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TECHNICAL REPORT

ALUMINIUM SECTOR OF VENEZUELA

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MOSCOW

2004

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1. CORPORACION VENEZOLANA DE GUAYANA (CVG), a decentralized state owned enterprise, located in the southeast of the country, accepts the challenge to properly and sustainably take advantage of the valuable hydro and forestry resources, iron, bauxite, gold and diamonds, in addition to other existent minerals and singular natural beauties within the region, to foster national development through economic diversification based on a policy of strategic alliances with domestic and foreign, public and private capitals. This region represents the non-oil alternative for the Venezuelan economy. CVG integrated by 13 enterprises and over 18.000 employees constitutes the economic and social axis of a region comprised by 5 states and more than half of the country's territory. Corporacion de Alumino Venezolana (Cavsa) is the holding company of four subsidiaries in the production of raw bauxite to aluminium.

Bauxilum produces alumina from bauxite from the Pijihuao mine, 650 km down the Orinoco River. It has the capacity to process six million tons of bauxite per year, and from this it can output an annual 1.8 million tons of alumina. The alumina is sent down the river to two other Cavsa firms, Venalum and Alcasa, to be turned into aluminium, and some for export. Venalum is 80 per cent-owned by Cavsa, with Japanese firms holding the rest. Carbonorca, the fourth arm of the Cavsa Empire, makes anodes and cathodes.

Venezuela is the largest producer of aluminium in South America and the eighth-biggest in the world. It accounts for 4% of world supply and has very low production costs. But the sector's financial contribution to the economy is modest. Heavily subsidized in the past, the industry has now become a drain on the government budget, with accumulated debts of more than $1.5 billion. CVG is committed to financial recovery, with the support of government in its search for new strategic partnerships in order to diversify aluminium production in Venezuela. It gives priority to transforming primary aluminium into secondary products to add value, create jobs and raise foreign exchange earnings. This new policy of indirect, partial privatization began to take shape in 2001 when Bauxilum entered into an alliance with French group Pechiney. The deal involved a $260 million package to upgrade technology and boost economies of scale. The government intends to inject more competition into the sector.

According to the task we have studied the current tendencies in Venezuelan aluminum industry in respect of general situation, technologies and prime products. Below are given the main companies dealing in aluminium sector in Venezuela.

2. CVG ALUMINIO DEL CARONI, S.A. (ALCASA) was constituted in 1960 and was officially inaugurated on October 14th, 1967 with a production capacity of 10 thousand metric tons of primary aluminium, therefore becoming the pioneer producer of this noble metal in Venezuela. At present, Alcasa has an installed production capacity of primary aluminum of 210 thousand metric tones a year (currently producing 160 thousand metric tones), with the capacity to supply a

variety of sheet products. CVG Alcasa sets up the basis for the downstream aluminum industry, when the rolling mill plant was established in Ciudad Guayana located in Bolivar state. Currently, the company has an annual production of primary aluminum that reaches 185.000 metric tons. Its operative areas are the Carbon Plant, and the Foundry and Slabs Rolling Plants. Its products are aluminum ingots of 454 and 22.5 kilograms, extrusion billets, and rolling slabs up to 8 tons, which are destined to satisfy the requirements of the national manufacturing sector (40%), and the surplus is exported to Costa Rica, the United States, Colombia, Mexico, Puerto Rico, Peru, Argentina, England and Belgium (60%).

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2.1. Alcasa Production Processes

Carbon Plant

The Alcasa Carbon Plant uses batch mixing technology (10 mixers). The plant has one vibrating compactor to convert the anode paste in blocks of green anodes and a cooling system (water tank) to cool the anodes. The anodes are subject to a baking process in two furnaces, one open furnace with 56 sections and other closed furnace with 48 sections, with the purpose of improving their physical and mechanical properties. Alcasa has two rodding rooms in operation, for yoke of three points, for a total capacity of 50 anodes/hour.

Reduction

The reduction process takes place in cells, which make possible the transformation of alumina into aluminium. The reduction area comprises 4 lines, for a total of 684 Reynold technology cells, 288 of Niagara type, 180 of P-19 and 216 of P-19S. The nominal capacity of the plant is 210,000 tons/year. An expansion project comprising a new line has been considered as an opportunity for join venture open to investors.

Reynolds Niagara Technology
Central Break

This technology was developed by Reynolds, it uses a single crust-breaker, which is a steel bar placed along the central channel among anodes. Its function is to break the central crust and then the alumina is added to the bath. Line 1 and 2 have 288 cells with this technology. Each cell uses 28 anodes which have an useful life

of 11 days and its daily production is of 0.496 Tonnes. The operation temperature is 965 °C. The addition of aluminum Fluoride is manual. The operation amperage is 70 kA. The metal taping frecuency is every 24 Hours and the anode beam raising is done every 5 days. The alumina feeding is controled manually.

Reynolds P-20 Technology

This technology was developed by Reynolds. It uses 4 crust-breakers and feeders acting simultaneously. Line III has 180 cells with this technology, each cell uses 18 anodes which have a useful life of 23 days and its daily production is 1.2 Tonnes. The operation temperature is 954 °C. The addition of aluminium fluoride is manual. The operation amperage is 160 kA. The metal tapping frecuency is every 24 hours and the anode beam raising is done every 22 days. The alumina feeding is controled by a centralized control system.

Reynolds P-20S Technology
Point Feeders.

This technology was developed by Reynolds. It uses 4 crust-breakers and feeders. Line IV has 216 cells with this technology, each cell uses 18 anodes which have a useful life of 23 days and its daily production is 1.2 Tones. The operation temperature is 954 °C. The addition of aluminium fluoride is manual. The operation amperage is 159 kA. The metal tapping frequency is every 24 hours and the anode beam raising is done every 22 days. The alumina feeding is controlled by a distributed control system.

Reynolds P-23S Technology
Point Feeders.

This technology was developed by Reynolds. It uses 4 crust-breakers and feeders. There are 5 cells with this technology in Alcasa, each cell uses 18 anodes which have a useful life of 24 days and its daily production is 1.35 Tonnes. The operation temperature is 954 °C. The addition of aluminium fluoride is manual. The operation amperage is 180 kA. The metal tapping frecuency is every 24 hours and the anode beam raising is done every 22 days. The alumina feeding is controled by a distributed control system.

Casthouse

In the Casthouse the aluminium alloys are prepared according to the client requirements. The liquid aluminium obtained in the pot rooms, 99.8% pure, is transferred in crucibles to the Casthouse and poured into holding furnaces where metals such as titanium, magnesium, copper and iron are added in order to prepare the various alloys. The liquid metal in the furnaces is

subjected to several tests and quality controls to later being transferred to the related casting unit. During casting the liquid aluminium is poured into water cooled moulds. The final product is either primary aluminium remelt ingots (22.5 and 450 kg) or extrusion ingots and rolling slabs. Most rolling slab production is delivered to Alcasa's rolling mill.

Sheet Plant

Alcasa sheet plant started its operation in 1970 and later on, in 1991, parts of its facilities were renewed with state-of-the-art equipment and expanded sheet coil capacity. Total current installed capacity is 37,176 metric tones per year (tpy), limited by annealing and finishing equipment.

Slab Scalping Machine

In order to obtain a smooth blemish-free surface ready for hot rolling, it is necessary to scalp the slabs. This is performed in a slab scalping machine, which was supplied by Knoevenagel, Germany. This scalper can handle slabs up to 600 mm thick x 1700 mm wide x 5000 mm long and with a weight up to 12.6 metric tones (t), at a production rate up to 6 slabs per hour. It is of the dual-head design, with slabs passing vertically. The material to be simultaneously removed from each of the two major faces is around 12-16 mm of thickness. Chips are delivered to one of the three storage silo adjacent to the scalper. Then, chips are transported to a chip compaction press to be compacted and recalculated back into the slab casting process. Total installed capacity is 180,000 tonnes per year (tpy).

Slab Heating Furnaces

Prior to hot rolling, slabs are heated to a temperature of about 590±10°C. A gas-fired pusher-type slab heating furnace with a capacity of 25 slabs inside the furnace is used for this purpose. There are two furnaces of this type supplied by Guinea, Spain. It can handle slabs up to 10.3 tonnes, at a production rate up to 90,000 tpy.

Hot Rolling Mill

The hot rolling process for aluminium sheet takes place on a reversing single-stand 4-high hot mill, which was supplied by Clecim-Cosim, France. It was designed to handle up to 550 mm thick x 1700 mm wide x 4900 mm long slabs. It accommodates work rolls of 850 mm diameter x 1970 mm wide and backup rolls of 1360 mm diameter x 1900 mm wide. The maximum rolling speed is 200 m/min. The Alcasa hot mill stand is in line with all the requirements of modern rolling mills. The mill was designed for the production of 2.5 to 10 mm thick hot strip and has a capacity of up to 120,000 tpy of strip coils. The complete pass schedule is

generated by an on-line control computer. The coil, obtained on the rewind reel, is transferred to a weighing scale for weighing and strapping before transportation to the next operation.

Cold Rollings Mills

Alcasa sheet plant has three single-stand 4-high nonreversing cold rolling mills for aluminium strip.

– Davy Mckee cold rolling mill: 18 t/hr (531m/ min).

– United cold rolling mill: 7.55 t/hr (300 m/min).

– Bliss cold rolling mill: 3.58 t/hr (396 m/min).

The Davy Mckee mill reduces 6 mm thick initial materials to strip with a minimum thickness of 0.27 mm and a maximum width of 1600 mm, whereas the united mill produces finished strip with gauges down to 0.18 mm and maximum width of 1524 mm. The Bliss cold rolling mill rolls strips down to a minimum exit gauge of 0.10 mm and a maximum strip width of 1473 mm. Equipment availability accounts for 85% and efficiency - 95%.

Coil Annealing Furnaces

There are four batch-type gas-fired radiant-tube heating furnaces for annealing of cold worked strip coils as well as as-cast strip coils. Two of them were manufactured by Guinea, Spain, and the other two by Canefco, Canada. Strip coils passing through the Guinea annealing furnaces are processed in atmosphere whereas those through Canefco furnaces are processed in air. The furnaces useful enclosure size is 3800 mm wide x 7800 mm long x 2000 mm high for Guinea annealing furnaces and 3251 mm wide x 8737 mm long x 1422 mm high for the Canefco ones. Each Guinea furnace allows a batch charge up to 71 t (8 strip coils), whereas Canefco furnaces allow up to 62 t of coils (8 coils). The maximum annual capacity is indicated on the next slide.

Coil Finishing and Packing Area

Facilities in these areas include:

- A tension leveling line.

- A slitting line.

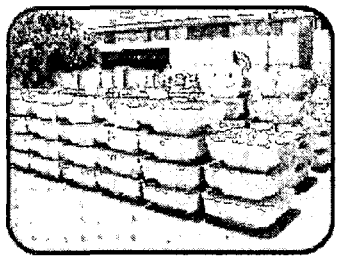
- Two cut to length machines.

- An embossing machine.

- A coil cleaning and coating line.

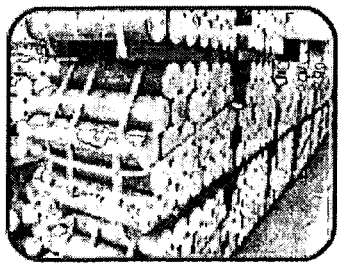
2.2. CVG Alcasa Products

CVG Alcasa produces 22.5 kg remelt ingots in 45 ingot bundles 1,012.5 kg each. CVG Alcasa also supplies remelt sow type ingots of 454 kg, adequate for clients having moderate size melting furnaces.



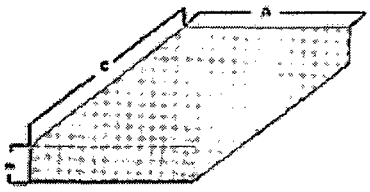
Extrusion Billets

CVG Alcasa uses state of the art vertical DC casting technology in order to produce extrusion billets and logs within 5 1/8" - 9" in diameter and 16"-152" long. The product, which exhibits a defect free surface, is delivered homogenized and cut to length.



Rolling Slabs

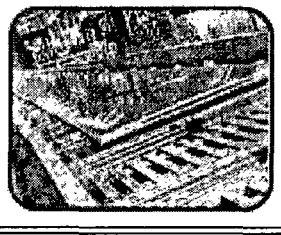
CVG Alcasa uses the most commonly used vertical DC casting technology worldwide in order to produce rolling slabs in a variety of dimensions and lengths. The product is supplied in the as-cast state and cut to length, to later be processed in rolling mills.



Rolling Slabs

WIDTH (A)		THICKNESS (B)		LENGTH (C)	
Inches	mm	Inches	mm	Inches	mm
30	762	10	254	100 to 192	2,540 to 4877
36	914	10	254	100 to 192	2,540 to 4877
36	914	18	457	100 to 192	2,540 to 4877
36	914	20	508	100 to 192	2,540 to 4877
41	1,041	20	508	100 to 192	2,540 to 4877
42	1,067	20	508	100 to 192	2,540 to 4877
51	1,295	20	508	100 to 192	2,540 to 4877
52	1,321	20	508	100 to 192	2,540 to 4877
54	1,372	20	508	100 to 192	2,540 to 4877
62	1,575	20	508	100 to 192	2,540 to 4877

Coils Sheets and Strips



Slit coiled flat sheet, mill finished	Slit coiled flat sheet, stucco-embossed	
Common alloys (AA)	1050, 1070, 1100, 1200, 1145, 1350, 3003,3005, 3103, 5005, 5052, 8011, 8111	1050, 1070, 1100, 1200, 1145, 1350, 3003,3005, 3103, 8011, 8111

Tempers (AA)	F, O, H-1X, H-2X, H-3X Some restrictions will apply according to required alloy/thickness.	H-1X4, H-2X4, H-3X4, H-1X5, H-2X5, H-3X5 As fabricated from the corresponding H-1X, H-2X, H-3X Some restrictions will apply according to required alloy/thickness.
Thickness	From 0.38 mm (0.015") up to 2.54 mm (0.100"), tension leveled Material over 2.54 mm (0.100") is not tension leveled	From 0.38 mm (0.015") up to 1.0 mm (0.040").
Width	From 100 mm (4") up to 1524 mm (60")	From 100 mm (4") up to 1524 mm (60")
Internal diameter	508 mm (20")	508 mm (20")
External diameter min	1016 mm (40")	1016 mm (40")
External diameter max	For width from 100 mm(4") up to 610 mm (24"): 1321 mm (52") For width over 610 mm (24") up to 1524 mm (60"): 1524 mm (60")	For width from 100 mm(4") up to 610 mm (24"): 1321 mm (52") For width over 610 mm (24") up to 1524 mm (60"): 1524 mm (60")
Dimensional tolerances	Half commercial (AA)	Half commercial (AA)

	Cut to length flat sheet, mill finished	**Cut to length flat sheet, stucco-embossed**
Common alloys (AA)	1050, 1070, 1100, 1200, 1145, 1350, 3003,3005, 3103, 5005, 5052, 8011, 8111	1050, 1070, 1100, 1200, 1145, 1350, 3003,3005, 3103, 8011, 8111
Tempers (AA)	F, O, H-1X, H-2X, H-3X Some restrictions will apply according to required alloy/thickness.	H-1X4, H-2X4, H-3X4, H-1X5, H-2X5, H-3X5 As fabricated from the corresponding H-1X, H-2X, H-3X Some restrictions will apply according to required alloy/thickness.
Thickness	From 0.38 mm (0.015") up to 2.54 mm (0.100"), tension levelled Material over 2.54 mm (0.100") is not tension levelled	From 0.38 mm (0.015") up to 1.00 mm (0.040").
Width	From 305 mm (12") up to 1524 mm (60")	From 305 mm (4") up to 1524 mm (60")
Length	From 305 mm (12") up to 3658 mm (144")	From 305 mm (12") up to 3658 mm (144")
Dimensional tolerances	Half commercial (AA)	Half commercial (AA)

3. CVG INDUSTRIA VENEZOLANA DE ALUMINIO S.A (VENALUM) was constituted in August of 1973 with the purpose of producing primary aluminium in different shapes for the export market. It is a mixed capital company, composed of 80% Venezuelan investment, through the Corporación Venezolana de Guayana (CVG), and 20% of foreign capital, integrated by Showa Denko K.K., Kobe Steel Ltd., Sumitomo Chemical Company Ltd., Mitsubishi Aluminium Company Ltd, and Marubeni Corporation. Officially inaugurated on June 10th, 1978 VENALUM operates the largest aluminium smelter in Latin America, with an installed capacity of 430,000 tonnes per year. It counts with five production lines and its main products are ingots of 680,22 and 10 kilograms, extrusion cylinders and liquid aluminum, that supplies several local manufacturers. It is located in Ciudad Guayana, Bolívar State, on the southern margin of the Orinoco River. The 75% of its production is shipped to the United States, Europe and Japan, the rest serving the national market. This plant counts with a high percentage of (98.8% of purity) quality products. The main operation areas are coal, reduction and foundry plants. The main portion of its exports is predestined to the Japanese and US market. One of the greatest accomplishments of CVG Venalum is the development of cell V-350, conceived by Venezuelan engineers that work for the organization, based on the current technologies and developing electromagnetic, thermal and structural mechanical models as well as computerized systems, succeeded in designing a cell that exceeds all known productivity levels. This high amperage cell comprises higher production capacity, lower investment per metric ton of produced aluminum, and consequently, higher profitability as a result of lower production costs.

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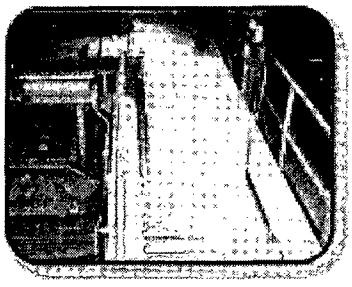
3.1. Venalum Production Processes

Carbon Plant

In the carbon plant of Venalum, the anodes are manufactured which make the electrolytic process possible. In the area of grinding and compressing, blocks of green anodes are made using batch mixing technology (there are 16 mixers). Three vibrating compactors make possible the transformation of anode paste into green anodes. Green anodes are subjected to a baking process in four vertical close furnaces (2 with 48 sections and 2 with 32 sections), with the purpose of improving their

hardness and electric conductivity. In the rodding room, the conductor bars (rods) are connected to the baked anodes for their proper use in the pots. The bars or rods coming from the used anodes (butts) are also conditioned to be reused.



Grinding and Compressing

Group A.
Transport, Screening and Crushing of Coke.

This group consists of the following equipment:

- Six vibrator chutes: two of 40 t/h, two of 70 t/h, one of 50 t/h and one of 7 t/h of capacity.
- Eight conveyor belts: three of 70 t/h, two of 50 t/h, two of 40 t/h, one of 20 t/h.
- Three bucket elevators: two of 70 t/h and one of 50 t/h.
- A dryer of petroleum coke and butts of 70 t/h.
- Three vibrator screens of 30 t/h each one.
- Four storage bins: a bin for coarse coke of 450 tons, a bin for medium fraction coke of 1500 tons, a bin for fine fraction coke of 1500 tons and one for butts of 260 tons.
- Two mills: one of 40 t/h and another of 7 t/h.
- Six screw conveyor systems: three of 30 t/h, two of 40 t/h and one of 7 t/h.
- A hopper for coarse coke of 260 t/h and a hopper of distribution of 7 t/h.

Group B.
Transport of Powder of Coke.

This group consists of:

- Five vibrator tubes of 20 t/h each one.
- Two conveyor belts of 30 t/h each one.
- A bucket elevator of 30 t/h of capacity

Group E.
Transport and Storage of Medium Fraction Coke.

This group consists of the following:

- Two conveyor belts of 30 t/h each one.
- Four vibrator tubes of 20 t/h each one.
- A bucket elevator of 30 t/h.
- Two screw conveyor system of 30 t/h each one.

Group C

Transport, mill and storage of coke dust

It consists of:

- Three ball mills of 10 t/h each.
- Seven storage bins: three for feeding the mills of 30 tons each and four for the material processed by the mill of 65 tons.
- Three disk feeders of 10 t/h each.
- Three classifiers of wind of 10 t/h each.
- Three cyclone separators of 10 t/h each.
- Two screw conveyor systems of 10 t/h each.

Group D.
Transport of coarse butt

It consists of:

- A vibratory chute of 15 t/h
- A bucket elevator of 15 t/h.
- Two screw conveyor systems of 15 t/h each.

Group H.
Transport, trifurcation and storage of butts and green scrap

It consists of:

- An impact crusher of 40 t/h

- A jaw crusher of 80 t/h.
- Six vibrator chutes: two of 30 t/h, two of 60 t/h and two of 85 t/h.
- Two vibrator screens: one of 60 t/h and another of 85 t/h.
- A cone crusher of 85 t/h.
- Four conveyor belts: one of 60 t/h, one of 20 t/h and two of 40 t/h each one.
- Two bucket elevators: one of 85 t/h and one of 20 t/h.
- A storage bin of coarse butt of 400 tons.
- Three screw conveyor systems of 20 t/h each.

Group G.
Transport and melting of coal tar pitch.

This group consists of:

- Two vibrator chutes of 20 t/h each.
- Two conveyor belts of 20 t/h each.
- A hammer mill of 20 t/h.
- Three screw conveyor systems: one of 30 t/h and two of 7,5 t/h.
- A bucket elevator of 30 t/h.
- Two storage bins for solid pitch, one of 55 tons and another of 11 tons.
- A scale belt of 15 t/h.
- Two smelters of pitch of 7,5 t/h each one.
- Four pumps for transport: two of 15 m^3/h and two of 40 m^3/h.
- An overflow tank of 15 t/h.
- Two storage tanks for liquid pitch of 375 tons each .

Group F.
Pneumatic system of dust transport

It consists of:

- Two pneumatic systems for transport of coke dust with 30 t/h of capacity.

Group K.
Transport, distribution and mixing.

This group consists of two lines with 8 mixers each one. Each line contains the following equipment:

- Five storage bins: coarse butt of 10 tons, medium coke of 10 tons, medium fine butt of 13 tons, dust of 16 tons and green scrap of 50 tons.
- Four vibrator chutes of 60 t/h each.

- Five screw conveyor systems: two of 100 t/h, one of 68 t/h and two of 84 t/h each.
- Three scales: one for dry aggregate, one for green waste and one for liquid pitch.
- A preheater of 84 t/h.
- Eight batch type mixers of 5 t/h each.

Group M.

Transport, vibrocompacting and cooling of green anodes.
This group contains:

- Five conveyors of 100 t/h each one.
- Three vibrating compactors: 63 anodes/h capacity.
- Systems of apron conveyors of 80 anodes/h capacity
- Systems of roller conveyors of 80 anodes/h.
- Two gyratory tables of 80 anodes/h
- Two pushers.
- Dumper of green anodes.

Baking Furnace

•Two sheds of closed baking furnace of vertical flow.

•Each shed has a furnace of 48 and another of 32 sections.

•Baking cycles: 24 → 48 hours.

•Capacity: e.g. Anode 1400 mm ⇒ 105 Anodes/section.

Rodding Room

The rodding room is composed of two production lines, which capacity is:

Nominal capacity: 140 anodes/h

	Line I	Line II
Nominal capacity	60 anodes/h	80 anodes/h

Main workstations:

	Line I	Line II
Loading and unloading station	52 anodes/h	75 anodes/h
Butt stripping station	72 anodes/h	90 anodes/h
Thimble removal station	60 rods/h	50 rods/h
Graphite coating station	75 rods/h	75 rods/h
Stub heating station		75 rods/h
Anode casting station	32 anodes/h	80 anodes/h
Aluminium coating station	60 anodes/h	75 anodes/h

Reduction

The reduction process takes place in cells, which make possible the transformation of alumina into aluminium. The reduction area comprises 5 lines, for a total of 900 cells, 720 of Reynolds technology, and 180 of Hydro Aluminum technology. Additionally, there are 5 V-350 type cells, developed by Venezuelan engineers working for the company. The nominal capacity of the plant is 430,000 tons/year. The electrolytic cells are controlled and supervised by a computerized system which controls the voltage, the crust breaking, alumina feeding and the general state of the cells.

Pot Room

The pot room is the place in which the pot cells are connected in a circuit.
Venalum is conformed by 5 reduction lines, with 180 cells per line. In general, Venalum has 900 cells in production and, additionally, it has 5 V-350 type cells, which are located at the end of the Fifth line.

Reynolds P-19 Technology
Central Break.

This technology was developed by Reynolds at the end of the sixties. It uses a single crust-breaker, which is a steel bar placed along the central channel among anodes, its function is to break the central crust and then the alumina is added to the bath. There are 180 cells in Line 1 with this technology. Each cell uses 18 anodes which have an useful life of 22 days and its daily production is 1,1 tons. The operation temperature of this cell is 960 °C. The addition of aluminum Fluoride is manual. The operation amperage is 162 kA. The metal tapping frequency is every 24 Hours and the anode beam raising is done every 15 days. The alumina feeding is controlled by a demand control system.

Reynolds P-19 Technology
Point Feeders.

