes in the world, and production is based on unique equipment that is already produced on these patents in the territory EU.
Innovative technology for the production of charcoal briquettes in the Russian Federation

Mr. Aleksandr Pekaretz
Forest Technology Company, SPb SU ITD, RAOBumprom

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About half the wood extracted worldwide from forests is used to produce energy, mostly for cooking and heating. Of all the wood used as fuel worldwide, about 17 percent is converted to charcoal.

Global charcoal production is expected to continue increasing in coming decades. The charcoal sector, which is largely informal, generates income for more than 40 million people, but a lack of regulation means that it promotes inefficiency and governments forgo billions of dollars in revenue.

An estimated 1–2.4 Gt CO\(_2\)e of greenhouse gases are emitted annually in the production and use of fuelwood and charcoal, which is 2–7 percent of global anthropogenic emissions. These emissions are due largely to unsustainable forest management and inefficient charcoal manufacture and woodfuel combustion.

**Wood charcoal production worldwide** – more 50 mln. T./y, and by Africa - more 30 mln. T./year.

**1961–2015** Charcoal production in particular has risen in recent decades as demand has grown among urban populations and enterprises. Where demand is high, mainly in sub-Saharan Africa (SSA) but also in Southeast Asia and South America, unsustainable wood harvesting and charcoal production contribute to forest degradation and deforestation and to greenhouse gas (GHG) emissions along the charcoal value chain, especially when charcoal is produced using inefficient technologies. Charcoal produced using sustainably managed resources and improved technologies, however, is a low net emitter of GHGs, thereby helping mitigate climate change while also increasing access to energy and food and providing income-generating opportunities.
Operating lines for the production of charcoal briquettes (made in the village of Kachug, Irkutsk region)

• since 2015 - the village of Kachug, Irkutsk region ;
• since 2017 - p. Lesozavodsk, Primorsky Territory;
• from 2019 - Bratsk, two lines;
• since 2019 - Vladimir region;
• from 2019 (December) - Latvia (Riga).

• Start of mass production of technological lines and products - briquettes and coal briquettes in Latvia (EU subsidies) - December 2019
Siberian larch (*Larix sibirica*) and Dahurica larch (*Larix dahurica Turcz*)

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**Larch wood Biorefinery**

**Biorefinary of Larch Wood**

Mechanical conversion of wood:
- Sawn wood: 54%
- Chips: 29%
- Sawdust: 12%
- Shrinkage: 5%

Irkutsk region processes 10 000 000 m³ of wood per year. 1 000 000 m³ of sawdust per year can be used for further biorefining.

«Biorefining of larch sawdust producing wood and wood-charcoal briquettes: scientific and technological aspects».
Alexander Pekaretz, Yury Mandre, Nikita Vinogradov, Akim Eduard
EUBCE2019, 28 May 2019, Lisbon
Basic block diagram of charcoal production, Pat. RF 2596683, 2628602, 2653513, 2678089
Process is based on following principles:

- Directed change of relaxation state of wood polymer components.
- Brittle destruction of sawdust during drying in aerodynamic flow.
- Plastification of particles surface.
- Extrusion in minimal Newtonian viscosity mode.

Diagram of relaxation states of the ternary system: two polymers (P) – solvent (S) in larch wood as in cellulose composite material.
Drying

Sawdust is dried in a circular dryer that has constant cross-section. Recirculation is done by heat resistant fans.

Heating chamber is heated by injecting kiln gas with temperature up to 700 °C.

To prevent wood burning, oxygen content is kept less than 8-10%.

Dried wood destruction is brittle, lowering energy consumption for particles size reduction.

Addition of steam in drying ring reactor additionally activates sawdust.
Extrusion

Wood can’t be directly extruded as its decomposition temperature is lower than melting point. To extrude wood, its relaxation state has to be changed by applying plasticizer – water and heat. Steaming weakens intermolecular interaction and high shear forces allow extrusion in viscous flow state. Wood briquette has high density (1.27 – 1.30 g/cm³) and has a stiff water resistant surface layer.
Carbonization

Carbonization oven operates on heat from thermal wood decomposition.

Gases are collected and burnt; after that are fed to drying section.

Turbulent stream of heat carrier and high density of briquettes provide effective heat transfer.

Addition of steam can be used to activate charcoal.
Methods for extracting arabinogalactan from chips

• Water extraction of arabinogalactan.
• Water extraction with high pH
• Steam extraction.
• Black liquor extraction of arabinogalactan.
• Прямой отжим АГ из опилок.
• Сочетание отжима и экстракции.
Arabinogalactan

Arabinogalactan is a water-soluble polysaccharide contained in larch wood up to 30% by weight.