It arises as a result of the retrofit process carried out in the cells, which included: magnetic field compensation, alumina point feeding, and new adaptive control system. The alumina point feeding is carried out by means of 4 feeders with their respective crust-breakers, which operate independently. There are 540 cells in lines 2, 3 and 4 with this technology. The cell operation temperature is 960 °C. The addition of aluminium Fluoride is automatic using a fluoride feeder located in the center of the cell. The operation amperage is 162 kA. The metal tapping frecuency is every 24 Hours and the anode beam raising is done every 15 days. The alumina feeding is controled by an adaptive control system.

Hydro Aluminium Technology

Developed by Hydro Aluminium, the technology HAL-230 side by side with 5 alumina feeders and one of aluminium fluoride, has an automatic control system for the alumina and aluminium fluoride supply. In Venalum the Fifth Line(180 cells) was built with this technology. Each cell uses 26 anodes which have a useful life of 22 days and its daily production is 1,6 tonnes. The operation temperature is 960 °C. The aluminium fluoride feeder is located in the center of the cell. The operation amperage is 223 kA. The metal tapping frecuency is every 24 Hours and the anode beam raising is done every 15 days. The alumina feeding is controled by an adaptive control system.

V-350 Technology

Developed in Venalum, the V-350 technology syde by syde, point feeding with 6 alumina feeders and one of aluminium fluoride, has an automatic control system for the alumina and aluminium fluoride supply. Venalum has 5 cells with this technology, each cell uses 36 anodes which have a useful life of 22 days and a daily production of 2,5 tonnes. The operation temperature is 958 °C. The addition of aluminium Fluoride is carried out through a feeder located in the center of the cell. The operation amperage is 320 kA. The metal tapping frecuency is every 48 Hours and the anode beam raising frequency is 12 days.

CastHouse

The liquid aluminium obtained in the pot rooms is collected and transferred in crucibles to the Cast House, where the finished products are made. The aluminum is poured into holding furnaces, and if required by the clients, alloying elements are added. Each holding furnace determines the casting of a specific shape: 10 kg ingots, 22 kg ingots, 545/680 kg ingots, extrusion billets (logs), and liquid metal. Once the process is completed the aluminium is ready to be sold to national and international markets.

Installed Production Capacities

REDUCTION: 430,000 tpy

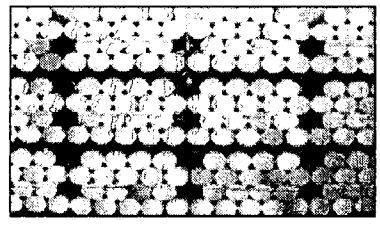
tpy: metric tons per year

CASTHOUSE:

MAXIMUM LIQUID ALUMINIUM HOLDING CAPACITY:	453 t primary 336 t alloyed
INSTALLED PRODUCTION CAPACITY (tpy):	**544,169**
22 kg INGOTS	352,836
545/680 kg INGOTS	80,933
10 kg (PRIMARY ALLOYED) INGOTS	21,600
EXTRUSION LOGS/BILLETS (6060/6063)	88,800

3.2. CVG Venalum Products

Extrusion Billets



Composición Química (%) / Chemical Composition (%)

									Otros Others		
Aleaciones Alloys	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	C/U Each	Total	Al
6061	.40 - .80	.70	.15 - .40	.15	.80 - 1.2	.04 - .35	.25	.15	.05	.15	Resto Balance
6063	.20 - .60	.35	.10	.10	.45 - .90	.10	.10	.10	.05	.15	Resto Balance
6061*	.30 - .70	.50	.10	.03	.35 - .80	.03	.10	-	.03	.10	Resto Balance
6105	.60 - .10	.35	.10	.10	.45 - .80	.10	.10	.10	.05	.15	Resto Balance
6060	.30 - .60	.10 - .30	.10	.10	.35 - .60	.05	.15	.10	.05	.15	Resto Balance

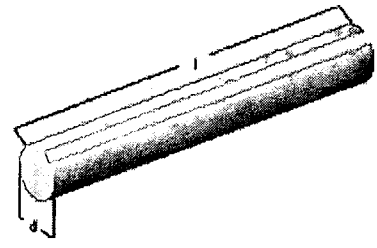
*Contenido de Boro: 0.06 % máx. / Maximum Boron content: 0.60 %

Diametros (d) / Diameters (ø)

Pulgadas Inches	6	6 1/8	7	8	9
mm	152	156	178	203	229

Longitudes (l) / Lengths (l)

Pulgadas Inches	20	24	30	120	220	236	240
mm	508	610	762	3048	5588	5994	6096



Homogeneizado: El producto es homogeneizado de acuerdo con prácticas industriales bien establecidas que dependen de la aleación.

Calidad Superficial: El producto presenta una calidad superficial libre de defectos, alcanzada mediante proceso de colada vertical semicontinua, y lubricación controlada por molde con aire y aceite.

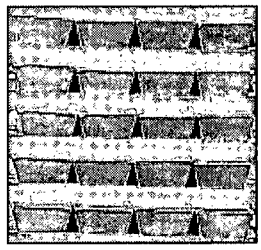
Especificaciones diferentes a las indicadas podrían ser fabricadas previo acuerdo con el cliente.

Homogenizing: The product is homogenized according to well established industrial practices, that depend on alloy type.

Surface Quality: The product exhibits a defect free surface, achieved through semi-continuous vertical DC casting, and controlled lubrication by mold with air and oil.

Specifications different from those indicated may be produced prior agreement with the client.

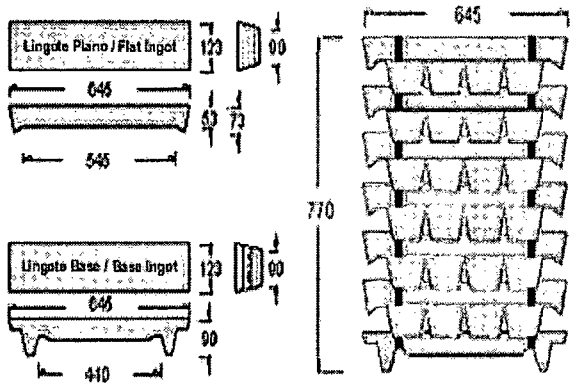
10 kg Ingots



Composición Química (%) / Chemical Composition (%)

										Otros Others		
Aleaciones Alloys	Si	Fe	Cu	Mn	Mg	Sr	Zn	Ca	Ti	C/U Each	Total	Al
A-356.2	6.5 - 7.5	.12	.10	.05	.30 - .45	.05	.05	.03	.20	.05	.15	Resto Balance

Dimensiones (mm) / Dimensions (mm)



Características del Bulto:
4 lingotes base y 12 camadas de 4 lingotes planos cada uno.
Peso: 520 kg aproximadamente.

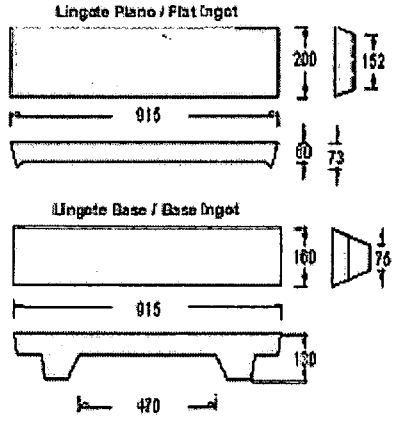
Bundle Characteristics
4 base ingots and 12 layers of 4 flat ingots each.
Weight: approximately 520 kg.

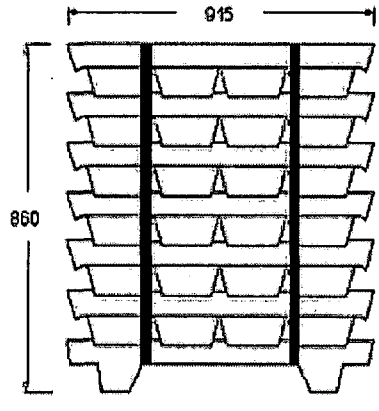
22 kg Ingots

Composición Química (%) / Chemical Composition (%)

									Otros Others		
Aleaciones Alloys	Si	Fe	Cu	Mn	Mg	Zn	V	Ti	C/U Each	Total	Al
1070	.20	.25	.04	.03	.03	.04	.05	.03	.03	----	99.70 min
1080	15	.15	.03	.02	02	.03	.05	.03	.02	----	99.80 min
1085	.10	.12	.03	.02	.02	.03	.05	.02	.01	----	99.85 min
1090	.07	.07	.02	.01	.01	.03	.05	.02	.01	----	99.90 min
1350	.10	.40	.05	.01	----	.05	----	----	.03	----	99.50 min

Dimensiones (mm) / Dimensions (mm)

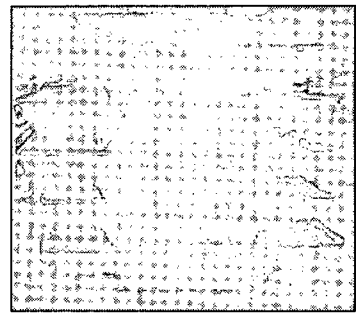




Características del Bulto:
5 lingotes base y 12 camadas de 4 lingotes planos cada uno.
Peso: 1200 kg aproximadamente.

Bundle Characteristics
5 base ingots and 12 layers of 4 flat ingots each.
Weight: approximately 1200 kg.

680 kg Ingots

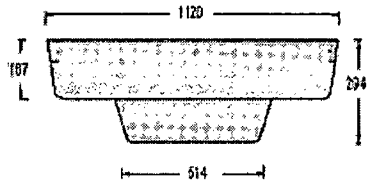


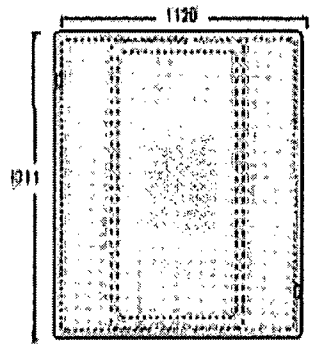
Composición Química (%) / Chemical Composition (%)

Aleaciones Alloys	Si	Fe	Cu	Mn	Mg	Zn	V	Ti	Otros Others C/U Each	Otros Others Total	Al
1070	.20	.25	.04	.03	.03	.04	.05	.03	.03	---	99.70 min
1080	.15	.15	.03	.02	.02	.03	.05	.03	.02	---	99.80 min
1085	.10	.12	.03	.02	.02	.03	.05	.02	.01	---	99.85 min
1090	.07	.07	.02	.01	.01	.03	.05	.01	.01	---	99.90 min
1350	.10	.40	.05	.01	---	.05	---	---	.03	.10	99.50 min
6201*	.50 - .90	.50	.10	.03	.60 - .90	.10	---	---	.03	.10	99.50 min

*Contenido de Boro: 0.06 % máx. / Maximum Boron content: 0.60 %

Dimensiones (mm) / Dimensions (mm)





Quality

In VENALUM, quality control is carried out at all stages of the production process, from raw materials to final product, through continuous tests and inspections, in order to guarantee the quality of the final product. The products are certified according to the NORVEN standard; however the company is working towards the certification of its quality system as required by the ISO 9002 standard. In order to certify each product, different tests are carried out, among which ultrasound, vacuum testing, macro attack, and hydrogen content. The laboratory is certified according to the COVENIN standard, whereas the company pursues its certification under the international ISO 2534-94 standard.

4. CVG CARBONES DEL ORINOCO C.A. (CARBONORCA) was created under the original conception of constituting a centralized plant for the production of green and cooked anodes to supply the increased capacities of CVG Alcasa and CVG Venalum as well as new projects of aluminium reduction plants that would settle in the Guayana region. The company was founded in December 1987, beginning its operation in December 1988, with a share distribution as follows: CVG 10%, Alcasa 45%, Venalum 45%. The investments carried out in CVG Carbonorca were made in 140,000 tons a year of green anodes paste plant, and two baking furnaces, with a combined capacity of 194,800 metric tones a year of baked anodes. It uses continuing mixing technology to manufacture anodes with high electric conductivity, high mechanic resistance, low oxygen and air reactivity with a homogenous configuration, which is an ideal condition for using as electrodes in metallurgical processes. The company counts with a grinding and compacting plant and 3 cooking furnaces. This company is also a fundamental piece for the future projects for the construction of primary aluminum plants in the region. Besides satisfying the national market, the company has successfully approached international markets exporting part of its production.

Address:
Av. Armed Forces - Industrial Zone Slaughters
Puerto Ordaz - State Bolivar.
Telephones: 58 (286) 99806207
Presidency: 58 (286) 9940204/9941286
email: ventas@carbonorca.com.ve

4.1. Carbonorca Production Processes

Grinding and Compressing
The paste plant has a continuous mixer, pitch casters, dry aggregate preheaters and a vibrocompactor where the green anode blocks are built from petroleum coke, tar

and recycled anode material. The capacity of the paste plant is 140,000 tonnes/year.

Baking Furnaces

The company has two (2) closed type baking furnaces, where the anodes are baked in order to improve their mechanical properties and electrical conductivity. The furnace HC 1.1 of 48 sections has a capacity of 121,750 metric tonnes a year and the furnace HC1.2 of 32 sections has a capacity of 73,050 metric tonnes a year.

•Two sheds of closed baking furnace of vertical flow.

•Each shed has a furnace of 48 and another of 32 sections.

•Baking cycles: 24 → 48 hours.

•Production adjusted to client requirements.

Other Facilities

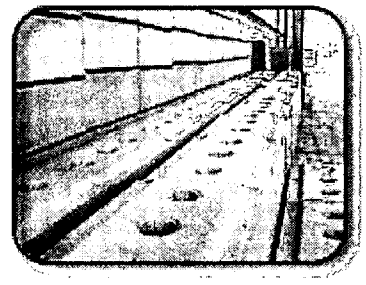
Carbonorca also has the following facilities; Warehouse of Green Anodes, Warehouse of Baked Anodes, Fume Treatment Plant, Water Treatment Plant, spare parts Warehouse, Compressors Plant, Gas station and fuel Supply plant.

Baked Anodes

Height : 560 mm
Length : Minimum: 1100 mm
Maximum: 1680 mm
Width : Minimun: 710 mm
Maximun: 810 mm

Technical Specifications

Property	Value
Density (g/cc)	1.54 – 1.6
Permeability (nPm)	3
Electrical Resistance (μ Ω m)	58
Bending Strength (MPa)	8-12
Thermal Conductivity (W/m K)	3-5
Dust by CO2 (%)	2
Residual by CO2 Reaction (%)	90



5. A LIST OF NEW TECHNOLOGIES AVAILABLE IN RUSSIA AND COMECON COUNTRIES

Having analyzed the existing technologies and the range of prime products manufactured by the CVG's aluminum plants we have made the following conclusions. In addition to the technologies currently applicable in all the above mentioned companies we may offer a number of new technologies for manufacturing value-added aluminum products. We have identified the list of advanced and the most suitable technologies available in Russia. They are as follows.

1. Hard colour anodizing technology is intended for finishing of aluminum structures used in civil engineering and for finishing of various products and components used for technical and household purposes. The technology allows production of coatings of high thickness, hardness and corrosion resistance. Table below shows technical characteristics of an anode oxide film produced via the hard colour anodizing technology.
2. Technology for manufacturing a wide range of laminated aluminum alloy sheet semiproducts.
3. Technology for manufacturing extruded aluminum alloy bars.
4. Technology for manufacturing aluminum alloy shapes. Range of the shapes is extremely wide. There are several thousands of standard sizes. Both solid and hollow shapes can be produced. The extrude shapes are used in civil engineering, transport mechanical engineering, aircraft and defense industries.
5. Technology for manufacturing extruded aluminum alloy tubes.
6. Technology for manufacturing aluminum powder, aluminum powder for production of heat-resisting alloys, secondary passivated aluminum powder, secondary aluminum powder, aluminum atomized powder, aluminum powder for manufacturing of explosives and pyrotechnic matters, aluminum

atomized hydrophilic powder, aluminum paste, grain-type aluminum powder.

7. Technology for manufacturing:
   - extruded shapes and panels of aluminum alloys: extruded solid shapes of continuous section and integrally stiffened panels of continuous section;
   - extruded tubes of aluminum alloys: seamless tubes and welded tubes;
   - aluminum alloy ingots; to ensure increased metal purity melt is subject to evacuation and filtration through foam-ceramic filters combined with glass meshes; to obtain cast surface of high quality casting is done in block systems with "hot top"; ingots are semi-continuously cast into sliding molds;
   - billets of alloys;
   - tubes for risers manufacture;
   - alloying elements for aluminum alloys;
   - plates of aluminum alloys.

8. Rolling technology (all sorts of aluminum and aluminum alloys) for producing:
   - Sheets (thickness 0.5-4.5 mm, width up to 2000 mm, length up to 7500 mm) ;
   - Plates (thickness 10-200 mm, width up to 2000 mm, length up to 9000 mm);
   - Strip in coils (thickness 0.5-10 mm, width 120-630 mm, length up to 3500 mm);
   - Sheets with corrugated surface (thickness 0.8-1.0 mm, width 950-1050 mm, length 2000 mm);
   - Sheets with a relief surface (thickness up to 4,0 mm, width 500-1350 mm, length up to 4000 mm).

9. Extruded section production technology:
   - Extruded profiles of aluminum wrought alloys (more then 6000 types, cross section area 0,2-100,0 sq. sm.);
   - Bars:

   - Round bars (diameter 7-300 mm, length up to 12000 mm)
   - Square section bars (square side 18-150 mm, length up to 6000 mm)
   - Hexahedral bars (hexahedron side 22-100 mm, length up to 6000 mm)
   - Bars for electrical engineering purpose (cross section 2x20-10x100, 2x20-2x290 mm).

10. Tubes manufacturing technology:
    - Round section cold deformed thin walled tubes (external diameter 6-120 mm, wall thickness 0.5-5.0 mm);

- Extruded round tubes (external diameter 18-120 mm, wall thickness 1.5-32.0 mm);
- Tubes of square section thin walled, cold deformed (Side of square 10-120 mm, wall thickness 1.0-5.0 mm);
- Round welded tubes (external diameter 10-20 mm, wall thickness 0.6-1.5 mm);
- Tubes with ribs for the heat exchangers.

11. Technology for manufacturing FMCG products:
    - Wide range of kitchen utensils and household aluminum die-stamped vessels;
    - Extruded aluminum water-heating radiators (height 300-2000mm, weight of a section 0.95-8.00kg, heat transfer agent temperature 130°C, working pressure 1.6 MPa, test pressure 3.0 MPa, number of radiator sections 2-24 pcs);
    - Car wheel disks forged of aluminum alloys.

6. A LIST OF INSTITUTIONS, ENTERPRISES AND COMPANIES WILLING TO COOPERATE IN TECHNOLOGY TRANSFER

6.1. JSC "ALL RUSSIA INSTITUTE OF LIGHT ALLOYS"

The general direction of VILS activity is the development of fundamentally new technologies, which open the ways to making essentially new products and materials, achievement of an effectively new level of metal quality.

HARD COLOUR ANODIZING OF ALUMINIUM ALLOYS

A hard colour anodizing technology intended for finishing of aluminium structures used in civil engineering and for finishing of various products and components used for technical and household purposes was developed at VILS Stock Co. The technology allows production of coatings of high thickness, hardness and corrosion resistance.

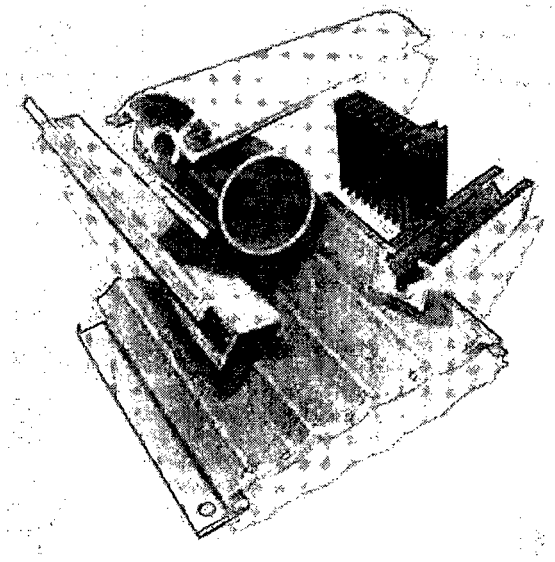


Table below shows technical characteristics of an anode oxide film produced via the hard colour anodizing technology.

Anode film thickness, mkm		Corrosion resistance, rating		Anode film hardness, MPa	
Hard anodizing	Conventional anodizing	Hard anodizing	Conventional anodizing	Hard anodizing	Conventional anodizing
3-100	3-25	10	8-9	8000-9000	2000

In the case of hard colour anodizing, film growth rate is higher 3.5–4 times in comparison with conventional anodizing in sulphuric acid and higher 2 times than in the case of well-known hard anodizing under lower temperatures.

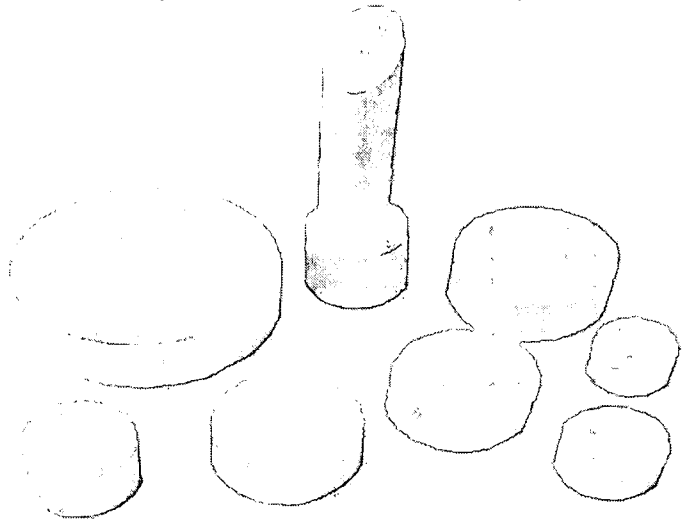
Therefore, 20 mkm thick film for structures used in civil engineering can be produced for 15 min (instead of usual 60 min).

Hard colour anodizing allows one to attain maximum corrosion resistance in a thickness range of 30–40 mkm. In this case the expected service life in open atmosphere will be 40–50 years instead of 8–10 years which is characteristic of conventional anodizing.

30–40 m thick film gives a complete gamut of colours with high light fastness in the cases of electrocolouring (from light brown to black) and conventional colouring (golden, light blue, blue, green).

EXTRUDED BARS

made of alloys of Al-Mg, Al-Mg-Si, Al-Cu-Mg, Al-Cu-Mg-Fe-Ni, Al-Zn-Mg-Cu-Zr and Al-Zn-Mg systems.



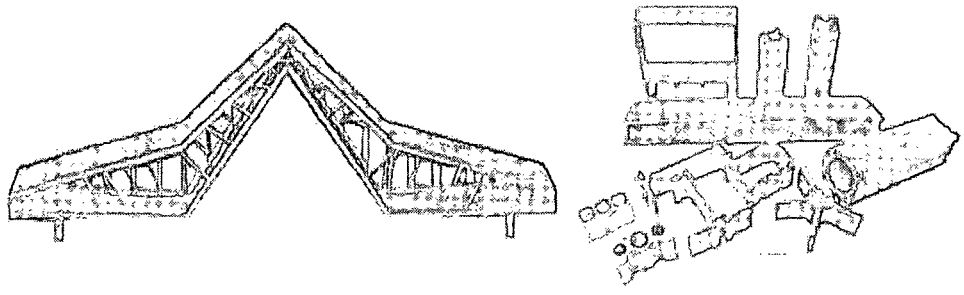
Depending on the field of application and desired level of mechanical properties, products as hot-extruded, as-annealed or as-heat treated can be supplied to customers. In some cases products after stretcher straightening including those with specified degree of residual strain, and also in semi-cold worked and cold-worked conditions can be supplied. Round, square or hexahedral bars can be produced. In the case of heat-treatable alloys, nominal diameter of round bars and inscribed circle diameter of square bars is 11-120 mm. Hexahedral bars with inscribed circle diameter of 7?35 mm can be produced. In the case of nonheat-treatable alloys, bars up to 220 mm in diameter can be supplied. Standard maximum deviations from nominal diameter of bars are determined by three classes, namely normal accuracy, improved accuracy and special accuracy.

Maximum Geometrical Size Deviations

Nominal diameter, mm	Maximum allowable deviations					
	from diameter, mm			from straight, mm		
	normal accuracy	improved accuracy	special accuracy	normal accuracy	improved accuracy	special accuracy
11-18 19-30	-0,70 -0,84	-0,43 -0,52	-0,1 -0,15	3	2	0,5
31-50	-1,00	-0,62	-0,2	2	1	0,7
51-80 81-120	-1,20 -1,40	-0,74 -1,00	-0,4 -0,6	1	1	-

EXTRUDED PROFILE

Range of the shapes is extremely wide. There are several thousands of standard sizes. Both solid and hollow shapes can be produced. Depending on a shape type and alloy, the shapes with a flange thickness from 1.5 to 100 mm, cross-section area from 0.5 to 150 cm2 and circumscribing circle diameter up to 350 mm can be produced. An available set of presses and thermal adjusting equipment allows production of the shapes up to 14000 mm in length. The shapes are produced in accordance with State Standard (GOST), branch standard (OST), DIN, ASTM and special Specifications. The extruded shapes are used in civil engineering, transport mechanical engineering, aircraft and defence industries.

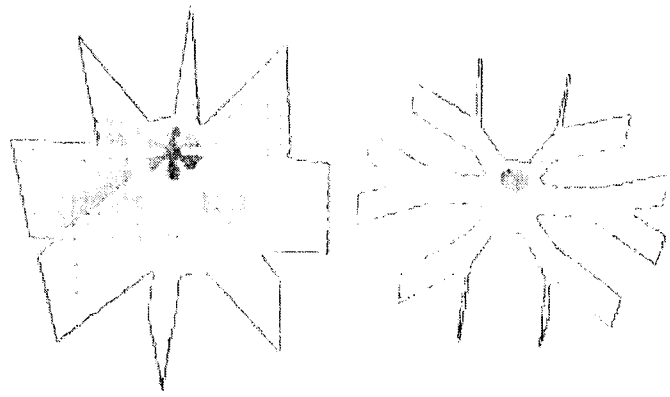


Material	Density, g/cm3	Mechanical properties			Delivery condition*
		UTS, MPa	YS, MPa	d, %	
Al-Cu-Li alloys	2,61	>530	>450	>6	?6
Al-Mg-Li alloys	2,47	>410	>270	>7	?4
Al-Zn-Mg-Zr alloys	2,85	>590	>540	>6	?6
Al-Mg-Sc alloys	2,64	>400	>245	>14	0

* Temper of the material can be measured in accordance with Customers request.

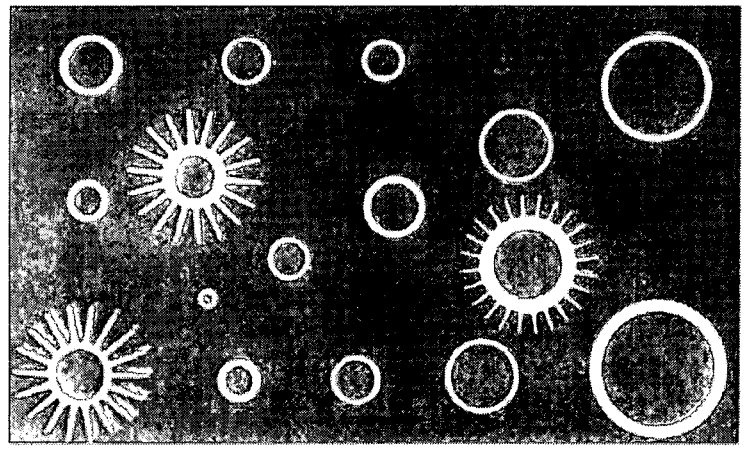
EXTRUDED ALUMINIUM ALLOYS TUBES

VILS Stock Co commercialized production of a wide range of tubes with a wall thickness of 0.2-5.0 mm, made of easy-to-deform Al 99.9Mg1, AlMn1, AlMg1, AlMgSi0.5 alloys and with a wall thickness of above 5 mm, made of high strength AlMg4.5Mn, AlCuMg1, AlCuMg2 and AlZnMgCu1.5 alloys.

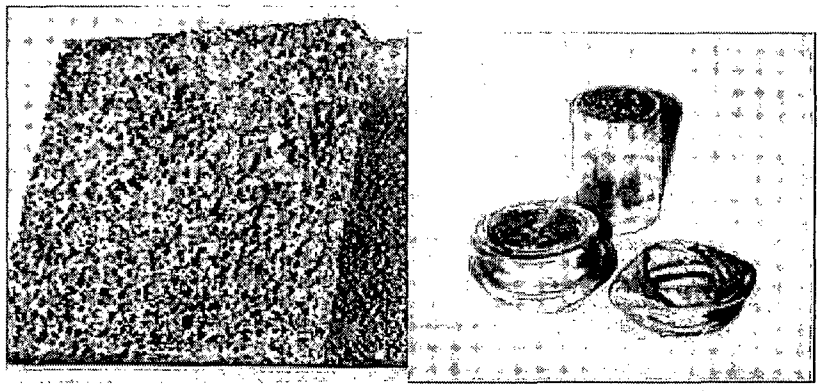


Pipes of Special Purposes

Semiproduct	Alloy	Range of pipes	Application
Pipes with external finning	Al99,9Mg1 AlMgSi0,5	Circumscribing circle diameter: 40-186 mm; external perimeter: 240-1400 mm	Cryogenic equipment
Multihole flat-and-oval pipes	AlMn1 AlMgSi0,5	Width-to-height ratio: 20:1, Wall thickness: up to 1.5 mm Number of channels: up to 10	Motor vehicle and aircraft onditioners ,motor vehicle cooling radiators
Bimetallic products (sacrificial anodes)	Ats2/steel AP1/steel Mg alloy/steel .	30-40 mm dia., Galvanized steel core dia.: 4.0-5.0 mm	Corrosion protection of ship hulls motor vehicle bodies, pipe-lines, etc.



ALUMINIUM ALLOY-BASED FOAMED MATERIALS



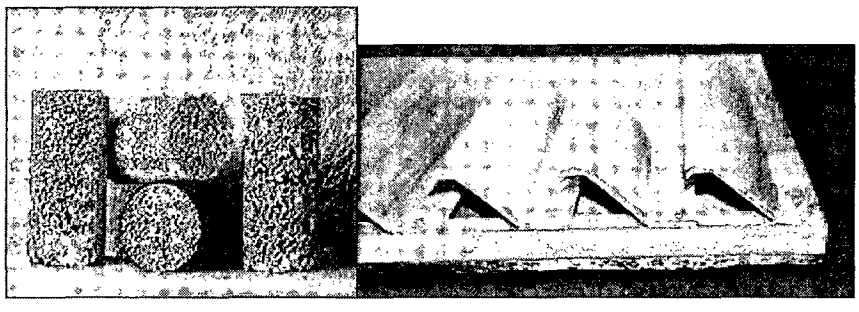
Aluminium alloy-based foamed materials show ?° unique combination of properties:

density <1.2 g/cm3, low heat- and electrical conduction, high ability to absorb shock energy and acoustic vibrations, incombustibility and ecological safety.

VILS Stock developed a pilot technology for production of rolled foamed aluminium semiproducts with the use of the powder metallurgy technique.

Works are carried out also for production of foamed aluminium-based composites and laminated foamed materials via the powder metallurgy and casting techniques.

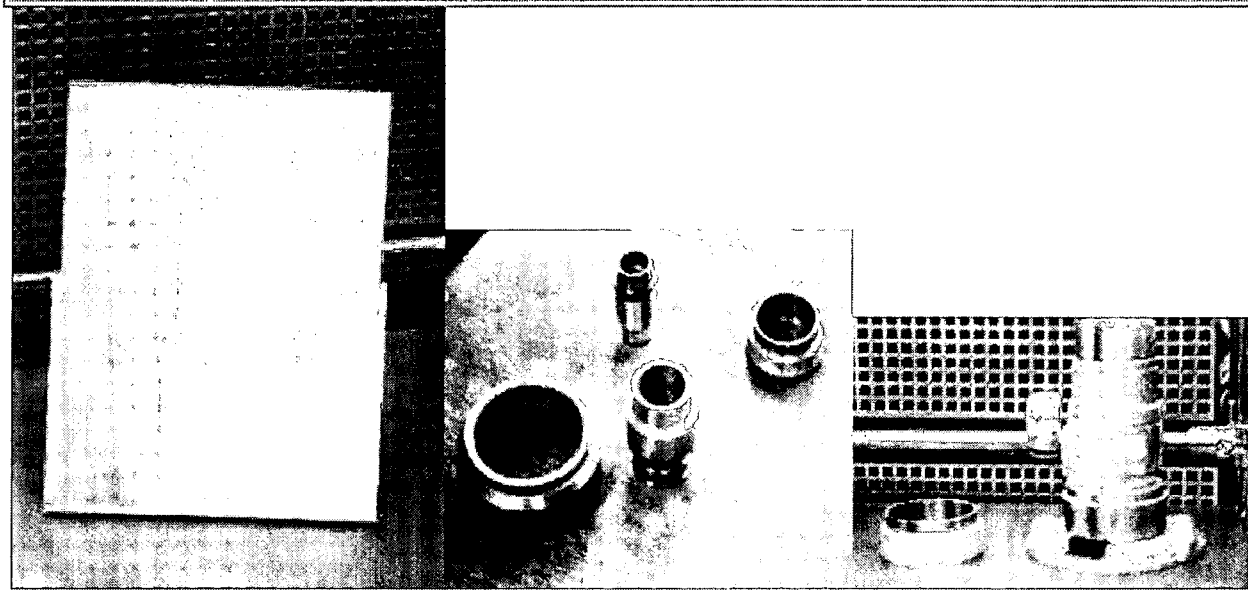
Aluminium alloy-based foamed materials can be effectively used instead of inflammable or ecologically dangerous materials (wood, wood particle boards, plastics, organic foamed materials, etc.) for production of noise-absorbing damping and incombustible elements in structures for aircraft and motor vehicles industries, civil engineering and mechanical engineering.



LAMINATED SHEET SEMIPRODUCTS

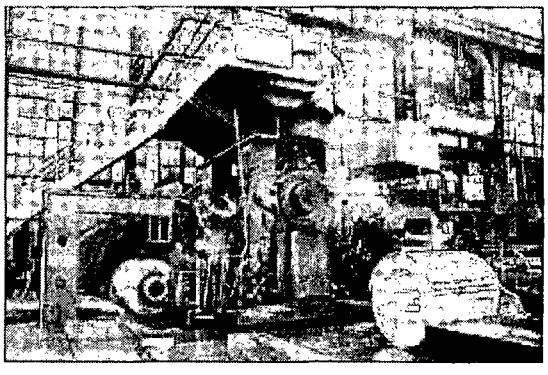
Constituents	Composition	Size, mm	Efficiency
Al-Cu	APM, AMg6PM	1.5-20x300-1200x x400-3000 Copper layer thickness: 0.2-0.4	–A reduction in weight of electrical conductive components 2.5–3.0 times; – Replacement of scarce copper.
Al/steel	AD1, A5, A6, A7/12H18N10T AMg6, 1201,	1.5-4.0x340-360x x1500-coils Steel layer thickness: 0.17-0.2	– An improvement in corrosion resistance; – A reduction in weight; – An improvement in surface

	AMTs, AD1/12H18N10T	2?15x400-1200x x600-1500 Steel layer thickness: 1-8	quality; – Replacement of bolted joints by welded ones; – An improvement in reliability and tightness of structures. .
Al/Al–Si	APS, AMTsPS, Ts2	0.3-0.8x200-600x x1000-coil Clod layer thickness, %: 6-12	– A reduction in weight of soldered heat exchangers; – Replacement of scarce copper and its alloys.
Nb-Ti-Nb	NTN	5x1300x1300	– Ensuring of recurrence of start of a liquid-propellant rocket engine in an orbit at temperatures from –196 °C up to +1400 °C
Al-Ti	D16/VT1-0	0.8-2.5x550x2500	– Protection of airplane fuselage against erosion, an improvement in service life and reliability of structures.
Al-Al	AD1/AD1, AMg2/AMg2	1.0-3.0x200-1100x x400-4500	– A reduction in weight and size of refrigerator evaporators, chambers of space objects with the preset temperature conditions.



6.2. JSC "STUPINO METALLURGICAL COMPANY" is the multiple production kind of works having the following manufacture features: - semi-finished products of wrought aluminium alloys - forged blanks of steel and superalloys - vacuum melted bars and ingots of special-property alloys on the base of nickel, titanium, and cobalt - consumer goods.

ROLLING



The four-high hot and cold rolling mills having barred length of 2800 mm and auxiliary equipment permit to manufacture plan rolled products of alluminium and its alloys for different purposes in a wide range:

· Sheets (0,5 to 4,0 mm thickness, up to 2000 mm width, up to 7200 mm length) of different conditions of shipment: annealed, quenched, cold-worked,
semi-cold-worked; with different cladding: standard, increased thickness, production method one.

· Plates (from 11 to 200 mm thickness, up to 5000 mm length) in as-hot rolled condition with cutting into fixed length up to thickness of 60,0 mm

· Coiled strip (from 0,5 to 10,0 mm thickness, up to 2000 mm width, up to 6,0 tons by mass of different conditions of shipment.

· Corrugated sheets of alloy 1105 (from 0,8 to 1,0 thickness, 950 mm width, 2000 mm and 2500 mm length, height of corrugation 24 mm).

· Sheets with a relief surface of alloys ? ? ?2 and ? ? ? (sheet base thickness from 1,5 to 4,0 mm, from 500 to 1350 mm width, from 1000 to 4000 mm length, relief element
height 1,0 mm)

Mentioned production finds a wide application in aircraft industry, consumer goods production and in many other branches of the national economy.

Sheets

Alloys	shipment condition	thickness	width	length	specifications
? 16, ? 19?	? ? , ? ? , ? ?, ? ?	0,5-4,0	1200-2000	2000-7200	
1163	? ? ? , ? ? ?	1,5-7,5	1200-1500	2000-7200	? ? ? 190246-77
? 16	? ? , ? ? , ? ?, ? ?	0,5-4,0	1200-2000	2000-7200	? ? ? ? 21631-76

	? ? ? , ? ? ?	1,5-7,5	1200-1500	2000-7200	
? ? ?2	? , ? , ? 2	0,8-4,0	1200-2000	2000-7200	? ? ? ? 21631-77
? ? ?3	? , ? 2	1,0-4,0	1200-2000	2000-7200	
? ? ?6	? ? , ? ?	2,0-4,0	1200-2000	2000-7200	? ? ? ? 21631-77
	? ? ? ? , ? ? , ? ?	2,0-4,0	1200-2000	2000-7200	? ? ? 192000-90
? ? , ? 5, ? 6, ? 7, ? ? ? , ? ? 1, ? ? ?	? , ? , ? 2	0,5-4,0	1200-2000	2000-7200	? ? ? ? 21631-77
? ? 35	?	1,5-4,0	1200	3000	? ? 1-1-8-79
? 40	? , ?	0,8-4,0	1200-1500	3000-7200	? ? ? 190261-77
	? ?	1,5-7,0			
? ? ? ? ? , ? ? ? ? ?					
? ? ? , ? ? ? 1	? , ?	0,5-4,0	1200	3000	? ? 1-1-74-77

? - annealed ? - quenched

? - cold-worked ? 2 - semi-cold-worked

? ? - limited strength ? - standard cladding

? - increased thickness cladding ? - production method cladding

Plates

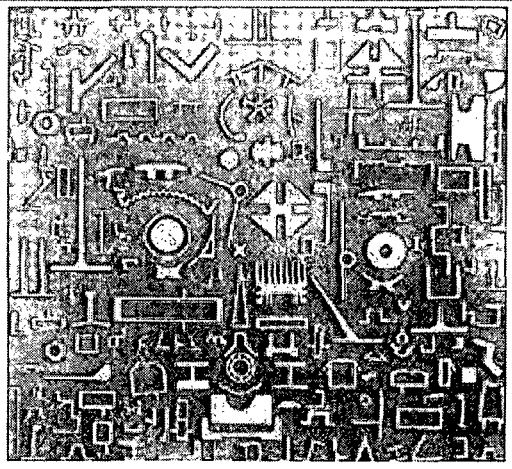
Alloy	Thickness	Width	Length
All brands of aluminium	10,5-35,0	1200-2000	3000-4500
? ? ?2, ? ? ?3, ? ? ?6, ? ? ?	36,0-60,0	1200-2000	up to 7000
? ? 35, 1105, ? 16, ? 19	more than 60,0	1200-2000	non fixed length

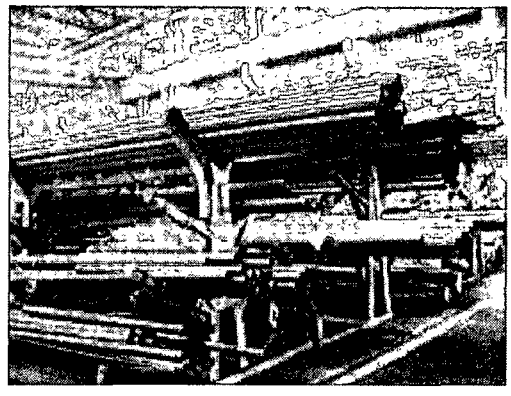
Coiled strip

Alloy	Shipment condition	Thickness	Mechanical properties	
			? ? ? (? ? ? , ? ? ?)	%
All brands of aluminium, ? ? ?, ? ? ?2, ? ? ?3, ? 16	? , ? , ? 2, hot rolled	0,5-10,0	6-29 (60,8-284,2)	d? , MPa (kgf/mm2) 3-28

Pipe production

The shape pressing shop manufactures extruded (GOST 8617-81, OST 190113-86) round, square, hexahedral bars (GOST 21488-97, OST 190395-91), busses and pipes for electrotechnical purposes (GOST 15176-89, GOST 18482-79). Alloys: Profiles A5, ? ? 1, ? ? ?, ? ? 6, ? ? ?6, ? ? 31, ? ? 35, ? ? , ? 1, ? 16. Bars ? ? 1, ? ? ?, ? ? 31, ? ? 35, ? ? , ? 16, ? 1, ? ? 6, ? ? 3. Busses ? ? 1, ? ? 0, ? ? 1. Pipes ? ? ? , ? ? 0, ? ? 1 The pipe pressing shop manufactures extruded, (GOST 18482-79) seamless cold deformed (OST 192096-83, GOST18475-82), welded (GOST 23697-79) pipe semi-finished products of round, square finned and other equally thickness section of alluminium and wrought aluminium aloys, welded pipes of steels 08X18H10T and 12XH10T. Square and rectangular pipes are manufactured according to OST 192096 and GOST 18475 with sides 10,0 - 60.0 mm of alloys ? 16, ? 1, ? ? ?2, ? ? ?3.





Alloys	Average external diameter, mm	Average wall thickness, mm
? 1, ? 16, ? ? ?2, ? ? ?3, ? ? ?, ? ? ?, ? ? 1, ? ? 31, ? ? , ? ? 6	6,0-105	0,5-10,0
? ? ?6	30,0-65	1,5-5,0

Aluminium die-stamped utensils

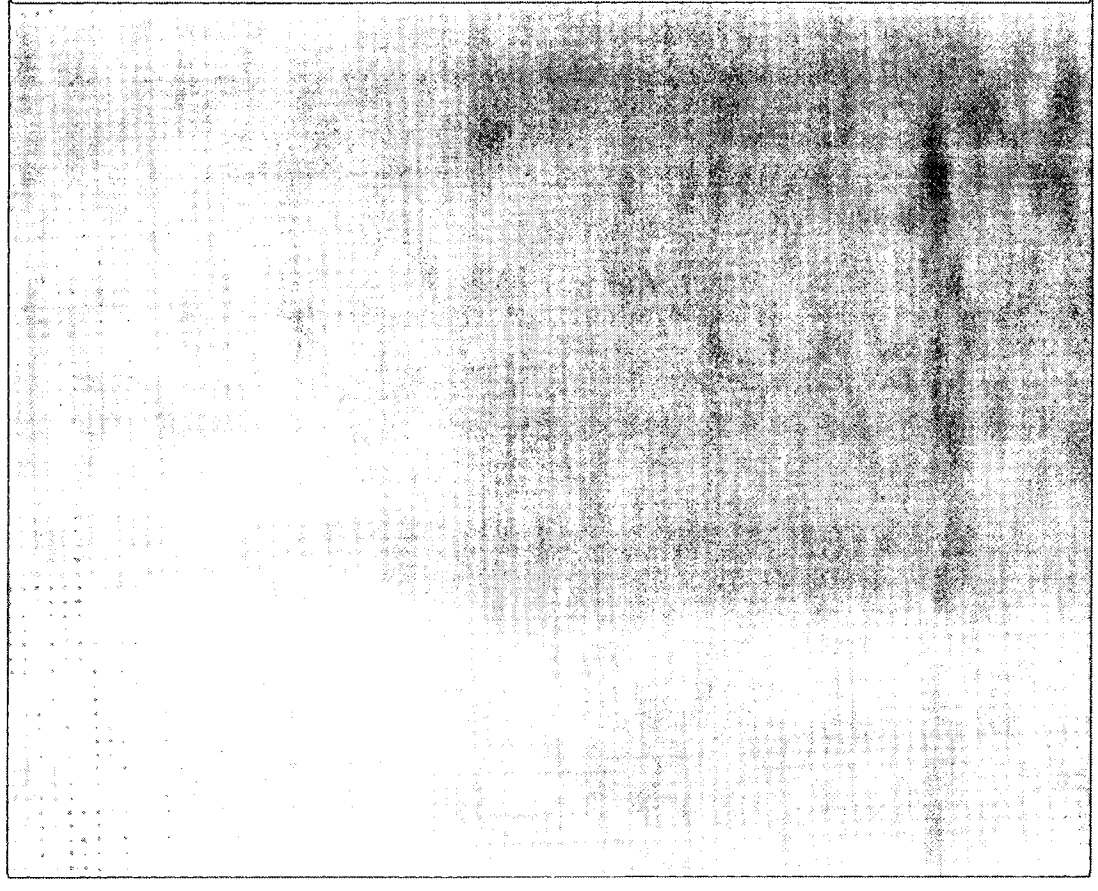
JSC "Stupino Metallurgical Company" is the

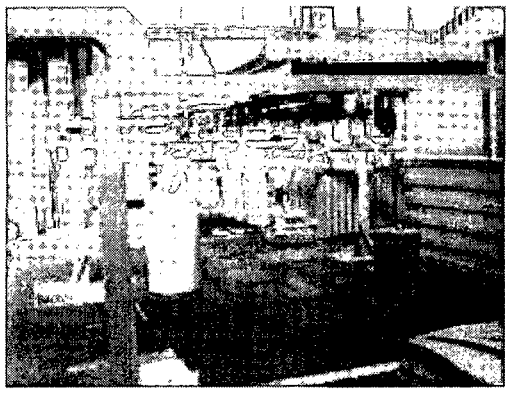
aluminium pots (dull), pots with a relief surface, tureens, plates, mugs, frying-pans, cookers, dinner-services, flasks for milk and diary products.

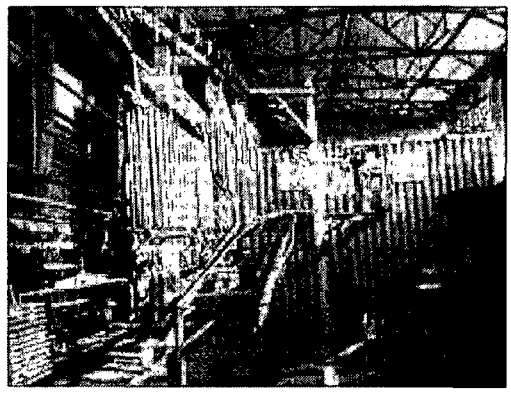
Heating radiators

Heating radiators of aluminium corrosion-resistant alloy, having high-strength characteristics. The radiators are developed in Russia and certificated by the research institute "Santechnika".

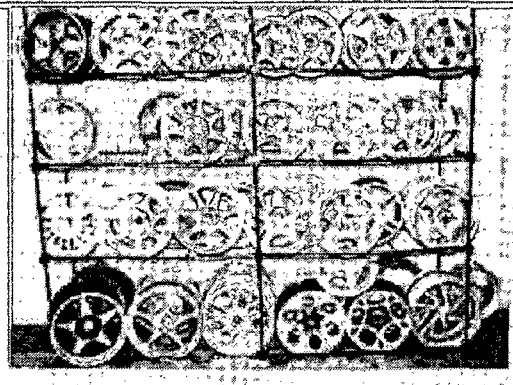
Technical data:	
Heat transfer agent temperature, 0C	130
Working pressure MPa (kg/cm2)	1,5 (15)
Number of radiator	







Car wheel disks.



JSC "SMK" is one of the world few manufactures of car wheel disks of aluminium alloys which are manufactured by hot die forging. High quality of our wheel disks with a trade mark "CMK" is confirmed by Gosstandart certificate of compliance to GOST P 5051 requirements, by certificate of compliance POCC RU.MT25.802946, by "Silver Quality Mark" of "Russian Brand" national contest. Moreover, the quality system with the model of international standard ISO 9001:2000 is worked out and operates at the company. This quality system is confirmed by the firm TUV certificate ? 1210010059. The modern engineering and strength analysis technologies, sophisticated technologies of forged blanks production and following machining assure production of high quality. Car wheel disks manufactured by our company are characterized by:

- *Optimal macrostructure grain location;*
- *Casting flaws absence that are appropriate to cast wheel disks of light alloys;*
- *Successful mechanical properties complex, which define operating quality of the wheel;*
- *Considerable reduction of disk weight;;*
- *High corrosion resistance;*
- *Modern design.*

6.3. JSC "BOGOSLOVSKY ALUMINIUM PLANT" is one of the biggest producers of high-quality alumina and aluminium. The greater part of the aluminium produced is of high grade. The brand A7E "BAZ-SUAL" was

registered at London Metals Exchange and has a high commercial prestige both in Russia and abroad. Principal production:

- Alumina, aluminium hydroxide;
- Primary aluminium and its alloys;
- Aluminium powders and pastes;
- Anode paste;
- Protective Al-covers for marine metalwork structures against corrosion.