Currently it is chemically extracted and used as a biologically active additive.

Latest inquiry is in combined production of wood/charcoal briquettes and arabinogalactan.
Biofuel – Wood briquettes, charcoal briquettes & Wood Pellets
Charcoal briquettes

QUESTIONS?
Средняя плотность

- Древесно-угольный брикет: 780 кг/м³
- Уголь из дуба дальневосточного: 490 кг/м³
- Уголь из берёзы дальневосточной: 380 кг/м³
- Уголь из сосны дальневосточной: 290 кг/м³
Теплотворная способность

- **Каменный уголь**: 40 МДж/кг
- **Нефть**: 43 МДж/кг
- **Дрова (берёза)**: 15 МДж/кг
- **Брикеты из бурого угля**: 18 МДж/кг
- **Брикеты из каменного угля**: 27.18 МДж/кг
- **Пеллеты**: 18 МДж/кг
- **RUF**: 19.22 МДж/кг
- **Pin-kay**: 17.6 МДж/кг
- **Древесно-угольный брикет**: 34.3 МДж/кг
<table>
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<tr>
<th>Источник энергии</th>
<th>Энергетическая плотность МДж/м³</th>
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<tbody>
<tr>
<td>Каменный уголь</td>
<td>52000</td>
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<tr>
<td>Нефть</td>
<td>38700</td>
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<tr>
<td>Дрова (берёза)</td>
<td>9750</td>
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<tr>
<td>Пеллеты</td>
<td>18000</td>
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<tr>
<td>RUF</td>
<td>19220</td>
</tr>
<tr>
<td>Pin-kay</td>
<td>21472</td>
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<tr>
<td>Древесно-угольный брикет</td>
<td>27371</td>
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China’s recovered-paper imports fell by 34.8% in 2018, to 17.0 million tonnes, as customs officials enforced quality controls (Valois Vision Marketing, 2019).

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>Change (%) 2017-2018</th>
</tr>
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<tbody>
<tr>
<td>Kraft</td>
<td>19,242</td>
<td>20,034</td>
<td>4.1</td>
</tr>
<tr>
<td>Mechanical</td>
<td>1,796</td>
<td>1,541</td>
<td>-14.2</td>
</tr>
<tr>
<td>Dissolving</td>
<td>2,603</td>
<td>2,838</td>
<td>9.0</td>
</tr>
<tr>
<td>Other</td>
<td>65</td>
<td>389</td>
<td>498.5</td>
</tr>
<tr>
<td>Total</td>
<td>23,707</td>
<td>24,803</td>
<td>4.6</td>
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<th>2014</th>
<th>2018</th>
<th>Изменение (%) 2014-2018</th>
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<tr>
<td>Новая Зеландия</td>
<td>11.5</td>
<td>15.8</td>
<td>37</td>
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<tr>
<td>Российская Федерация</td>
<td>9.9</td>
<td>7.8</td>
<td>-21</td>
</tr>
<tr>
<td>США</td>
<td>5.5</td>
<td>5.1</td>
<td>-7</td>
</tr>
<tr>
<td>Австралия</td>
<td>2.1</td>
<td>4.1</td>
<td>95</td>
</tr>
<tr>
<td>Канада</td>
<td>3</td>
<td>2</td>
<td>-33</td>
</tr>
<tr>
<td>Другие</td>
<td>3.5</td>
<td>5.5</td>
<td>57</td>
</tr>
<tr>
<td>Всего</td>
<td>35.6</td>
<td>40.1</td>
<td>13</td>
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Биорефайнинг опилок лиственницы по экструзионной релаксационно-аэродинамической технологии

Биорефайнинг опилок лиственницы по экструзионной релаксационно-аэродинамической технологии (ЭРАТ) основан на:

• Сочетании сушки и хрупкого разрушения опилок в аэродинамической сушилке-дезинтеграторе;
• Увлажнении паром измельченной древесины до 3-4% с получением экструдируемых смесей;
• Экструдировании брикетов в режиме минимальной ньютононской вязкости;
• Карбонизации древесных брикетов в регулируемой парогазовой среде.
Проблемы

• Сегодня Россия экспортирует 90-95% древесных пеллет и 40-50% брикетов; есть меры государственной поддержки экспорта и появляется проблема избавления от экспорто зависимости – формирование внутреннего рынка и его инфраструктуры;

• Вовлечение всех древесных отходов, включая вторичную древесину, в производство брикетов и пеллет;

• Разработка методологии «мусорной революции» для мега полиса СПб и агломерации «СПб – Ленинградская область».
Professor Eduard Akim, PhD.
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