6.4. VSMPO – VERKHNAYA SALDA METALLURGICAL PRODUCTION ASSOCIATION is the world's largest integrated producer of titanium, aluminum, magnesium and nickel alloys and steels. The Company does business with more than 260 companies from 39 countries worldwide. VSMPO's products find their application in aerospace, energy, chemical and automobile sectors, shipbuilding and architecture.

VSMPO

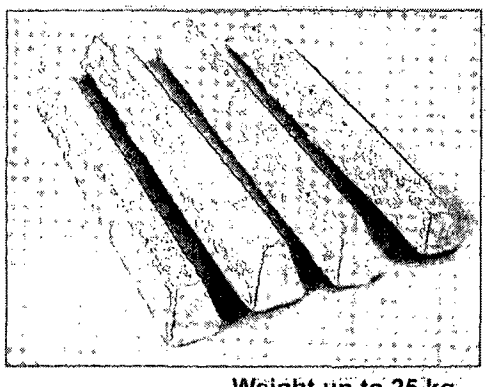
VERKHNAYA SALDA METALLURGICAL PRODUCTION ASSOCIATION

ALLOYING ELEMENTS FOR ALUMINIUM ALLOYS

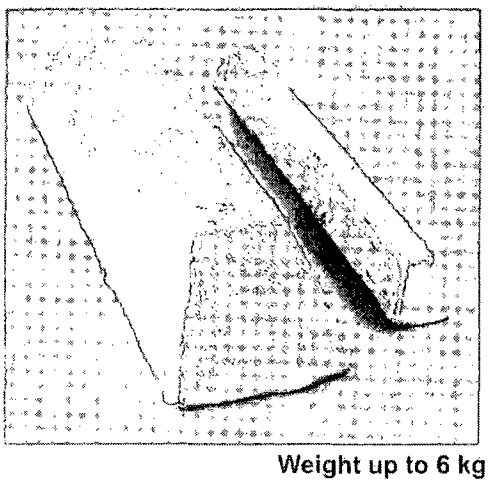
Alloying of pure aluminium helps to improve its mechanical and physical properties which is very important for production of high-quality material.

VSMPO alloying elements provide for quick dissolution in the melt at relatively low temperatures.

Alloying elements are produced in channel-type induction furnaces.
Alloying elements are poured into cast-iron molds.



Weight up to 25 kg



Weight up to 6 kg

TYPE OF PRODUCED ALLOYING ELEMENTS

Alloy aluminium-	Element	Nominal composition
manganese	Mn	up to 13%
zirconium	Zr	up to 2.5%
titanium	Ti	up to 4%
chromium	Cr	up to 6%
nickel	Ni	up to 31%
iron	Fe	up to 16%
silicon	Si	up to 13%
vanadium	V	up to 5%
molybdenum-titanium	Mo(Ti)	5% Mo (3% Ti)
chromium-magnesium	Cr (Mg)	4.5% Cr (2.5% Mg)
copper-manganese-titanium	Cu (Mn, Ti)	32% Cu (5.3% Mn, 2% Ti)

All alloying elements are produced in accordance with the Quality Control System.

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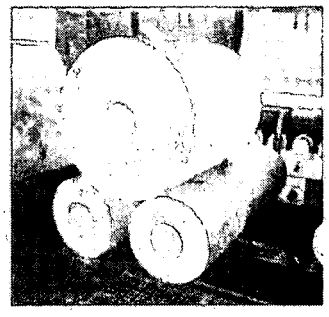
E-mail: export@vsmpo.ru

VERKHNAYA SALDA METALLURGICAL PRODUCTION ASSOCIATION

ALUMINIUM ALLOY INGOTS

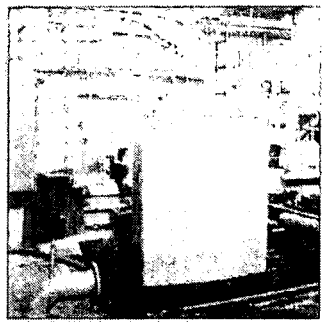


SIZE OF CAST INGOTS:

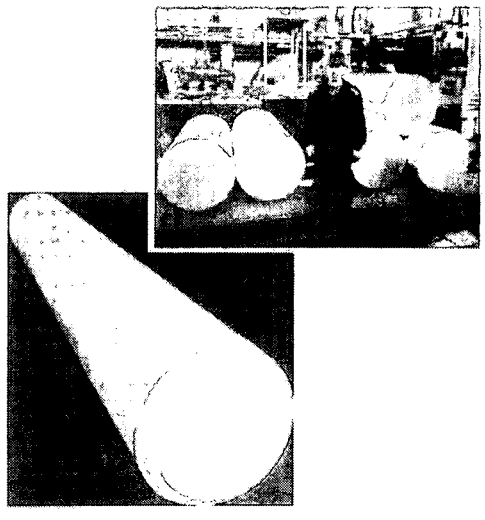
ROUND CONTINUOUS
diameter - 4.33 - 46.45 inch
length - 98.43 - 204.72 inch

ROUND HOLLOW
outer diameter - 10.71 - 33.27 inch
inner diameter - 3.86 - 7.87 inch
length - 98.43 - 204.72 inch

FLAT
thickness - 8.66 - 21.06 inch
width - 31.89 - 56.30 inch
length - 98.43 - 204.72 inch



Alloys	Delivery conditions
2014, 2017, 2024, 2219, 2618,2124.	AMS 4162C AMS 4144E, MSRR 8084
4032	C50E37-S2
5754, 5086, 5083, 5056.	DIN EN 573-3/ DIN EN 486
6060, 6061, 6063, 6151, 6282.	DMD-0561-26, CLE-AI-018
7005, 7075, 7175, 7010, 7050, 7150.	AMS 4147C
АД 0, АД 1, АМц	ГОСТ 4784-97
Д16, Д16ч, 1163,	ГОСТ 4784-97, ГУ1-2-83-38,
Д1, 1161.	ОСТ 190048-90
В95, В95пч, В95оч, 1973, В93, В93пч.	ГОСТ 4784-97, ОСТ1-90026-80
АМг3, АМг5, АМг6,АВ	ГОСТ 4784-97
В96-ц3, АК4-1ч, АК6	ОСТ 1 90048-90, ГОСТ 4784-97



J-S company VSMPO produces more than 50 grades of wrought aluminium alloys to Rosstandard and more than 20 alloy grades to international standards.

To ensure increased metal purity, melt is subject to evacuation and filtration through foam-ceramic filters combined with glass meshes.

To obtain cast surface of high quality, casting is done in block systems with "hot top".

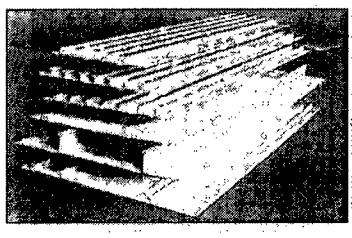
Ingots are semi-continuously cast into sliding molds.

Наш адрес
624760, Россия, г. Верхняя Салда Свердловской области,
ул. Парковая 1, ВСМПО
Тел: (34345) 21405, 22726, 22947 Факс: (34345) 24736
http://www.vsmpo.ru
Email: export@vsmpo.ru

VSMPO

VERKHNAYA SALDA METALLURGICAL PRODUCTION ASSOCIATION

EXTRUDED SHAPES AND PANELS OF ALUMINIUM ALLOYS

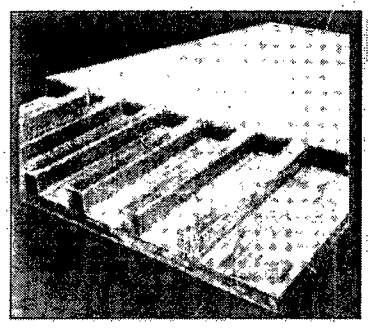


EXTRUDED SOLID SHAPES OF CONTINUOUS SECTION

-cross section area up to 31.00 sq.inch and diameter of the circumscribed circle up to 13.78 inch;
-cross section area 31.00 - 77.50 sq.inch and diameter of the circumscribed circle up to 23.62 inch;
-cross section area exceeding 77.50 sq.inch;
(as agreed with the customer).

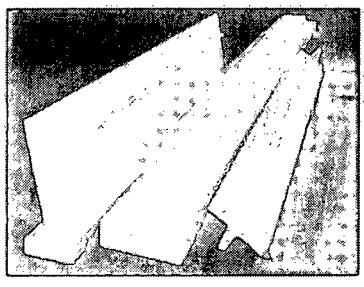
RUSSIAN ANALOGUES OF THE AMERICAN ALUMINUM ALLOYS AND ASSURED LEVEL OF MECHANICAL PROPERTIES OF THE EXTRUDED PRODUCTS FROM THE FOLLOWING ALLOYS

System	Alloys Russia GOST 4784	Alloys USA ASTM B 221	reference standards Russia	reference standards USA	Heat treatment	Mechanical properties tensile strength MPa	tensile strength Ksi	yield strength MPa	yield strength Ksi	Elongation %
Al - 99%	A5, A6,AD, AD0,AD1	1050, 1060, 1070, 1100	AD1	1060	F	60	8.69	15	2.17	25
Al-Cu-Mg	D1,D16, 1161,1163 1201	2024, 2117 2219, 2419	D16	2024	T3511	450	65.22	315	45.65	9
Al-Mn	Мм, АМц, Д12	3003, 3004, 3005, 3010, 3104	D12	3004	0	160	23.19	60	8.69	20
Al-Mg	АМГ1, АМГ2, АМГ3, АМГ4, АМГ5, АМГ6	5005, 5052, 5154, 5086, 5182, 5654	АМГ4	5083	0	270	39.13	110	15.94	14
Al-Mg-Si	AD31, AD33, AD35, AB	6063, 6262	AD31	6063	T6	205	29.71	170	24.64	10
Al-Zn-Cu-Mg	1393, B95, B96, 1914, 1935, 1955	7050, 7075, 7070, 7108, 7004, 7475	B95	7075	T6511	560	81.16	490	71.01	6



INTEGRALLY STIFFENED PANELS OF CONTINUOUS SECTION

They are produced with blade width up to 50.0 inch.
Of special interest ore the integrally stiffened panels with rectangular, T-shape, A-shape springers(ribs).
If the Customer requires, he may propose his own shape for fabrication of the extruded item.
Sections and panels are delivered in length up to 531.5 inch in quenched and artificially aged condition, quenched and naturally aged one.
Extruded items are manufactured in aluminum alloys of 1000, 2000, 3000, 5000, 6000, 7000 series, to Russian standards as well as ASTM, AMS, DIN, EN, QQ-A-200/GEN.



VSMPO produces more than 500 names of the extruded shapes and panels of different configuration, including [illegible] with heavy ends.

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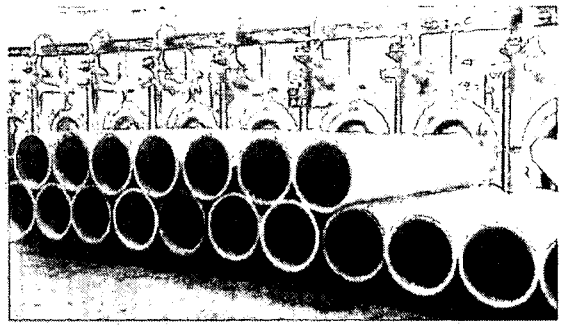
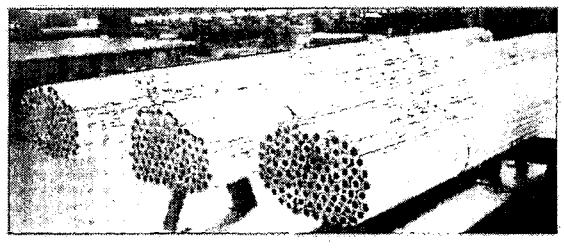
VERKHNAYA SALDA METALLURGICAL PRODUCTION ASSOCIATION

EXTRUDED TUBES OF ALUMINIUM ALLOYS





SEAMLESS TUBES

Outer diameter - 3.9-35.3 inch
Wall thickness - 0.39-4.92 inch
Maximum cross-section area - 131.7 sq. inch

ALLOYS OF 2000, 5000, 6000, 7000 SERIES

WELDED TUBES

Outer diameter - 0.39-3.9 inch
Wall thickness - 0.04-1.18 inch

ALLOYS OF 1000 SERIES

Alloy grade, specification	Heat treatment conditions	Mechanical properties				
		Tensile strength		Yield strength		Elongation, %
		МПа	Ksi	МПа	Ksi	
2219 ASTM B 241	T3511	322 - 340	46 - 49	198 - 226	28 - 33	27,6-31,3
6061 ASTM B 241	T6511	262 - 283	38 - 41	255 - 276	37 - 40	12.2-18,1
2024 QQ-A-200/3	T8511	490 - 510	71 - 74	421 - 455	61 - 66	9,3-10,25

Tubes are produced to AMS, ASTM, DIN, EN, QQ-A-200 specifications.

Heat treatment to ASTM B 597, AMS 2770 specifications.

Ultrasonic inspection to MIL-STD-2154, ABP 6-5232 specifications.

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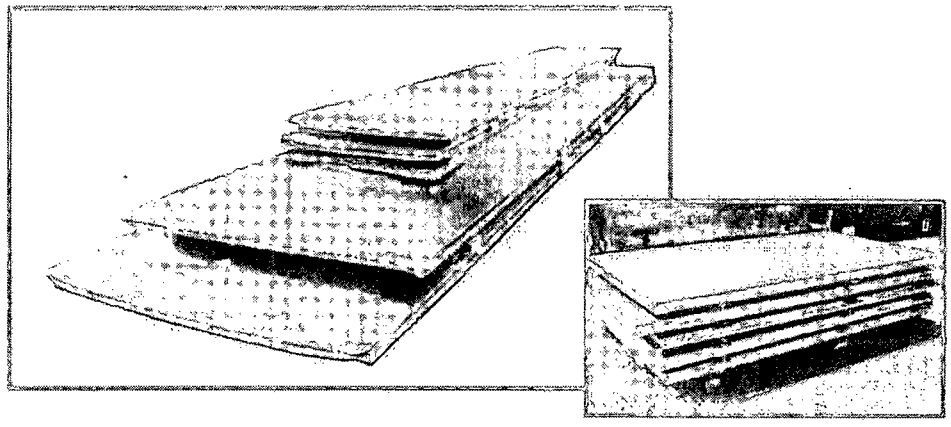
E-mail: export@vsmpo.ru

VERKHNAYA SALDA METALLURGICAL PRODUCTION ASSOCIATION

PLATES OF ALUMINIUM ALLOYS

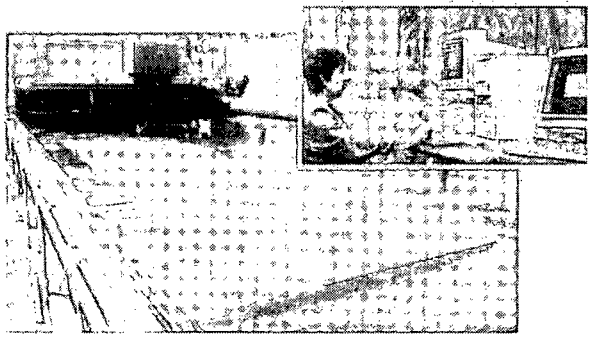


ALLOYS
Д16ц, АК4-1ч, В95пч по ГОСТ17232, ОСТ 1 - 90117, ОСТ 1 - 90125, 2024, 2219, 6061, 7075 по ASTM B209

RANGE OF PLATES

ALLOY	THICKNESS, inch	WIDTH, inch
Д16ц, 2024	1.18 - 2.17	43.31 - 63.0
2219	1.18 - 1.96	43.31 - 63.0
АК4-1	1.18 - 1.96	47.24 - 63.0
6061	1.57 - 2.36	47.24 - 63.0
В95пч, 7075	1.38 - 2.17	47.24 - 63.0

Plate length up to 472.44 inch



Plates are delivered in hardened condition

Upon the customer's reguirements plates shall be subject to ultrasonic testing.

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VSMPO, 1, Parkovaya st., Sverdlovsk region,
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E-mail: export@vsmpo.ru

6.5. Belaya Kalitva Metallurgical Production Association (BKMPO)

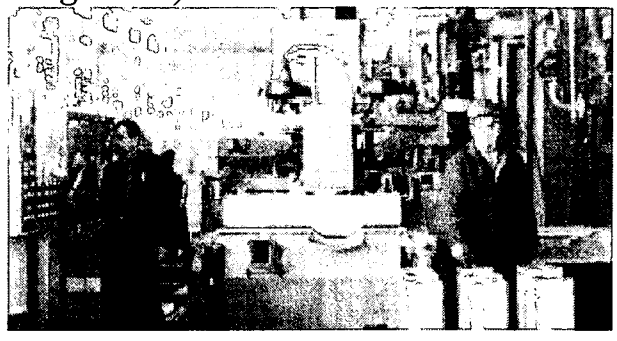
FOUNDRY

Ingots

BKMPO has a large-scaled foundry practice for the manufacture of flat and round (solid and hollow) ingots from more than 40 wrought aluminium alloys, to be used in the manufacture of plates, sheets, profiles, forging and die forging, tubes and consumer goods.

The **Production Association** pioneered process-casting into an electromagnetic crystallizer (EMC); this invention was patented in 17 countries around the world, including USA, Japan, germany, France etc.

Installation ALPUR D-1000 for non-furnace continuous metal melt refining.
Function: Melt purification from metalic, non-metalic and gaseous inclusions (natrium, calcium, hydrogen etc.)



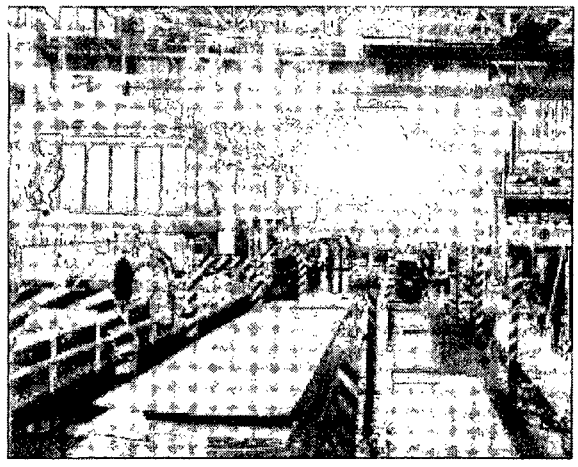
For the production of ingots with increased purity and high strength characteristics we utilize up to date melting-cast units, vacuum mixers of 14.5-22.5 ton capacity, limiting vacuum 133.3 Pa (1.0 MM of Hg) and inert media (argon), Alpur installation, intended for melt refining by means of melt filtration through a glass net with fixed meshes and foam ceramic filters.

ROLLING

Rolled Sheet

We are happy to offer our customers a wide range of rolled sheet metal products - hot and cold rolled sheets, plates and coils in a wide range of delivery conditions, such as annealed, guenched, aged and cold hardened - to name a few of the possibilities.

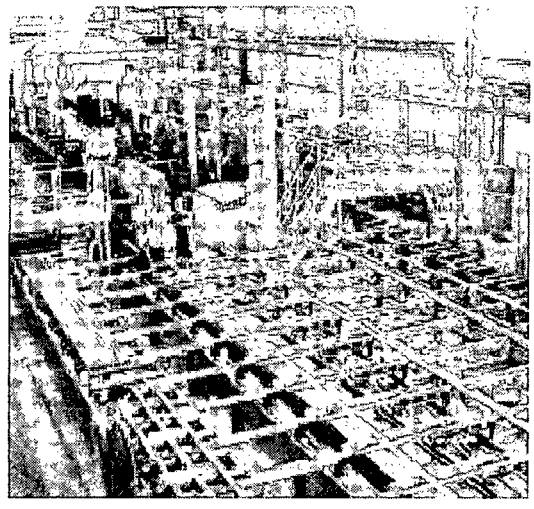
For rolling production we utilize such equipment as the 2800 FOUR HIGHSTAND hot mill, 1700, 1800, 2800, 3100 FOUR HIGHSTAND cold mills and heat adjustments are completed on a complex of equipment, including a quenching furnace, a 6 000 ton stretching machine and a Splav-6M (Alloy-6M) installation for ultra-sonic dtection of internal defects.



EXTRUSION

Rods and Profiles

The Rod and Profile Works specializes in using advanced equipment to manufacture a wide range of rods and profiles (more than
3 000 types and sizes, from more than 20 different alloys) for the aerospace industry, machine construction, ship building, radio engineering, communication, costruction and other industries.
BKMPO produces also unique long extruded and heat-treated profiles with lengths of more than 30 meters.
In the industry branch BKMPO is the leading manufacturer of profiles for coolers of engine semi-conductor instruments.

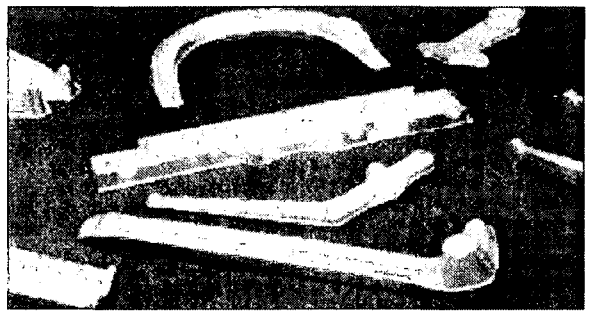


FORGING

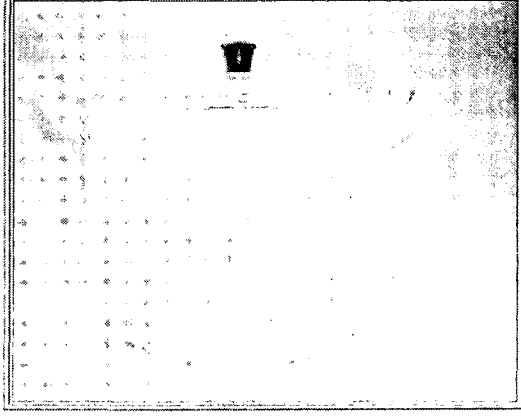
Forged Production

BKMPO manufactures over 7 000 die forged and forged items, using advanced equipment, technology, automatic production lines.

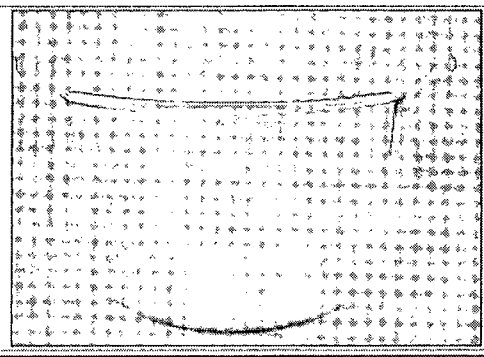
- Drums and flanges for aircraft undercarriages
- Aircraft bodies
- Fuselage and airfoil parts
- Aircraft frames (transverse rings)
- Aircraft supports
- Aviation engine pistons
- Internal combustion engine pistons
- Car wheel webs
- Die forging for industry
- Forging, biscuits, circular billets



6.6. ALUMINIUM CONSUMER GOODS LTD. is specializing in producing dull aluminum crockery and different containers for transporting foodstuffs, milk cans and other goods made of lacquered strips, spare parts for cars, billets for aluminium tubes for pharmaceutical industry and cosmetic industry and other goods (in total 80 titles).

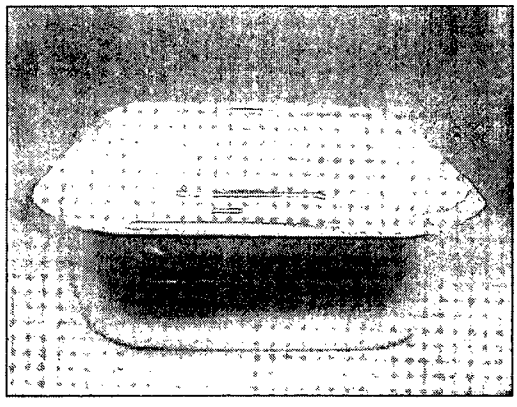
PAN - 2,5 l – 10,0 l GOST 17151-81	
	Pan is made of aluminium A5

DIXY GOST 171151-81



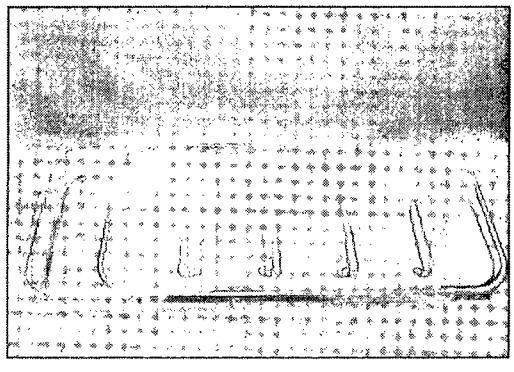
Pan is made of aluminum A5. The surface is etched. Lid and handles are made of bar AD31T.

CONTAINER FOR FOODSTUFF



Container is made of aluminum A5. The surface is etched.
Sizes – 412?412?150mm;
Metal thickness- 1,5? ? ;
Mass – 1,28kg

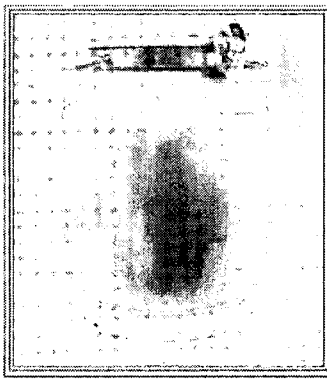
TRAY FOR CONFECTIONARY INDUSTRY



Tray can be manufactured both with and without lid.
Tray and lid are made of aluminum ? 5.
The surface is etched.

Sizes – 300?600?90mm,
Metal thickness - 1,0mm,
Sizes – 318?618?12mm,
Metal thickness - 1,0mm,
Mass – 0,925kg
Lid mass – 0,535kg

MILK CAN GOST 5037-97

	Milk can is made of aluminum A5. Surface is degreased.

7. SUMMARY TABLE

This summary table contains the names of the institutions, enterprises and companies, the addresses and contact information and a list of available technologies.

Company name	Contacts	Technology
1. JSC "All-Russia institute of light alloys"	2, Gorbunov Street, 121596,Moscow,Russia, phone/fax +7(095)4486375, phone +7(095)4449285, e-mail: info@vils.org web site: www.vils.org	1. Hard colour anodizing technology; 2. Technology for manufacturing laminated aluminum alloy sheet semiproducts; 3. Technology for manufacturing extruded aluminum alloy bars; 4. Technology for manufacturing aluminum alloy shapes; 5. Technology for manufacturing extruded aluminum alloy tubes.
2. JSC "Stupino metallurgical company"	19, Pristantsionnaya Street, 142800 Stupino Moscow region, Russia Phones: +7(095)2627010, +7(09664)47001 Fax: +7(095)2621416 Web-site: www.smk.ru E-mail: info@smk.ru	1. Rolling technology; 2. Extruded section production technology; 3. Tubes manufacturing technology; 4. Technology for manufacturing FMCG products.
3. JSC "Bogoslovsky aluminum plant"	1, Karl Marks Street 624440 Krasnoturyinsk Sverdlovsk region, Russia Phone: +7(34314)46410 Fax: +7(34314)22211, 46716 Website: www.baz-sual.ru E-mail: baz@sham.e-burg.ru	1. Technology for manufacturing aluminum powder, aluminum paste, grain-type aluminum powder.
4. VSMPO – Verkhnaya Salda Metallurgical Production Association	1, Parkovaya Street 624760 Verkhnaya Salda, Sverdlovsk region, Russia Phones: +7(34345)21304, 23832 Fax: +7(34345) 24736 E-mail: webmaster@vsmpo.ru Website: www.vsmpo.ru	1.Technology for manufacturing extruded shapes and panels of aluminum alloys; 2. Technology for manufacturing extruded tubes of aluminum alloys; 3. Technology for manufacturing aluminum alloy ingots; 4. Technology for manufacturing billets of alloys; 5. Technology for manufacturing tubes for risers production; 6. Technology for manufacturing alloying elements for aluminum alloys; 7. Technology for manufacturing plates of aluminum alloys.
5. [illegible]	347005 [illegible]	1. [illegible]

Intellectual property rights on the above mentioned technologies belong to the institutions and enterprises accordingly. This property is legalized in the form of the following documents – patent for invention, industrial designs, certificates for trade marks and utility models.

These institutions and enterprises own know-how and technologies. Price, terms and conditions for transfer of authority limited or unlimited should be discussed during direct negotiations.

8. A plan of follow up actions and modality of the implementation is as follows.

1. Specification by Venezuelan party of technologies, equipment and materials which they are interested in and the enterprises owning the property rights.
2. Forming the Venezuelan delegation and its visit to Russia and COMECON countries to the chosen enterprises in order to inspect the technologies on site and initiate negotiations on signing a contract for technology and equipment transfer.
3. Forming the delegation from the chosen companies from Russia and COMECON countries and its visit to Venezuela in order to examine local peculiarities and climate conditions for using given technologies and equipment. Conducting negotiations with the Venezuela party for practical implementation of technology transfer.
4. Preparing the legal and technical documentation for practical realization of reached agreements.
5. Assistance of all the meetings and negotiations by the International congress of industrialists and entrepreneurs as organizer and guarantor of follow up actions implementation.

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E-mail: iti@umail.ru, iti@hotmail.ru

TECHNICAL REPORT

HYDROCARBON SECTOR OF VENEZUELA

EXECUTORS:
A. Skibnevsky
E. Denissova
A. Katasov
I. Kukushkina

MOSCOW

2004

CONTENTS

1. Hydrocarbon Sector General Background

Venezuela is among the top ten crude oil producers in the world. Venezuela is important to world energy markets because it holds proven oil reserves of 77.8 billion barrels (as of year-end 2003), including billions of barrels of extra-heavy oil and bitumen. Venezuela's recoverable reserves of heavy and extra-heavy oil and natural bitumen are on the order of 286 billion barrels (Orinoco Oil Belt and Western Venezuela's Maracaibo Lake Basin). These reserves in addition to current proven reserves of light- and medium-crude oil, some 26 billion barrels, give a grand total of 313 billion barrels. Present production amounts to some 3.4 million barrels per day of which 72 percent corresponds to conventional oil. Venezuela's proven oil reserves have been declining, meaning that Venezuela is pumping oil out of the ground faster than it discovers new reserves. The country has many mature oilfields requiring major investment for enhanced or secondary oil recovery as well as one largely unexplored basin (Northern Basin). That is why Venezuela needs to tempt foreign companies with exploration expertise to Venezuela to help develop additional reserves. Venezuela has vast reserves but little technical know-how. Venezuela's most significant reserves occur in the Eastern Venezuela and Maracaibo basins that are both established producing areas.

The Venezuelan economy is extremely oil-dependent. Oil accounts for more than three-quarters of total Venezuelan export revenues, about half of total government revenues, and about one-third of gross domestic product. Venezuela has been identified as a high priority market for the oil and gas sector because of its high level of proven oil reserves. This priority is a result of the high level of investment anticipated for both oil and gas sectors in the spheres of enhancing oil production from existing fields; developing new oil and gas fields; increasing the capacity of the country's already substantial refining and petrochemical sector.

2. Petróleos de Venezuela S.A. (PdVSA) – Business Profile

PdVSA, the national oil company of Venezuela, is engaged in the exploration and production of crude oil and natural gas; the refining, marketing and transportation of crude oil and refining products; the production of petrochemicals; and various other hydrocarbon-related activities. The Bolivarian Republic of Venezuela is the company's sole shareholder. PdVSA is one of the world's largest oil companies, as well as Venezuela's largest business and employer. PdVSA has operations, industrial and service installations in Venezuela and over 50 other countries. The corporation is the country's main exporter and the biggest contributor to the nation's treasury.

The oil industry has experienced rapid change and greater competition. Among their challenges are new technologies and energy sources, economic growth and the opening of Middle Eastern oil sources. Because of shifts in the industry, mergers are occurring with greater frequency to gain the rewards from specialization, optimization

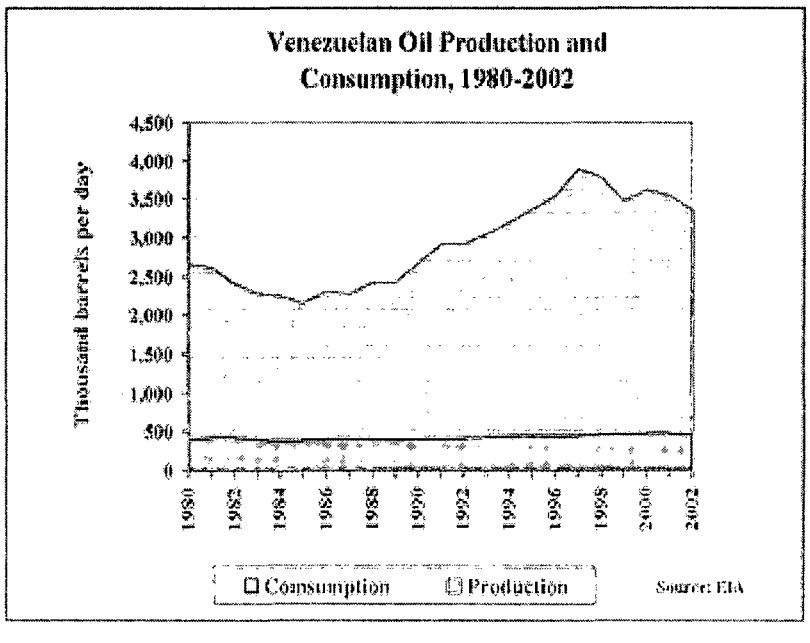
and increased influence. In order to remain competitive under low price scenarios, PdVSA needs to implement cost reduction strategies. While their competitors (such as British Petroleum and Mobil) have achieved integrated supply chains, PdVSA is still in stage one of the process.

PdVSA's primary challenge is increased production costs. 70% of their costs lie in product design. In determining the real cost of technology, it is important to consider the impact of product design on future costs. Production strategies include: improving reservoir productivity, knowledge management, achieving best practices and reducing the time scale for exploration.

The national strike virtually paralyzed Venezuela's oil industry during the first quarter of 2003. During the December 2002-February 2003 general strike, petroleum production and refining by PDVSA almost ceased. The strikers shut down a large portion of the country's oil industry, drastically reducing the production of Venezuelan oil and its delivery to internal and external markets. Crude oil production dropped from 2.9 million bbl/d in November 2002 to about 600,000 bbl/d in January 2003. Despite the strike, these activities eventually were substantially restarted. In contrast, state oil company Petróleos de Venezuela S.A. (PdVSA) estimates current production at over 3 million barrels per day, close to pre-strike output levels. Venezuela's oil production increased in the first after strike months despite the dismissal of more than one-third of PdVSA's work force. In January 2003, the Venezuelan government decided to restructure PdVSA, splitting the company into two regional operating units: one responsible for all activities in the eastern Venezuela and the other, for activities in the western part of the country. The goal of the reorganization, according to PdVSA, was to decentralize the company and make it more efficient.

3. Oil

Venezuela is home to the Western Hemisphere's largest conventional proven oil reserves at 77.8 billion barrels, as of January 2003. Substantial extra-heavy oil and bitumen deposits are not included in this total. In 2002, Venezuela produced an estimated 2.9 million barrels per day (bbl/d), down almost 200,000 bbl/d from 2001 annual production figures. Of this 2.9 million bbl/d, about 453,000 bbl/d were consumed domestically, while the remaining 2.46 million bbl/d were exported.



3.1. Oil Exploration and Production

Venezuela has four major sedimentary basins: Maracaibo, Falcon, Apure and Oriental. These fields contain reserves of 77.7 billion barrels of conventional oil, most of which has an API gravity of less than 20 degrees, making Venezuela's conventional crude oil heavy by international standards. Due to the maturity of many of these basins and their declining productivity, PdVSA plans to spend $45 billion to increase production at the country's existing oil wells, as well as to develop new non-conventional extra heavy crude oil and natural gas resources. Venezuela would like to raise oil production to 5.1 million bbl/d by 2008. In order to achieve this goal, the government plans to launch a new licensing round and will most likely need to attract significant amounts of foreign investment.

PdVSA announced in early May 2003 that it made two significant oil discoveries, which could raise reserves by 1 - 2.4 billion barrels. PdVSA's exploration division made both discoveries in the Chaguaramal and Furrial fields in the eastern state of Monagas. ConocoPhillips, along with PdVSA, AGIP, and OPIC Karimun Corporation, received approval in April 2003 to develop the Corocoro field in the Gulf of Paria in western Venezuela. The group invested $480 million to produce 55,000 bbl/d.

3. 2. Extra Heavy Crude Oil

Venezuela contains billions of barrels in extra-heavy crude oil and bitumen deposits, most of which are situated in the Orinoco Belt, located in Central Venezuela (estimates range from 100 - 270 billion barrels of recoverable reserves). There are four congressionally approved joint ventures between PdVSA and foreign partners to develop extra-heavy crude oil. These four projects are at different stages of development aimed to convert the extra heavy crude from approximately 9° API crude to lighter, sweeter synthetic crude, known as syncrude. These projects normally produce about 450,000 bbl/d of synthetic crude oil (this is expected to increase to 700,000 bbl/d by 2005). Syncrude is considered by the International Energy Agency (IEA) to be "non - conventional crude oil."

Conoco's Petrozuata produces extra-heavy crude oil from the Zuata region of the Orinoco Belt for transport to the port of Jose on Venezuela's northern coast. Conoco owns and operates two parallel 130-mile pipelines with a total capacity of 200,000 bbl/d to transport production from its wells and others in the region. Heavy crude oil is blended with a lighter crude oil for pipeline transportation to an upgrading facility. The upgrading facility processes the heavy oil into a higher value synthetic crude oil (with an API range between 19° and 25°), and associated byproducts: LPG; sulfur; petroleum coke and heavy gas oil. As production increases, pipeline capacity could be expanded to 500,000 bbl/d. Since 1997, Petrozuata has drilled more than 320 wells in 55,000 acres of the Zuata region, and production is currently 120,000 bbl/d.

ExxonMobil and PdVSA's joint venture at the Cerro Negro extra-heavy oil field started production in 2001. Extra-heavy crude oil from Cerro Negro is diluted with naptha and routed northward via pipeline to an upgrader complex at the port of Jose. The project's upgrader at the Jose complex processes 120,000 bbl/d of extra heavy crude oil into approximately 108,000 bb/d of syncrude and byproducts (sulfur and petroleum coke). Some of the syncrude is then exported to the partners' 180,000-bbl/d Chalmette refinery, located in Louisiana, near New Orleans, where the oil is refined and sold in U.S. markets. Germany's Veba Oil and Gas was also a 16% partner in the upstream component of the project. Exxon announced in May 2003 that it would like to increase production by 10% to 20%.

TotalFinaElf and ***Statoil*** are partners with PdVSA in the Sincor project, which began production in February 2002 and has been producing about 140,000-160,000 bbl/d of oil in recent months. Production is expected to plateau at 200,000 bbl/d, with about 35 years of operation. Sincor's extra-heavy crude is upgraded at a facility in the Jose complex, and then marketed for export, similar to the Petrozuata and Cerro Negro projects. Sincor's syncrude output comes in two grades, Zuata Sweet and Zuata Medium.

ConocoPhillip's and ***ChevronTexaco's*** joint venture with PdVSA, the Hamaca project, came onstream in November 2001 and is currently producing about 30,000 bbl/d of extra-heavy crude, most of which is diluted and shipped to refineries in the United States. Peak production of about 190,000 bbl/d is expected after an upgrading facility at the Jose complex is completed in early 2004. The crude will be upgraded to about 26° API, and the field is expected to pump for about 34 years.

3.3. Orimulsion

Orimulsion is a branded product that is used as a boiler fuel, similar to #6 fuel oil. It is an emulsion of approximately 70% natural bitumen, 30% water, and less than 1% surfactants (emulsifiers). Bitumen is considered a non-oil hydrocarbon and is not counted towards Venezuela's OPEC crude oil production quota. Burning Orimulsion in conventional power plants produces emissions of carbon dioxide, sulfur dioxide, and nitrogen oxide roughly similar to emissions from fuel oil. Bitor, a PdVSA subsidiary, manages the processing, shipping and marketing of Orimulsion. Bitor now operates one Orimulsion plant in Cerro Negro, with a capacity of 5.2 million metric tons per year, and hopes to produce 20 million metric tons per year by 2006. According to Bitor, more than 1.2 trillion barrels of bitumen exist in the Orinoco Belt. Economically recoverable reserves are now estimated at about 267 billion barrels. Canada, China, Denmark, Guatemala, Italy, Japan, South Korea and Lithuania either consume or are considering consuming Orimulsion.

3.4. Oil Upstream

Venezuela has four major sedimentary basins: Eastern, Western, Barinas-Apure (where most oil production occurs), and the largely unexplored Northern basin. Due to the maturity of many of these basins, PdVSA spends a good deal of its budget on the application of secondary and enhanced oil recovery techniques to maintain output levels. Proven reserves in these fields are estimated at close to 2 billion barrels of light and medium crude oil.

The Venezuelan government is committed to developing national offshore experience so that in the medium term PdVSA can bid for offshore development contracts in areas such as Brazil and the Gulf of Mexico. The government also wants national companies to supply as much as possible of the equipment needed for the Plataforma Deltana project. The president of PdVSA Ali Rodriguez said he hoped as much as 65 percent of the material used could be sourced in Venezuela.

Venezuelan state oil company PdVSA has established the presence of a billion-barrel oilfield complex in the Lake Maracaibo area, which could double in size if results from future wells come in as expected. The field complex straddles the south eastern margin of the prolific Lake Maracaibo play where PdVSA subsidiary Mariven has recently been appraising the Ceuta field.

3.5. Oil Downstream

PdVSA operates one of the Western Hemisphere's largest refining systems and is one of the world's largest oil refiners. Domestic refinery capacity stands at about 1.3 million bbl/d, with significant additional holdings in Curacao, the United States (in Lake Charles, Lemont, Corpus Christi, Paulsboro, Savannah, and Lyondell), and Europe (in Germany, Sweden, Belgium, and the United Kingdom). Venezuela has integrated two refineries to make the massive Paraguana refining centre, one of the largest in the world with a capacity of around 940,000 bbl/d.

In order to reduce domestic dependence on oil revenue, there are plans for refining and petrochemicals activity to increase significantly with the government wanting to raise refined product sales. PdVSA also plans to increase the overall refining capacity by 200,000 bpd.

With private financing, the government plans to double petrochemical output to 22 million tons per year and increase Orimulsion output from 5 to 20 million tons annually by 2009. The bulk of Venezuela's petrochemical growth will be located on the northeast coast with ethane figuring prominently as feedstock. The country also plans to upgrade refinery streams to add value. Increased ethylene, ammonia and methanol capacities are expected on stream in the period to 2005.

4. NATURAL GAS

Venezuela has proven natural gas reserves of about 148 trillion cubic feet (Tcf), the second largest in the Western Hemisphere (behind the United States) and the eighth largest in the world. The country produced about 1.1 Tcf in 2001, all of which was consumed domestically. About 60% of the country's natural gas production is consumed by the oil industry, which either re-injects the gas into oil fields or flares it. About 10% of Venezuela's natural gas is used for power generation; 6% in petrochemical production; and the rest is used mainly by industrial or commercial customers in large cities. The Chávez administration has plans to increase both natural gas production and consumption. Non-associated gas production will become increasingly important as Venezuela increases production and consumption in a planned move away from economic reliance on oil.

4.1. Natural Gas Exploration and Production

In February 2003, PdVSA selected ChevronTexaco and Statoil to operate two of its five offshore blocks located in the Deltana Platform. The Deltana Platform, which borders Trinidad's maritime border, is estimated to contain up to 40 Tcf of natural gas. ChevronTexaco will operate Block 2, the Loran field. Statoil will operate Block 4, Cocuina field. PdVSA expects to reveal soon a new bidding round for the remaining three blocks - 1, 3, and 5. The company also has plans to open other bidding rounds for certain onshore tracts and for acreage in Lake Maracaibo.

PdVSA announced in early May 2003 that its exploration division discovered a natural gas reserve of 2.5 to 3 Tcf at Urica, on the border of the eastern states of Monagas and Anzoategui. PdVSA plans to develop the well itself.

4.2. Natural Gas Upstream

Venezuela's proven gas reserves are the largest in Latin America but currently it produces only associated gas and hence its gas production is linked to that of its oil. The Venezuelan government is actively promoting natural gas deals to reduce the nation's dependence on crude and refined products. It also wants to compete with neighbouring Trinidad and Tobago on the export of LNG, especially to the U.S.'s east coast.

Despite the political, social and economic turmoil that is affecting the country the natural gas sector is attracting a number of big companies that appear eager to invest, and provide the country with badly needed money and jobs. Venezuela is facing a supply shortage from the declining output of associated gas at its oilfields and has been forced to shut down oil wells to comply with its OPEC quotas.

It has been announced by PdVSA that Venezuela will plug a natural gas deficit in the nation's western region with supplies from neighbouring Colombia. The country will receive a maximum of 200 million cubic feet per day of gas from Colombia, with an

investment of $150 million. PdVSA has made a deal with Colombia's oil company Ecopetrol to buy up to 200 mm cf of LPG daily, until Venezuela's own natural gas fields start producing in two years. PdVSA said the five to seven-year supply deal with Colombia's state oil company Ecopetrol and US major ChevronTexaco would be terminated when Venezuela's offshore Mariscal Sucre gas project begins production. The development of the Mariscal Sucre project, which includes the construction of a 4.7 million tonne-per-year LNG export terminal, calls for 300 MMcfd of gas to be shipped to the domestic market by 2007.

4.2.1. Upstream, North Paria

In June 2002 Venezuela has reached a long-awaited agreement with Shell and Japan's Mitsubishi to undertake an integrated natural gas joint venture estimated to cost up to $3 billion. The project involves the development of 10 trillion cubic feet of gas from North of Paria offshore fields and the construction of a liquefied natural gas terminal with annual capacity of 4.7 million tonnes for both domestic use and export. First gas supplies are expected to hit the market in 2007. Total investments will be between $2.5 billion and $3 billion. The LNG project forms part of a strategy by Venezuela to broaden its oil-based economy by tapping into its natural gas reserves.

PdVSA will have a 60% stake in the Mariscal Sucre scheme while Shell will hold 30% and Mitsubishi 8% under the framework agreement. The remaining 2% will be offered to private investors. PdVSA plans to offer up to 4% of its own stake to Qatar Petroleum in the future. The partners still need to negotiate other details of the project including commercial terms before signing the final joint venture agreement (JVA), expected in 2003.

The project will also involve the supply of 300 million cubic feet of gas a day to the local market. The agreement calls for exploration work around the existing fields in Paria in the search for more gas reserves. Construction of the LNG plant, to be located in the eastern state of Sucre, will begin in 2005 with start-up expected in 2007.

4.3. Natural Gas Downstream

In June 2002 it has been announced that Venezuela would invest $1 billion to build two nitrogen plants to produce gas for pressurizing the country's oil wells. The plants, in Venezuela's two main oil-producing centers in the east and the west, will be built by 2003. Venezuela will use the nitrogen to maintain pressure needed to keep crude flowing to wellheads in the regions. While holding the eighth largest reserves of natural gas, Venezuela has been able to tap much of it because of a lack of development. In addition, the world's No. 5 crude exporter has been forced to shut in oil wells to comply with OPEC production quotas, reducing supplies of natural gas found in oil pockets. Venezuela will tap domestic markets to raise capital to build the plants and associated electricity generators.

4.4. Pipelines

The existing Venezuelan natural gas infrastructure consists of 3,000 miles of domestic pipeline. The country has no natural gas export pipelines. The government has recently stated an interest in connecting its gas distribution network especially with its neighbour Colombia but also northern Brazil. Venezuela has an extensive pipeline infrastructure with thousands of kilometers of oil and gas export pipelines. Foreign investment is being actively sought to help expand this network.

In April 2003, Colombia and Venezuela agreed to build a $120 million pipeline, allowing Colombia to export natural gas from the Guajira basin to the Maracaibo region of Venezuela. The $120 million natural gas pipeline would carry between 150 and 200 million cubic feet per day beginning in 2005. PdVSA has indicated that Venezuela would eventually use the pipeline to export natural gas to Colombia. Existing Venezuelan natural gas infrastructure consists of 3,000 miles of domestic pipeline.

In August 2001, PdVSA, the Colombian state oil company Ecopetrol, and Texaco agreed to conduct a feasibility study on a potential 130-mile natural gas pipeline between Colombia and Venezuela. The pipeline would enable Colombia to export gas to markets in Lake Maracaibo in Venezuela. PdVSA has suggested that in the future the direction of the pipeline flow might be reversed in order to allow it to serve as the first tranche in a pipeline system to export Venezuelan gas to other countries in Central and South America. Columbian imports are expected to end when foreign-backed development of offshore natural gas is completed in the next five years.

5. VENEZUELA'S HYDROCARBON UPSTREAM OPPORTUNITIES

The present political climate in Venezuela is not perhaps for the faint-hearted investor, but life nevertheless goes on in this oil patch. Governments come and go, and the farsighted, knowledgeable and careful companies will likely see a very healthy return on their money down the line, despite the upheavals that affect Venezuelans at this time.
We would like here to talk first of all about a series of new hydrocarbons projects that have recently been presented to potential investors by the Government, and then give an overview of certain aspects of untested legislation that might not be as deterring as it appears at first sight.

So, let's apply to the projects. After the promulgation of the new Organic Hydrocarbons Law (OHL) in 2001, the Ministry of Energy and Mines and PdVSA's Board of Directors have been offering investors new projects for oil exploration and production. Many believe that these fields in fact constitute a fourth round of Venezuela's oil opening, and experts consider them to be among the best development prospects in Venezuela.
They offer attractive returns, despite the financial and operational constraints imposed

by the OHL, but they have to be developed under the framework of joint ventures with PdVSA, and this undoubtedly gave rise to serious misgivings among potential investors, over and above their concerns regarding the OHL.

5.1. Up-and-coming projects

There are six fields: Ceuta Tomoporo, Horcon, Franquera 1-X, Domo Norte, Domo Sur, and Guarani.

(i) Ceuta-Tomoporo
This field is known as the "jewel of Venezuela". Ceuta-Tomoporo was discovered in March 1998. The field, located on the southeast side of Lake Maracaibo, has a total area of 15,467 acres and an average depth of 16,500 feet. The MEM estimates 4,585 mm bbl of oil in place. With a recovery factor of 22 %, this places the field's recoverable reserves at 1,008.7 mm bbl.
In Tomoporo 64 wells have been perforated, of which 58 are actively producing 120 mm bpd. Production is expected to reach 250 mm bpd at the height of the project, from both on and offshore wells.

(ii) Horcon 1
The MEM believes that Horcon 1 may hold approximately 115 mm bbl of petroleum and 30 mm cf. The depth here is 15,150 feet. The crude is a medium 20-24 degrees API.

(iii) Franquera 1-X
Franquera 1-X is a larger field, expected to hold 738 mm bbl of oil and 378 mm cf of natural gas. The depth of this field is 19,550 feet. The type of crude is expected to be medium with condensates.

(iv) Domo Norte
Domo Norte comes in at an expected 96 mm bbl and 58 mm cf of natural gas. (iv) Domo Sur
Domo Norte and Domo Sur are located south of Franquera and Tomoporo. Domo Sur is expected to hold 173 mm bbl of crude and 233 mm cf of natural gas. The type of crude is medium to light (20-40 degrees API). Preliminary 3D seismic is currently being interpreted.

(v) Guarani
Up along the Colombian border, north east of Lake Maracaibo lays the Guarani field that holds proven reserves of 31 mm bbl of crude and 43.8 mm cf of natural gas. Possible crude reserves are estimated at 117 mm bbl. The field may hold up to 104.34 mm cf of natural gas.
In addition to these most recent opportunities, we should also bear in mind that Venezuela's Orinoco Belt has recoverable reserves estimated at over 100 bn barrels of extra-heavy crude. Opportunities have also been offered for more upstream vertically

integrated projects to develop these reserves and convert the extra heavy crude from approximately 9 degrees API crude to 16-32 degrees API.

5.2. Investment alternatives

As we mentioned, the faint-hearted might balk at the challenges presented to them by the investment and legal climate currently prevalent in Venezuela. Seen from a negative standpoint, it has an unstable political climate; a hydrocarbons law (OHL-2001) that generally grants the state more control than it had before; and in the case of the projects mentioned above, the necessity of entering into an incorporated joint-venture with PdVSA, where the latter will hold more than 50 % of the capital stock. Evidently, this 50 %+ stake and consequent control over decision-making, equal more red tape and, thanks to a new Anti-Corruption Law, even possible criminal liabilities for the Operators' officers. Nevertheless, Venezuela's enviable geological wealth and geographical location, on the Caribbean, south of the Gulf of Mexico, mean that it possesses tactical advantages not to be had in other more distant and volatile places.

Generally speaking too, oil company executives are patient people who have to look far ahead, considering the decades-long production agreements to which they have to commit their companies. So, placing these prime concerns on one side of the scales, and the long-term tactical advantages on the other, we believe that Venezuela has a great deal still to offer. The fields mentioned above are proof, if necessary, of that. The biggest headache for companies about to get involved in long term agreements is probably Article 22 of the OHL, which says "primary activities indicated in Article 9 (production, gathering, and initial transportation and storage of hydrocarbons) shall be carried out by the State, whether directly by the Executive branch (Ministry of Energy and Mines) or through entities of which the State is the sole owner. The State may also perform such activities through entities in which it has control over its decisions, by maintaining participation greater than 50 % in the capital stock, which for purposes of this Decree-Law shall be referred to as Joint-Venture Entities. All entities dedicated to the performance of primary activities shall be deemed operating companies." The third alternative just mentioned is the one that would apply to the above-mentioned projects.

6. THE LOCAL PRIVATE SECTOR IN THE VENEZUELAN OIL INDUSTRY

Current situation in the oil & gas private sector in Venezuela is the following. The private sector has a fundamental role in the development of the hydrocarbons industry in Venezuela. It is firmly established and participates in all areas of the business: from providing goods and services, to investing and operating major enterprises in the areas of oil, gas, chemicals and petrochemicals. Private participation in the hydrocarbons industry is very important for sustainable economic growth. The local private sector is continuously growing its participation in the OIL & GAS business. Over 60 companies

are involved in the investment programs of more than 36 Billion US$. Areas of participation for the local and foreign private sectors are presented below:

- Orinoco Belt Heavy Oil Strategic Associations
- Mature Fields Operating Agreements
- Oil Exploration Agreements with risk and profit sharing
- Gas Industry Development
- Petrochemicals and Chemicals
- Development of Refinery Streams

VENEZUELAN COMPANIES PARTICIPATION IN THE UPSTREAM OIL & GAS SECTOR

Cartera de Inversiones	**Investor**		**Oil**	**Land**
Ehcopek	Investor		Oil & Gas	Land/offshore
Inelectra	Investor	Operator	Oil & Gas	Land/offshore
Jantesa	Investor	Operator	Oil	Land
Polar	Investor		Oil	Land
Otepi	Investor	Operator	Gas	Land
Open	Investor	Operator	Oil	Land
Suelopetrol	Investor	Operator	Oil	Land
Vincler	Investor	Operator	Oil & Gas	Land

This table represents total investment for the Venezuelan companies of over 400 million $US in 14 fields.

Strategic plan of the local private sector includes developing current properties to their full potential and identifying new opportunities with the help of new technologies and innovations. Such technologies provide a springboard for improving performance and productivity of local private sector, increase quality of new products and enhance competitive position of local enterprises at global markets. Thus developing associations with local and international partners may increase capitalization (strategic partnerships, capital markets).

There are a number of impressive prerequisites to develop competitive advantages of Venezuela in the hydrocarbon sector:

- Most prolific hydrocarbon region outside of the Middle East
- Attractive geographic location.
- A strong, well established and demanding industry based on international standards, with a competitive supply sector.
- More than twenty private oil companies operate in Venezuela ranging from large multinational to small local companies.
- A free market economy subscribed to the WTO.

- Substantial development plan for the coming years.
- A tradition of respect to private investment.
- A modern legal framework.

7. TECHNOLOGY TRENDS: ADOPTION, ADAPTATION AND DEVELOPMENT BY THE VENEZUELAN OIL INDUSTRY

Continued application of new and existing technologies, together with in-house developments carried out at PdVSA-INTEVEP, Petróleos de Venezuela's research and technological support center, have been the main weapons to face challenges to reduce cost and to maintain the Venezuelan Oil Industry as an international enterprise in the face of relatively low oil prices.

3D and 4D seismic advanced geological modeling and reservoir simulation techniques have provided an all-around understanding of existing reservoirs allowing selection of the most cost-effective way to produce from Venezuela's vast reserves. The integration of geology and geophysics has accounted for a reduction in the risk of interpreting structurally and sedimentologically complex areas throughout the Venezuelan oil provinces. As a result average exploration costs are in the order of only $1 per barrel.

For several years, key production technologies, such as horizontal completions, electrosubmergible and progressive cavity pumps, multiphase pumping and metering, have been successfully deployed in the Orinoco Oil Belt. As a result, production costs have been cut by more than 50 percent during the last decade and are currently around $1.50 per barrel.

The development of Orimulsion by INTEVEP will allow commercialization of a great deal of the extensive natural bitumen reserves of Eastern Venezuela. Orimulsion is an emulsion of extra-heavy oil, water and a surfactant, developed to compete with coal as an environmentally preferred boiler fuel. The emulsion contains 30 percent water with a calorific value around 13,000 BTU per pound. On-going research at PdVSA-INTEVEP aims at a new generation emulsion containing only 20 percent water with less surfactant and higher calorific value. Present production reaches 4.1 million tonnes per year with plans to increase production to 32 to 34 million tonnes for the year 2007.

PdVSA-INTEVEP has also developed a new upgrading technology for heavy/extra-heavy oils and bitumen which can be utilized in the conversion of the vast resources of the Orinoco Belt. The process, called AQUACONVERSION, allows for the conversion of non-conventional oils with gravities in the range of 8 to 10? API, to syncrude oil at 16? API or better. Scale-up and commercial application studies of this technology are being carried out throughout an alliance between PdVSA-INTEVEP, UOP and Foster Wheeler.

PdVSA-INTEVEP is also carrying out research to try to establish the actual production mechanisms for the heavy/extra-heavy oils and natural bitumen of the Orinoco Belt by means of "foaming crudes." This concept, by which certain heavy oils can be produced as gas-oil dispersions, is being thoroughly studied and characterized. Promising results have permitted the development of a methodology to evaluate foam stability and gas entrapment behavior in a variety of viscous crude. The increased recovery factors associated with this phenomenon, (more than 15 percent in some cases), are beginning to be observed at field operations in the Orinoco Belt.

To sum up the increase in Venezuela's production potential is a tremendous challenge. To keep up current production of 3.4 million barrels per day requires generation of over 700,000 barrels per day from the associations and joint ventures with the private sector. Petroleos de Venezuela's long-term business plan calls for an increase in production to 6.7 million barrels per day.

Venezuela is aiming at becoming the largest occidental hydrocarbon producer in the present century, doubling its present oil production. To meet this goal, a considerable amount of human effort and financial resources are entering the country with the Venezuelan Oil Opening.

8. A LIST OF NEW TECHNOLOGIES IN HYDROCARBON SECTOR AVAILABLE IN RUSSIA AND COMECON COUNTRIES

Total amount of new technologies and equipment available in Russia and COMECON countries accounts for more than 5000 items. The summary table given in this paragraph contains the leading hydrocarbon technology owners and equipment manufacturers. Below are presented the most advanced technologies with illustrations and technical specifications.

8.1. JSC "Machine works", RUSSIA

9, Smolenskaya Street, 196084, Saint – Petersburg, Russia
Phone: +7(812)1468381, 3163125, 1468398
Fax: +7(812)2522145
E-mail: mms@mashzavod.spb.ru

? ? ? -60? mobile drill rig

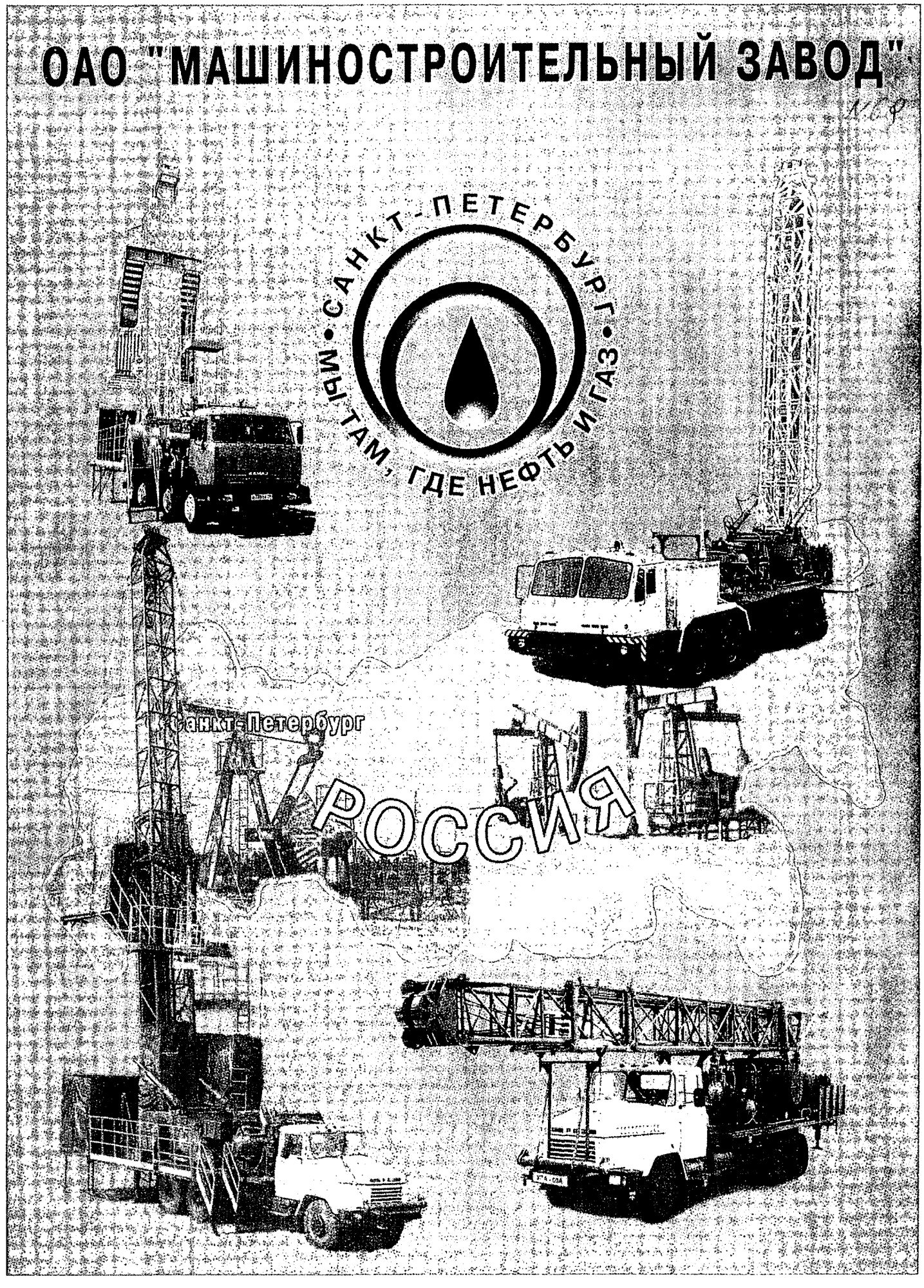
General

The ? ? ? -60? mobile drill rig is designed for the following jobs:

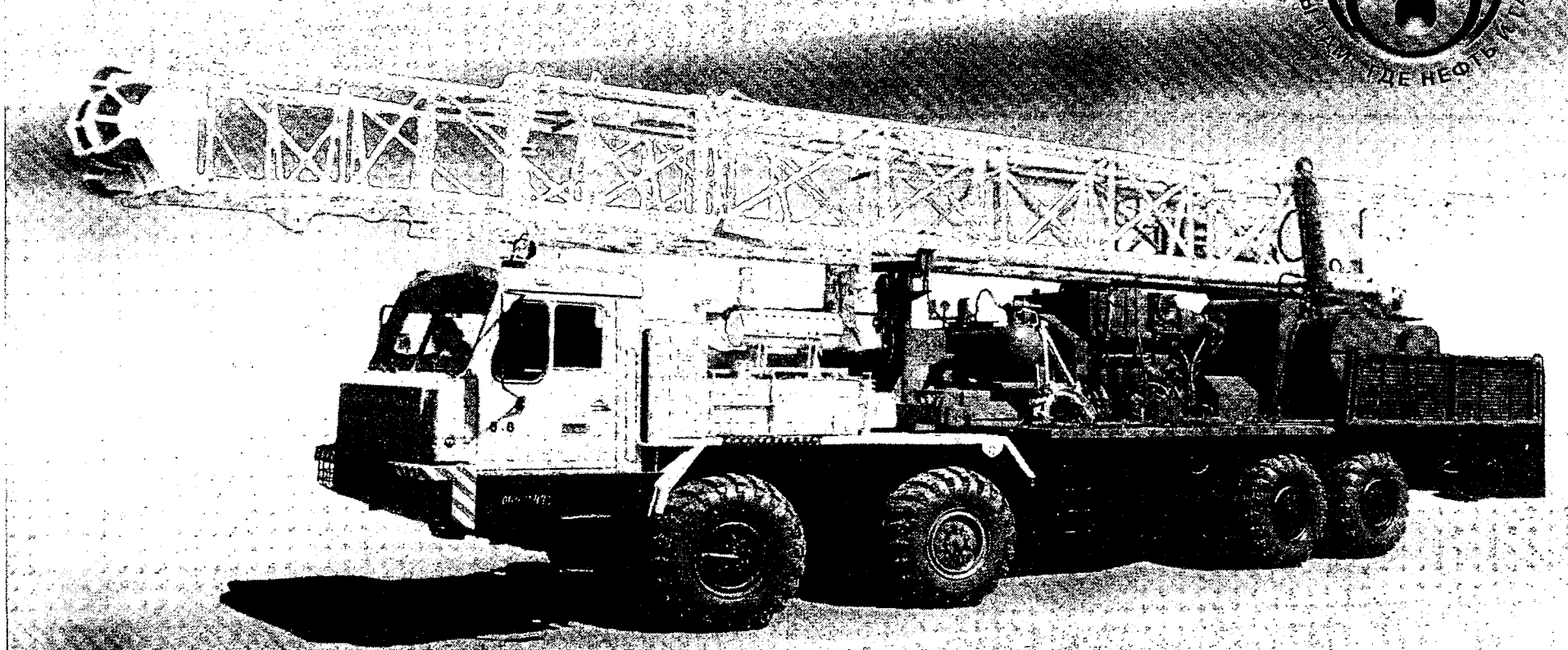
– drilling cement plugs in 5- to 6-in pipes and carrying out related operations, such as running in or pulling out drill pipes, flushing wells, etc.;

- running in and pulling out pump and compressor tubing;
- installing the flow head equipment;
- carrying out repairs and eliminating breakdowns;
- drilling processes.

With the exception of the flushing pump, all of the mobile drill rigs are assembled on the chassis of the ? ?? ?65053, ? ?? ? 65101, ? ?? ? 63221 (of the Kremenchug automobile factory of Ukraine) or ? ? ? 690902 (of the Bryansk factory of wheel tractors of Russia) truck. The driving power is provided with the truck's propelling engine.


ОАО "МАШИНОСТРОИТЕЛЬНЫЙ ЗАВОД"
МЫ ТАМ, ГДЕ НЕФТЬ И ГАЗ • САНКТ-ПЕТЕРБУРГ •
Санкт-Петербург
РОССИЯ

УСТАНОВКА ПОДЪЕМНАЯ УПА-60А 60/80



ОАО "МАШИНОСТРОИТЕЛЬНЫЙ ЗАВОД"
г. Санкт-Петербург

Specifications on mobile drill rig ???-60? 60/80 on base ???? 65053

It is intended for conducting running in and pulling out operations at repair of oil and gas chinks.

Characteristics

THE CHARACTERISTIC	
The chassis	**????-65053 (Euro II)**
Drive of mechanisms: the traction engine	**?? ?-238? (?2)**
Capacity, kw (h.p).	**243 (330)**
Admitted loading on a hook, ?N (hardware):	
nominal	**600 (60)**
maximal	
is maximum - short-term	**800 (80)**
Capacity of a drive of installation elevating, kw (h.p).,	**243 (330)**
auxiliary one-drum-type with a chain drive, a two-tape brake, auxiliary one-drum-type with a chain drive, a two-tape brake, filled with oil transmission, disk pneumatic gear	**+**
Traction effort to a drum auxiliary, ?N (hardware), not less	
at a rated load	**112 (11,2)**
at is maximum - short-term loadings from 60 up to 80 hardware	**149 (14,9)**
Speed of rise on a chisel drum, km/s, settlement	
the least	**0,191**
the greatest	**1,6**
at is maximum - short-term loadings from 60 up to 80 hardware	**0,12**
Speed of descent(release) at loading from 60 up to 80 hardware, m/s, no more	**1,2**
Number of speeds auxiliary:	
for running in or pulling out operations	**8**
for is maximum - short-term loadings from 60 up to 80 hardware	**1**
Mast	**Telescopic, inclined with the terminator of promotion of the top section and deflecting a board. With system of remote rise and system of the signal system of promotion of the top section of a mast**
Height of a mast from the ground up to an axis crownblock, m.	**22±0,4**
Length of a candle of a lifted column of pipes, m., no more, settlement	**16**
Platform the worker (not power(force)), with adjustable height from 1,0 up to 2,5 m complete with ladders, a protection with shelter	**+**
Pressure of hydrosystem nominal, ? Pa (kgs/sm2)	**15 (150)**
Drive mechanical rotary table	**Chain transfer**
Illumination of workplaces in explosion-proof execution(performance)	**+**

Emergency drive (from the electric motor)	+
Jacks hydraulic (autrigers) 2 kit -on 2pieces	**2 complete sets**
Basic plate for back jacks (autrigers) folding	**4000?1000?112**
Pipeline-up clamp (hydraulic), pieces.	**1**
Effort at pressure 6? Pa (60kg/sm2), ?N (hardware)	**50 (5)**
auxiliary hydraulic	+
The adaptation (the electronic device) for installation of the unit in horizontal position with the visual and sound signal system	+
Range of the control of corners of an inclination on axes X and Y, a hailstones.	**from 0 up to ± 1,5**
Execution(Performance)	**hardened**
auxiliary for promotion and lowering of the top section of a mast	+
Overall dimensions of installation elevating in transport position, mm., no more	**14000?2900?4300**
Weight of installation elevating in transport position, kg, no more	**25000**
Weight of installation elevating in gathering with accessories(belongings) and spare parts, kg, no more	**31680**
Conformity " to Safety rules for the oil and gas industry " ??-08-624-03 and to additions to them of 2003. At incomplete conformity to specify items(points) of Rules on which there is a discrepancy.	+

Specifications on mobile drill rig ???-60? by 60/80 carrying capacity of 60 tons and short-term 80 tons on base ???? 63221

It is intended for running in and pulling out operations at repair of oil and gas chinks.

Characteristics

THE CHARACTERISTIC	
The chassis	**????-63221**
Drive of mechanisms: the traction engine	**?? ?-238? (?2)**
Capacity, kw (h.p).	**243 (330)**
Admitted loading on a hook, ?N (hardware):	
nominal	**600 (60)**
maximal	
is maximum - short-term	**800 (80)**
Capacity of a drive of installation elevating, kw (h.p).,	**243 (330)**
Auxiliary one-drum-type with a chain drive, a two-tape brake, filled with oil transmission, disk pneumatic gear	+
Traction effort to a drum auxiliary, ?N (hardware), not less	
at a rated load	**112 (11,2)**
at is maximum - short-term loadings from 60 up to 80 hardware	**149 (14,9)**
Speed of rise on a chisel drum, m/s, settlement	
the least	**0,191**
the greatest	**1,6**

at is maximum - short-term loadings from 60 up to 80 hardware	**0,12**
Speed of descent(release) at loading from 60 up to 80 hardware, m/s, no more	**1,2**
Number of speeds of auxiliary:	
for running in and pulling out operations	**8**
for is maximum - short-term loadings from 60 up to 80 hardware	**1**
Mast	**Telescopic, inclined with the terminator of promotion of the top section and deflecting board. With system of remote rise and system of the signal system of promotion of the top section of a mast**
Height of a mast from the ground up to an axis of crownblock, m.	**22±0,4**
Length of a candle of a lifted column of pipes, m., no more, settlement	**16**
Platform the worker (not power(force)), with adjustable height from 1,0 up to 2,5 m complete with ladders, a protection with shelter	**+**
Pressure of hydrosystem nominal, ? P? (kgs/sm2)	**15 (150)**
Drive of mecanical rotary table	**Chain transfer**
Illumination of workplaces in explosion-proof execution(performance)	**+**
Emergency drive (from the electric motor)	**+**
Jacks hydraulic (autrigers) - 2 pieces	**2 complete sets**
Basic plate for back jacks (autrigers) folding	**4000?1000?112**
Pipeline-up clamp (hydraulic), pieces.	**1**
Effort at pressure 6? P? (60 kg/sm2), ?N (hardware)	**50 (5)**
Auxiliary hydraulic	**+**
The adaptation (the electronic device) for installation of the unit in horizontal position with the visual and sound signal system	**+**
Range of the control of corners of an inclination on axes X and Y, a hailstones.	**from 0 up to ± 1,5**
Execution(Performance)	**hardened**
Auxiliary for promotion and lowering of the top section of a mast	**+**
Overall dimensions of installation elevating in transport position, mm., no more	**14000?2900?4300**
Weight of installation elevating in transport position, kg, no more	**25000**
Weight of installation elevating in gathering with accessories(belongings) and spare parts, kg, no more	**31680**
Conformity " to Safety rules for the oil and gas industry " ??-08-624-03 from 2003?.	**+**

Specifications on mobile drill rig ???-60? by 60/80 carrying capacity of 60 tons and short-term 80 tons on the chassis of ??? 690902

It is intended for running in and pulling out operations at repair of oil and gas chinks.

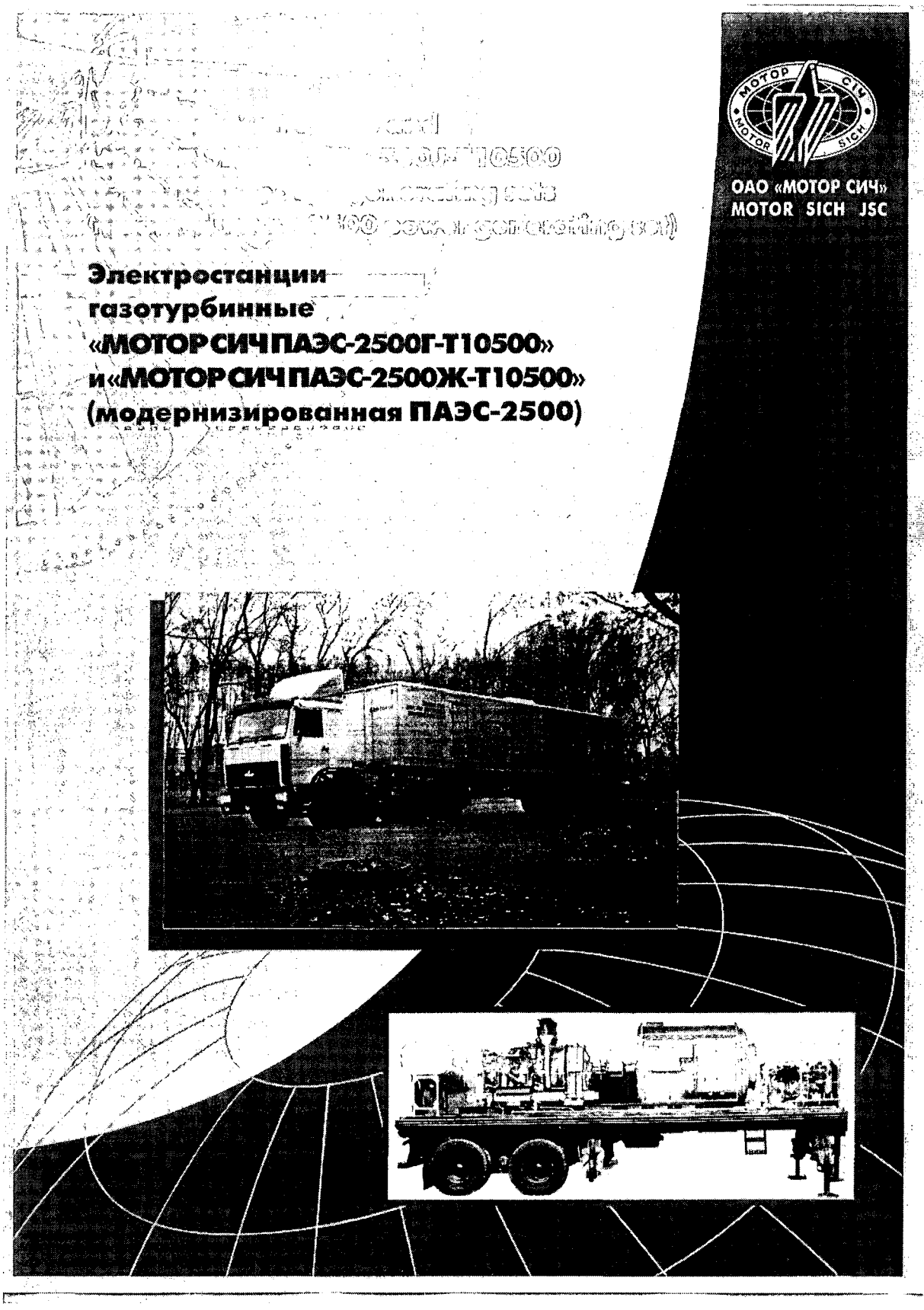
The characteristic	
The chassis	??? 690902
Drive of mechanisms: the traction engine	??? -7511.10
Capacity, kw (h.p).	294 (400)
Capacity of fuel tanks, (l) not less	1000
Admitted short-term loading on a hook, ?N (hardware):	785 (80)
Capacity of a drive of installation elevating, kw (h.p)., settlement	294 (400)
Auxiliary one-drum-type with filled with oil chain reducers of a drive, disk pneumatic gear	+
Traction effort to a drum auxiliary, ?N (hardware), not less	149 (14,9)
Speed of rise on a chisel drum, m/s, settlement	
the least	0,191
the greatest	1,6
Number of speeds of auxiliary:	
for running in and pulling out operations	8
Brake system	
The basic brake	+
Mast	Telescopic, inclined with the terminator of promotion of the top section and deflecting a board. With system of remote rise and promotion of the top section of a mast, presence of the sound and visual signal system of promotion and landing(planting).
Height of a mast from the ground up to an axis ????????, m.	22,0±0,4
Length of a candle of a lifted column of pipes, m., no more, settlement	16
Platform the worker (not power(force)), with adjustable height from 1,0 up to 2,5 m complete with ladders and a protection.	Changeable, with the sizes from 2?2,5 m up to 3?4 m, admitted loading not ?????? 500 kg
Hydrosystem	Providing job of a hydrokey " Oil Countri 55000 "
Illumination of workplaces in explosion-proof execution(performance)	+
Emergency drive	+
Jacks hydraulic (autrigers)	2 complete sets
Basic plate for back jacks (folding) (mm)	4000?1000?112
Auxiliary hydraulic	3 tn
The adaptation (the electronic device) for installation of the unit in horizontal position with the visual and sound signal system	Range of the control of corners of an inclination on axes X and Y, ????.?? 0 up to ± 1,5

Execution(Performance)	hardened
Auxiliary for promotion and lowering of the top section of a mast	Hydraulic
Drum for bypass of tackle cable	+
Overall dimensions of installation elevating in transport position, mm., no more	15500 ? 3200 ? 4500
Weight of installation elevating in gathering with accessories(belongings) and spare parts, kg, no more	44000
The mobile drill rig is corresponding to "Safety rules for the oil and gas industry" ??-08-624-03 from 2003.	

8.2. JSC "Motor Sich", UKRAINE

Zaporpzhye, 69069, Ukrain
Phone: (380 612) 614953
Fax: (380 612) 614552
Website: www.motovilikha.perm.ru
E-mail: untv.vtf@motorsich.com

Equipment for generating electric power



MOTOR SICH PAES-2500G-T10500 AND
MOTOR SICH PAES-2500J-T10500
GAS-TURBINE POWER GENERATING SETS

(modified PAES-2500 power generating set)

The purpose of the unit is to supply electric energy to industrial and domestic facilities, to compensate for lack of energy during peak loads, and to operate on a standby basis.

The unit is a mobile automated installation not requiring external power source for its starting. The unit is equipped with automated system for starting and accepting loads with subsequent continuous operation, the system of protection and indication of the state of the main engine parameters, as well modular as the noise suppression system. Operator's compartment is separated from equipment room by double wall.

Main advantages of the unit:

- high reliability
- works steadily as independent unit and in parallel with external power system
- features high maintainability and is simple and easy to control
- does not require big investments for putting into operation
- transportability

BASIC SPECIFICATIONS

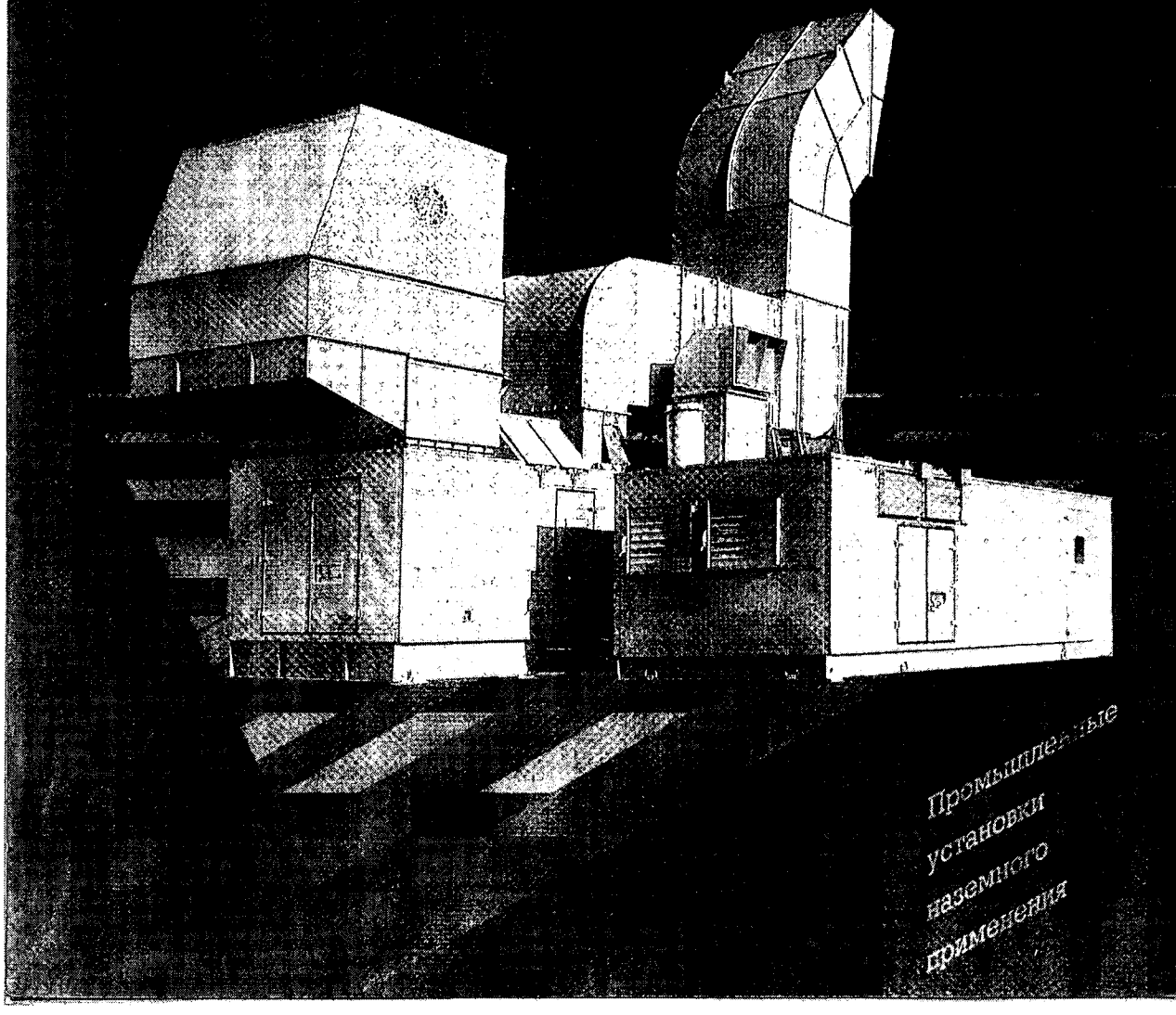
Power, kW
- rated 2500
- maximum..... 2750

Current..... AC, three-phase
Voltage, V..... 6300, 10500(13800)
Frequency, Hz 50 (60)
Fuel ..... liquid or gas
Engine Net efficiency at
rated load, % 24
Overall dimensions, m
(without noise suppressor) 12x2.5x3.7
Weight, kg 30000

электростанции газотурбинные "МОТОР СИЧ ЭГ–6000, ЭГ–8000"

MOTOR SICH EG–6000, EG–8000 gas-turbine power generating sets

ЗМКБ ПРОГРЕСС им. А.Г. Ивченко



Промышленные установки наземного применения

MOTOR SICH EG-6000, EG-8000, EG-10000 GAS-TURBINE POWER GENERATING SETS

The sets are designed to supply electric energy to the users of industrial and domestic facilities at base and other operating modes. The sets are manufactured in the modular transportable version. The sets are operated within the temperature range of -60 to +45°C, using gas or liquid fuel, as independent unit and in parallel mode.

Main advantages:

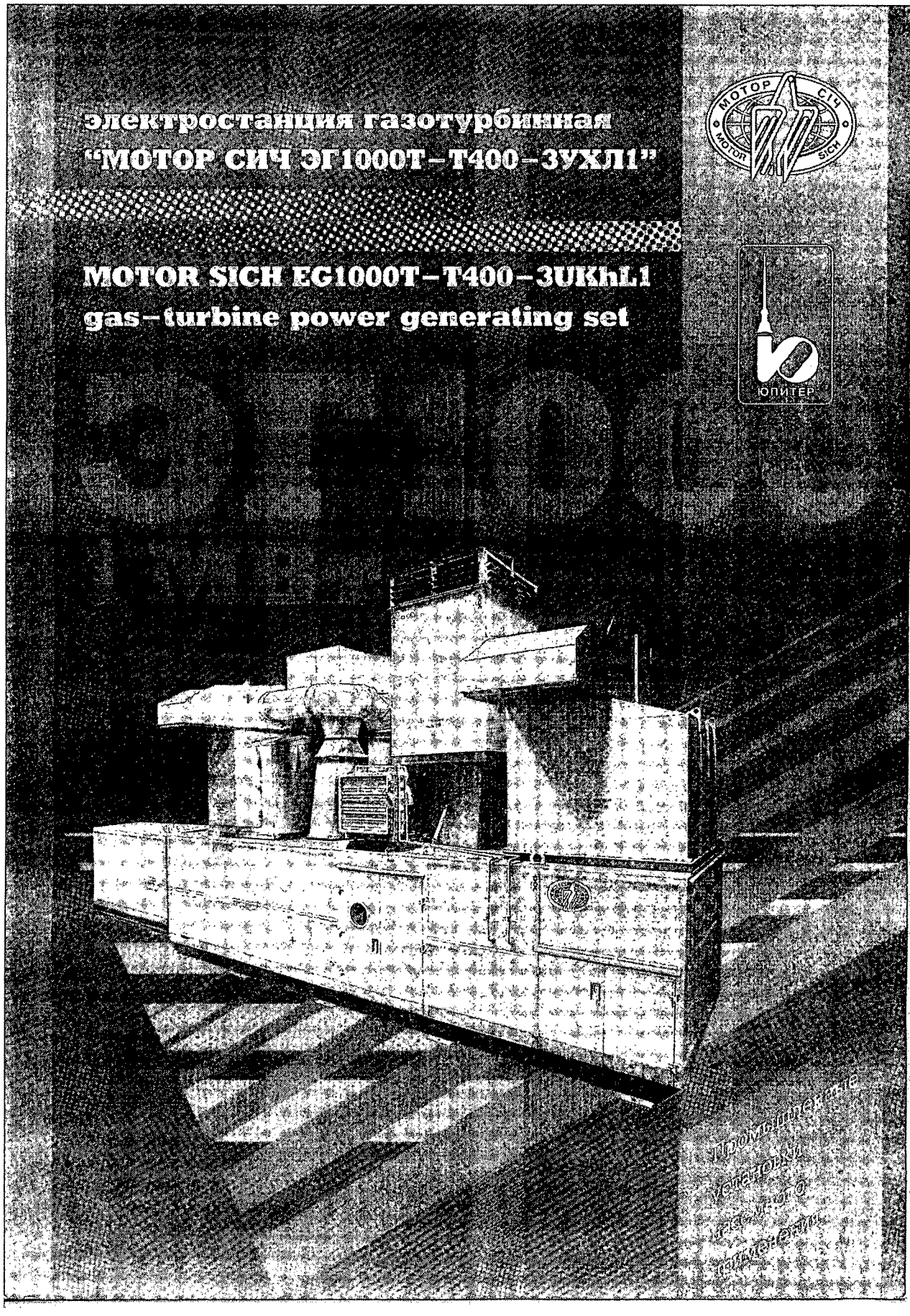
- high quality of generated energy
- high reliability
- high ecological parameters
- the sets are equipped with all necessary equipment providing self-contained operation

BASIC SPECIFICATIONS

	EG-6000	EG-8000	EG-10000 Power, kW
- rated	6000	7450	9700
-maximum	7200	9350	11700
Current .....AC, three-phase			
Voltage, V	10500	10500	10500
Frequency, Hz	50	50	50
Type of fuel..... gas* (natural gas or oil gas)			
Net efficiency at rated load.%	32	32.5	34.5
Overall dimensions (in assemblage), m:			
-length	13,7	25.0	25.0

-width	9,5	3.2	3.2
-height	11,8	8.7	8.7
Weight, t	60	70	70

-At Customer's request, the drive can be converted for operation with the use of liquid fuel, namely, kerosene of RT or TS-1 grades or similar fuels of foreign grades.


электростанция газотурбинная
"МОТОР СИЧ ЭГ1000Т–Т400–3УХЛ1"
MOTOR SICH EG1000T–T400–3UKhL1
gas–turbine power generating set
МОТОР СІЧ
MOTOR SICH
ЮПИТЕР

MOTOR SICH EG1000T-T400-3UKML1 GAS-TURBINE POWER GENERATING SET

The purpose of the EG1000T-T400-3UKhl_1 transportable gas-turbine power generating set is to supply electric energy to the users of industrial and domestic facilities. It can supply power at base and other operating modes.

Main advantages:

- high efficiency
- the unit is equipped withall necessaryequipment providing self-contained operation
- works as independent unit and in parallel mode
- has high ecological parameters
- provides high quality of generated energy

BASIC SPECIFICATIONS

Power, kW: Rated..... 1000

Maximum 1100

Current .....AC,three-phase

Voltage,V..... 400

Frequency, Hz..... 50

Fuel..... natural gas

Net efficiency at rated

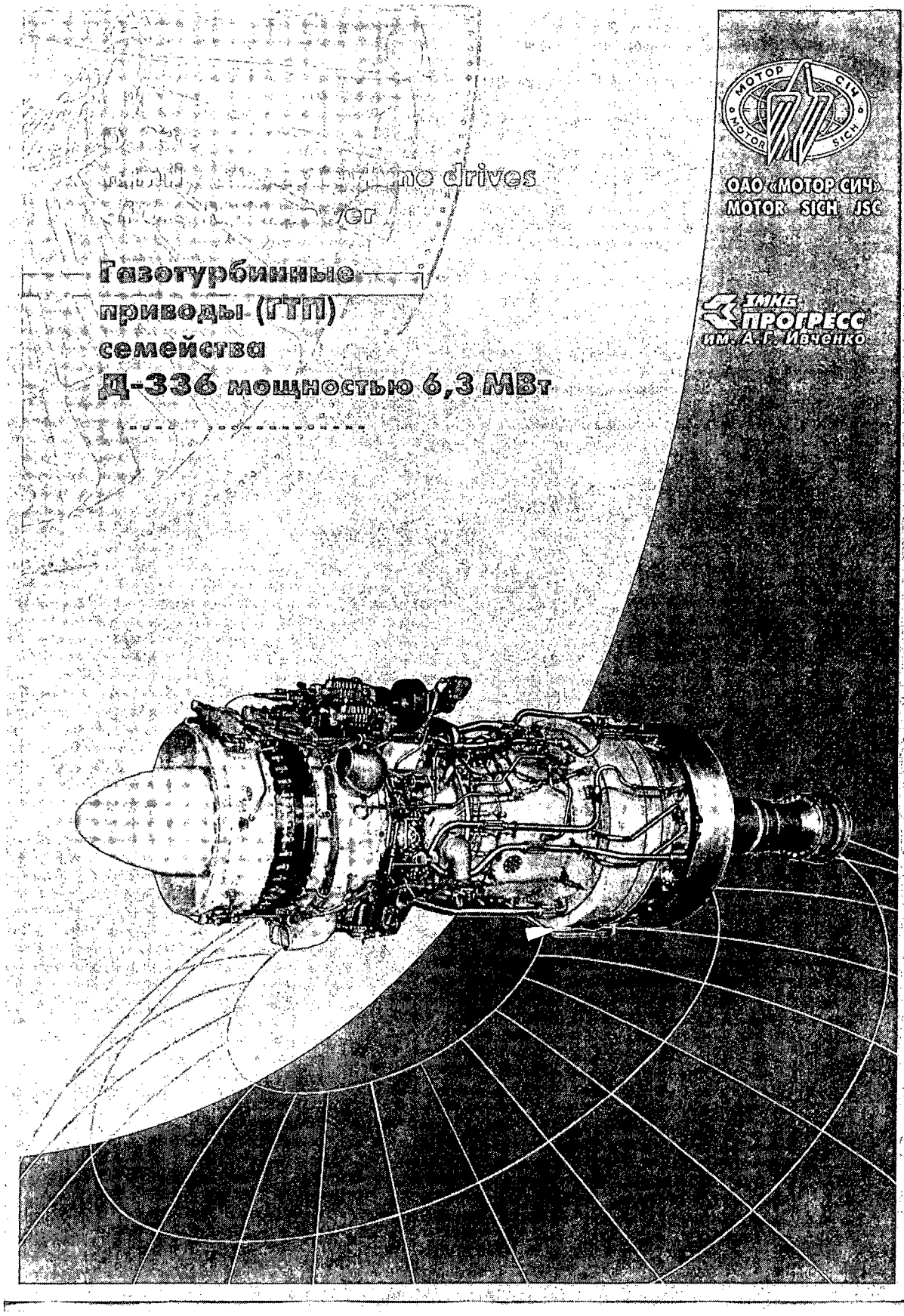
load,%..... 25

Overall dimensions, m: length 14.85

width 4.49

heigth 6.87

Weight, kg, not more than.....30000


no drives
ger
Газотурбинные
приводы (ГТП)
семейства
Д-336 мощностью 6,3 МВт
ОАО «МОТОР СИЧ»
MOTOR SICH JSC
ЗМКБ
ПРОГРЕСС
им. А.Г. Ивченко

D-336 FAMILY OF GAS-TURBINE DRIVES OF 6.3 MW POWER

They are used as drives for gas pumping units, gaslift units, oil pumping units, and for 6.3 MW power generating units. The gas-turbine drive design provides for the possibility of modular assembly, utilization of the high-efficiency system of cooling of heated parts and use of materials with high-strength characteristics. The engines can be successfully operated in various climatic zones within the ambient temperature range of -60 to +60'C up to altitude of 2000 m above sea level. D-336 family gas-turbine drives of 6.3 MW power have certificates of production conformance issued to MOTOR SIGH JSC, by Certification Centre «QUALITY», dated 30.12.99.

Main advantages of gas-turbine drives:
- high efficiency
- stability of parameters
- low maintenance cost
- repairability without engine removal from the unit
- reliability and trouble-free operation
- levels of pollutant emissions in accordance with COST 29.328-92
- level of acoustic performance in accordance with GOST 12.1.003-83
- controllability

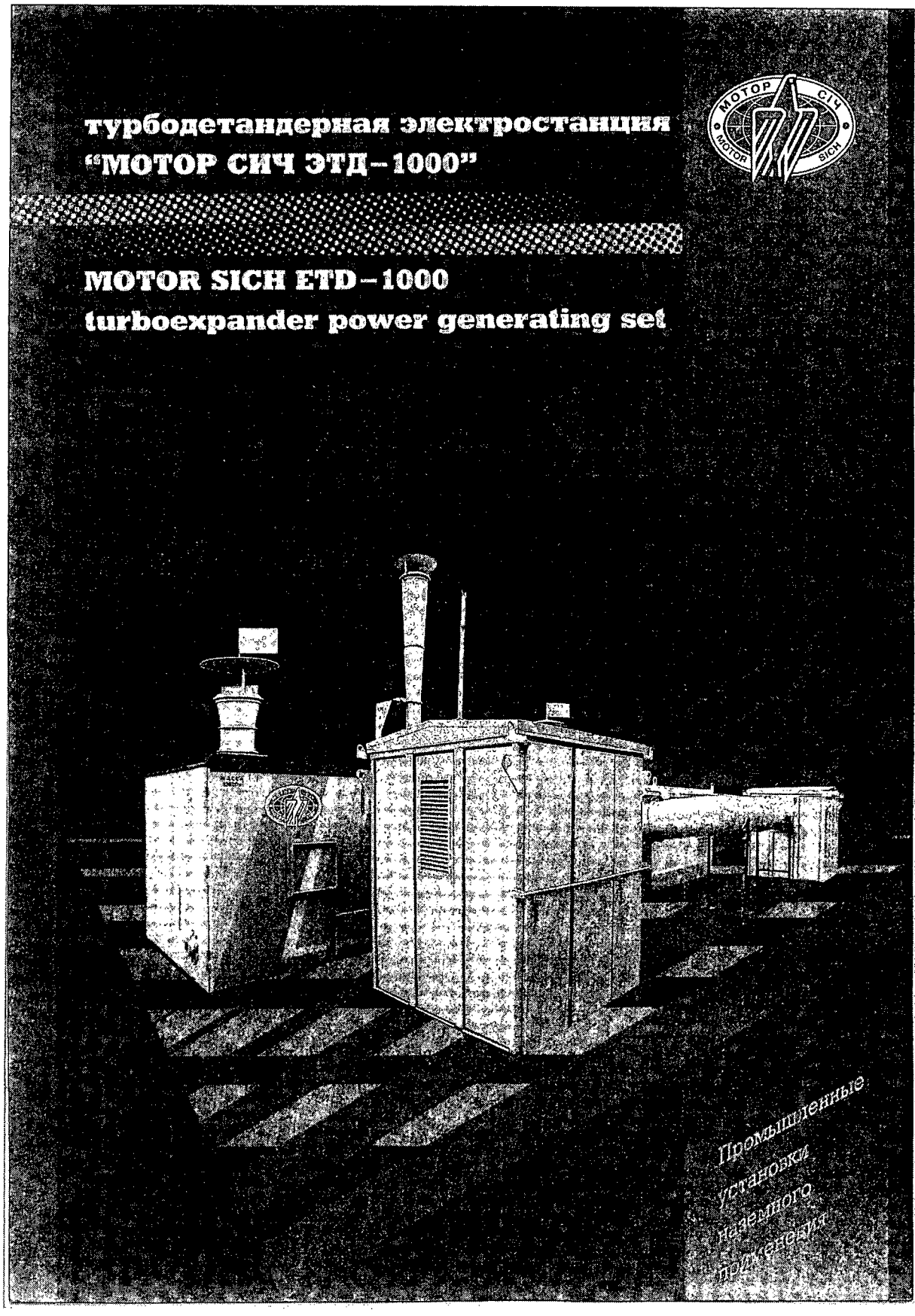
BASIC SPECIFICATIONS

	D-336-1/2, D-336-2T***
Rated power (sea level, +15°C), kW	6300
Rated power turbine rotor speed,min^{-1}	8200*
Type of fuel	gas* (natural or oil gas)
Net efficiency, %	32
Overall dimensions, m	154.82x42.05x48.32
Weight, kg	1470

* In case of necessity modifications of Gas- Turbine Drives can be made ensuring rotational speed of 5000 or 3000 min^{-1}, with D-336-1 featuring LH rotation, D-336-2 featuring RH rotation.

** At Customer's request, the drives may be converted for operation with the use of liquid fuel, namely, kerosene ofRTor TS-1 grades or similar fuels of foreign grades.

*** Maintaining power at +25°C


турбодетандерная электростанция
"МОТОР СИЧ ЭТД-1000"
MOTOR SICH ETD-1000
turboexpander power generating set
Промышленные
установки
наземного
применения

MOTOR SICH ETD-1000 turbo expander power generating set

The purpose of the set is to generate electric energy by eco logically clean method in Gas Distribution Stations (GDS) and Gas Distribution Points (GDP), the method lies in conversion of the excessive pressure energy of gas before its delivery to consumers The set can be used simultaneously as refrigerating plant for industrial and household needs

Main advantages:

- presence of highly efficient system of remote monitoring, control and diagnostics affords high reliability and comfortable operating conditions
- possibility to use natural gas in GDS and GDP having different parameters of gas flow and pressure thanks to utilization of turbine with variable nozzle guide vanes
- steady operation in self contained mode and in parallel with any electric power system
- provides for quick pay back and obtaining of high profit

Basic specifications	**ETD-1OOO**
Power, kW	
rated	**1OOO**
Terminal capacity, millions of m^J per 24 hours	**O.94** to 1.0
Gas pressure, kgf/cm^{ij}	
inlet	**up to 55**
outet	3 to 12
Voltage, kV	6.3
Frequency, Hz	SO
Overall dimensions, mm	
turbo expander container	**8OOOx3OOOx235O**
operators cabin container	**4OOOx3OOOx235O**
Weight, kg	**2OOOO**

JSC "Livgidromash", RUSSIA

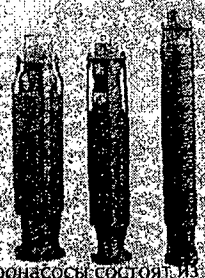
Manufactures pumps and pumping equipment for oil production

23/1, Mira St., 303851, Livny, Orlov region, Russia
Phone: +7(08677)31758, 71729
Fax: +7(08677)71241,71243,72069
Web site: www.livgidromash.ru
E-mail: sbyt@livgidro.orel.ru

АКЦИОНЕРНОЕ ОБЩЕСТВО

ЛИВГИДРОМАШ

ЭЦВ

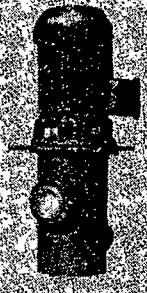


Подача Output	16...65	м³/ч m³/h
Напор Head	100...200	м m
Температура макс Temperature max	25	°С °C

Электронасосы состоят из центробежного многоступенчатого насоса, погружного электродвигателя. Предназначены для подъема из скважин воды общей минерализацией (сухой остаток не более 1500 мг/л, с массовой долей твердых механических примесей не более 0,01%).

Electric pumps consist of a centrifugal, multistage pump, a submersible electric motor. The pumps are designed to lift from the wells the water with a total mineralization (dry residue) of not in excess of 1500 mg/l and a fraction of total mass of solid mechanical impurities of not in excess of 0,01%.

1КсВ

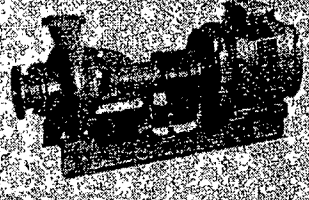


Подача Output	10...400	м³/ч m³/h
Напор Head	50...160	м m
Температура макс Temperature max	160	°С °C

Центробежные насосы для перекачивания конденсата в паровых сетях электростанций.

Centrifugal pumps for delivering condensate in vapour nets of electrical stations.

СМ



Подача Output	20...400	м³/ч m³/h
Напор Head	8...50	м m
Температура макс Temperature max	90	°С °C

Горизонтальные консольные насосы с закрытым рабочим колесом предназначены для перекачивания бытовых, промышленных сточных жидкостей и водонистых масс низкой концентрации.

Horizontal cantilever-type pumps with shrouded impeller are designed for handling the domestic, industrial sewage a pulps stocks of a low concentration.

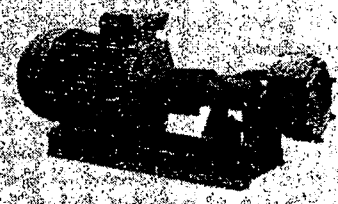
Joint stock company
LIVGIDROMASH

Mira str., 231, City Livny, Orel reg., RUSSIA, 303800
Teletype: Sosna 148883 Telefax: 00-7-08677-31762, 22069, 21758
Tel.: 00-7-08677-32954, 32068,21754
303800 Орловская область г.Ливны ул.Мира 231
Телетайп: Сосна 148883 Телефакс: 00-7-08677-31762, 22069, 31758
Тел.:00-7-08677-32954, 32068,21754

АКЦИОНЕРНОЕ ОБЩЕСТВО

ЛИВГИДРОМАШ

ВК, ВКО, ВКС

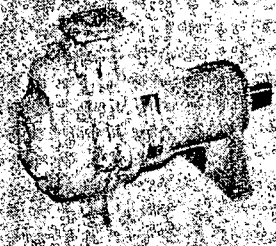


Подача Output	1,5...36	м³/ч m³/h
Напор Head	15...90	м m
Температура Temperature	-40...+85	°С °C

Горизонтальные одноступенчатые вихревые насосы предназначены для перекачивания воды, нейтральных и агрессивных жидкостей, не содержащих абразивных включений. Для перекачивания легкозастывающих жидкостей насосы изготавливают с обогревом.

Horizontal single-stage peripheral pumps are designed for handling water, neutral and corrosive fluids, containing no abrasive inclusions. The heating pumps are manufactured for handling the highly-solidified fluids.

ЦВК

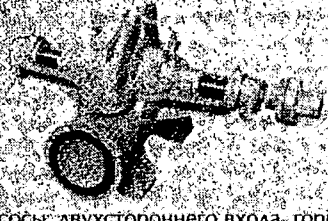


Подача Output	14...23	м³/ч m³/h
Напор Head	112...160	м m
Температура Temperature	-15...+105	°С °C

Консольные горизонтальные двухступенчатые вихревые насосы предназначены для перекачивания воды и других нейтральных жидкостей, содержащих твердые включения не более 0,05 мм.

Cantilever-type, horizontal, two-stage peripheral pumps are designed for handling water and other netral fluids, containing solid inclusions of the size not in excess 0,05 mm.

ЦН, НДВ, НДС



Подача Output	80...1200	м³/ч m³/h
Напор Head	20...115	м m
Температура Temperature	-15...+50	°С °C

Насосы двухстороннего входа горизонтальные одноступенчатые предназначены для перекачивания сырой нефти, топлива для реактивных двигателей, автомобильного и авиационного бензина дизельного топлива.

Pumps of ЦН, НДВ, НДС type are two-sided inlet, horizontale, single-stage pumps which serve to pump a raw fuel oil, fuel for jet engines, motor petrol, aviation petrol and diesel fuel.

Joint stock company

LIVGIDROMASH

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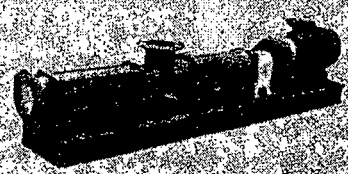
Телетайп: Сосна 148883 Телефакс: 00-7-08677-31762, 22069, 31758
Тел.:00-7-08677-32954, 32068,21754

АКЦИОНЕРНОЕ ОБЩЕСТВО

ЛИВГИДРОМАШ

H1B



Подача Output	0,1...40	м³/ч m³/h
Давление нагнетания Discharge pressure	1,6...10	кгс/см² kgf/cm²
Температура макс. Temperature max.	80	°С °C

Одновинтовые электронасосы предназначены для перекачивания чистых и загрязненных жидкостей, в том числе химически активных, содержащих твердые включения.

Helical rotor pumps are designed for handling the pure and contaminated fluids, including the chemically active fluids, containing solid inclusions.

A1 (A2, A3)BB

Подача Output	1,6...25	м³/ч m³/h
Давление нагнетания Discharge pressure	4...10	кгс/см² kgf/cm²
Температура макс. Temperature max.	80	°С °C

Двухвинтовые электронасосы с выносными опорами предназначены для перекачивания морской и пресной воды, загрязненной нефтепродуктами, с содержанием неабразивных механических примесей.

Two-screw electric pumps with external bearings are designed for handling seaand fresh water, contaminated with petroleum products, with a content of nonabrasive mechanical impurities.

A1 (A2, A3)3B

Подача Output	0,45...400	м³/ч m³/h
Давление нагнетания Discharge pressure	4...160	кгс/см² kgf/cm²
Температура макс. Temperature max.	150	°С °C

Трехвинтовые электронасосы (типа A1 3B с односторонним подводом жидкости и A1 3Bx2 с двухсторонним подводом жидкости) предназначены для перекачивания нефтепродуктов: минерального масла, мазута и нефти, дизельного топлива.

Three-screw electric pumps (type A1 3B with single suction and type A1 3Bx2 with doble suction) are designed for handling the petroleum products: petroleum oil, residual oil and oil as well as diesel fuel.

Joint stock company
LIVGIDROMASH

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Tel.: 00-7-08677-32954, 32068,21754
303800 Орловская область г.Ливны ул.Мира 231
Телетайп: Сосна 148883 Телефакс: 00-7-08677-31762, 22069, 31758
Тел.:00-7-08677-32954, 32068,21754

АКЦИОНЕРНОЕ ОБЩЕСТВО

ЛИВГИДРОМАШ

УЭВН

Подача Output	16...100	м³/ч m³/h
Напор Head	1000...1200	м m
Температура макс. Temperature max.	90	°С °C

Погружные винтовые сдвоенные электронасосы предназначены для добычи нефти, преимущественно повышенной и обычной вязкости и газосодержания. Наиболее эффективно применение этих установок на месторождениях, где использование другого оборудования нецелесообразно или невозможно: на месторождениях с низким коэффициентом продуктивности пласта, большим содержанием газа при высоком давлении насыщения и высокой вязкости нефти в пластовых условиях.

Submersible screw doubled electric pumps are designed for production of oil, mainly, of increased and ordinary viscosity and gas content. These pumps are used apply most effectivelly in the deposits, where the use of the other equipment is inexpedient or impossible: in the deposits with a low coefficient of the formation productivity and a large content of gas at the high saturation pressure and the high viscosity of oil under the stratal conditions.

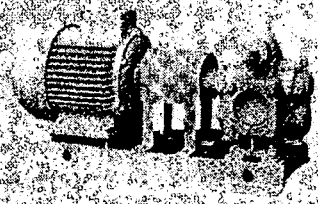
УЭЦНМ5

Подача Output	20...60	м³/ч m³/h
Напор Head	1360...1800	м m
Температура макс. Temperature max.	90	°С °C

Установки погружных центробежных насосов в модульном исполнении типа УЭЦНМ предназначены для откачки из нефтяных скважин пластовой жидкости (смесь нефти, попутной воды и нефтяного газа) с концентрацией твердых частиц не более 0,01% (0,1 г/л), сероводорода не более 0,001% (0,01 г/л), попутной воды не более 99%. Максимальное содержание свободного газа на входе насоса не более 25% по объему.

The units are designed for pumping out from oil wells the formation fluids (oil, gas-accompanying water-oil mixture) with a concentration of solid particles, not in excess of 0,01% (0,1g/l), of hydrogen sulphide, not in excess of 0,001% (0,01g/l), of accompanying water, not in excess of 99%. The maximum content of a free gas at the pump inlet is not excess of 25% by volume.

НМШ, Ш, НШ



Подача Output	0,6...37,5	м³/ч m³/h
Напор Head	15...160	м m
Температура макс. Temperature max.	70	°С °C

Шестеренные насосы с внутренними опорами на лапах предназначены для перекачивания нефтепродуктов, легкозастывающих и других жидкостей, обладающих смазывающей способностью.

Gear pumps with foot internal bearings are designed for handling the petroleum products, highly solidifiable and the other fluids, having lubricating power.

Joint Stock Company

#5 LIVGIDROMASH

Mira str., 231, City Livny, Orel reg., RUSSIA, 303800
Teletype: Sosna 148883 Telefax: 00-7-08677-31762, 22069, 21758
Tel.: 00-7-08677-32954, 32068,21754
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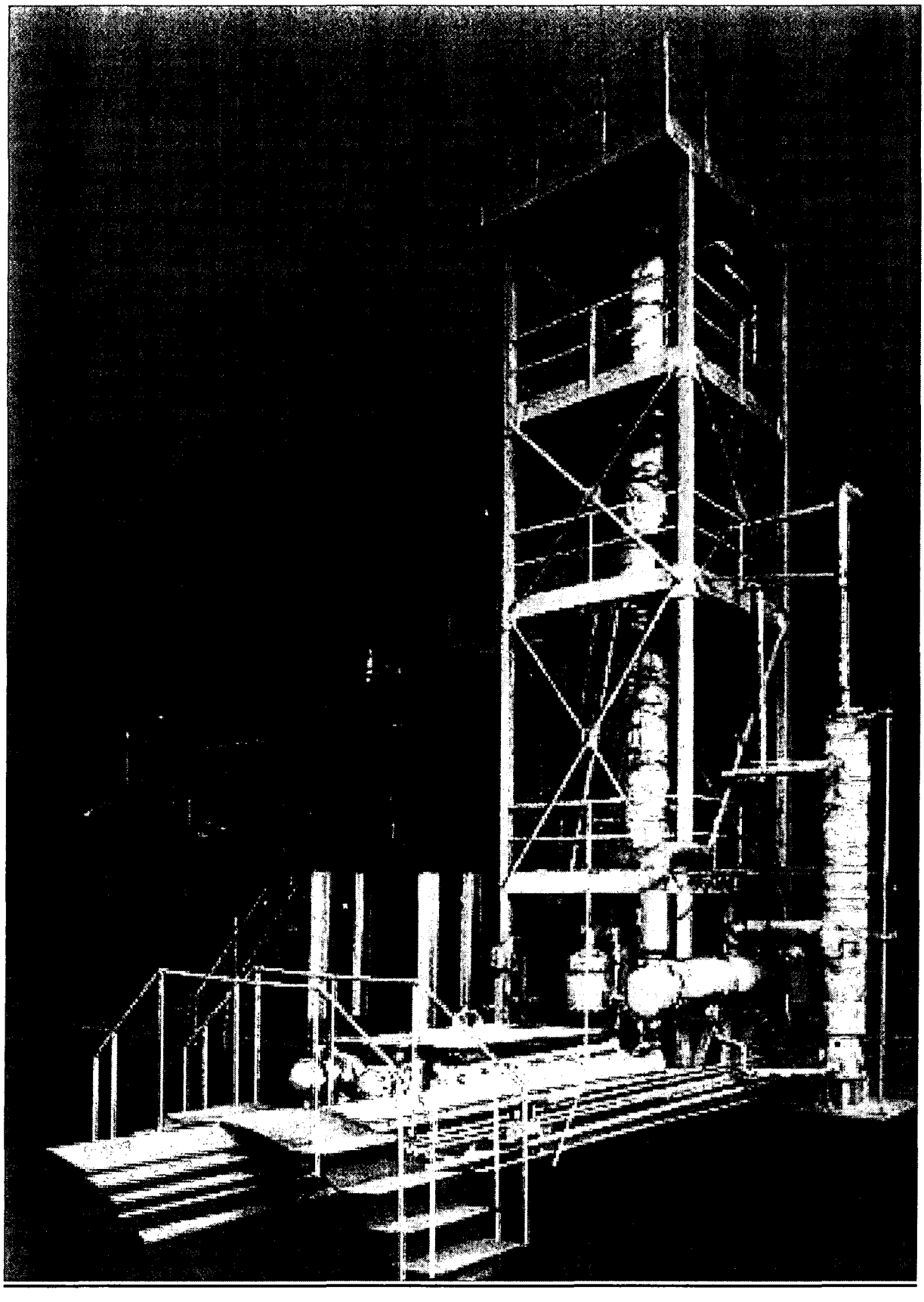
Телетайп: Сосна 148883 Телефакс: 00-7-08677-31762, 22069, 31758
Тел. 00-7-08677-32954, 32068,21754

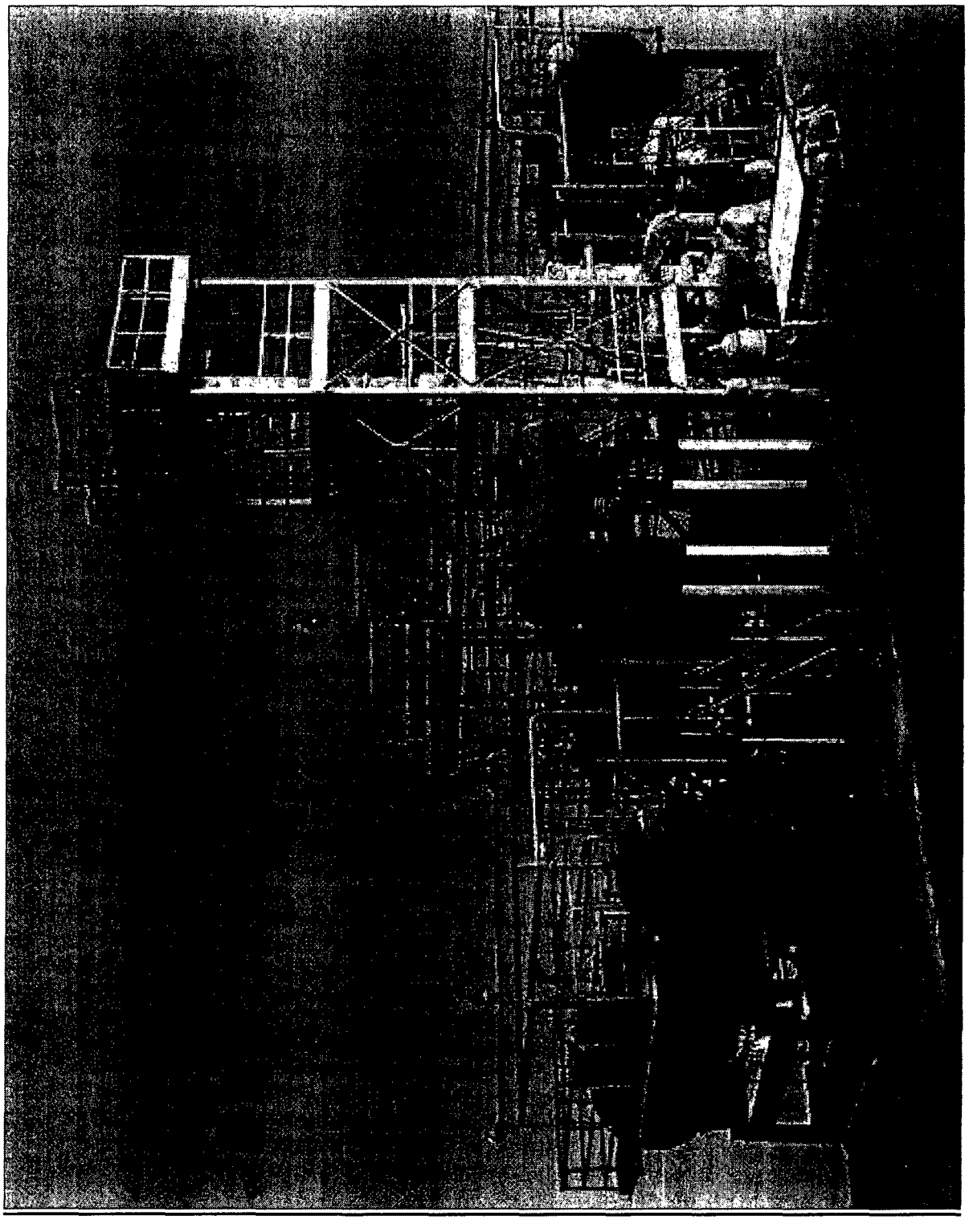
JSC "SNEZHNYANSKHIMMASH", UKRAINE

Manufactures oil production, transporting and petrochemical equipment

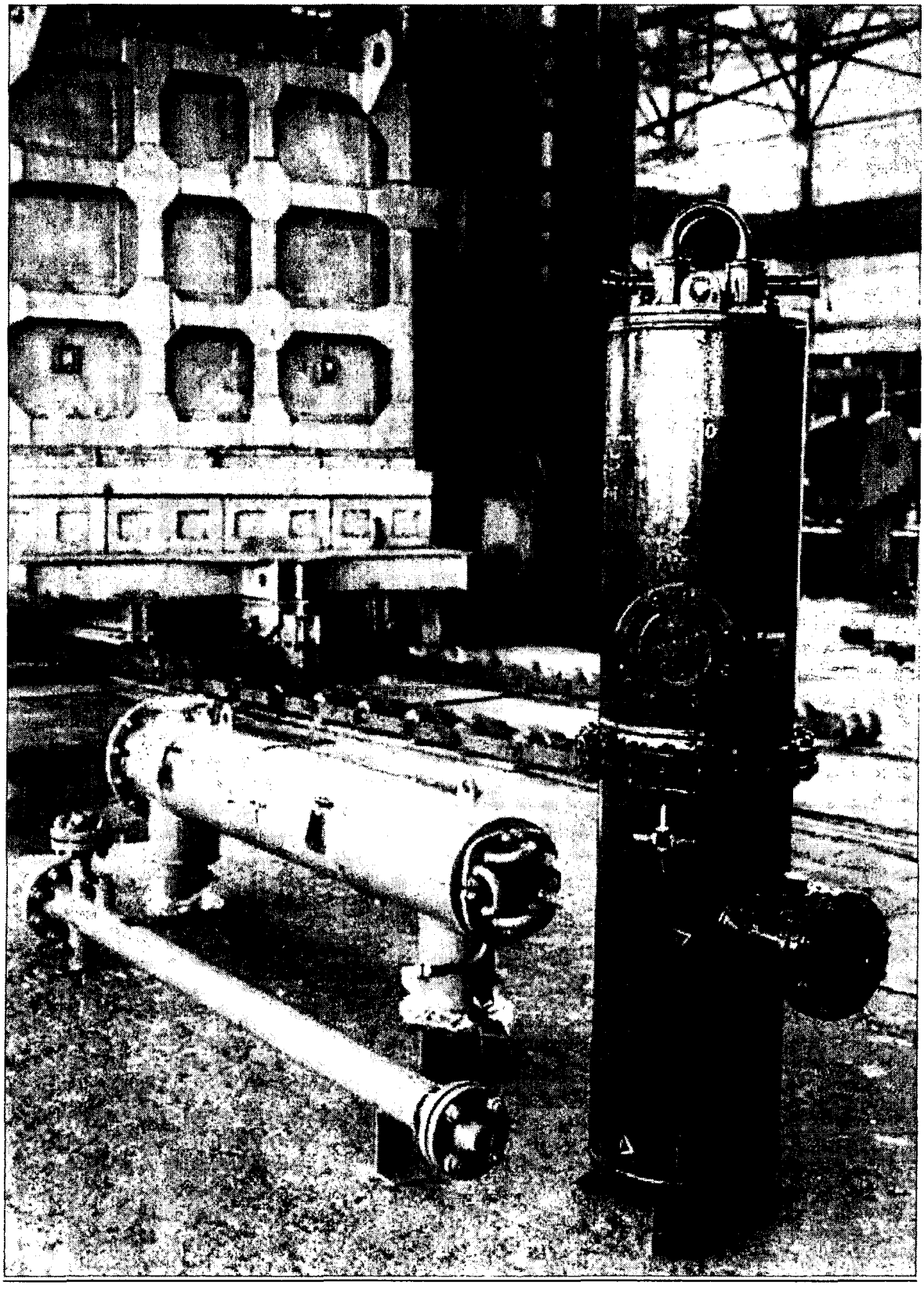
Sovetskaya Str., 86510,
Snezhnoe, Donetsk region, Ukraine
Phone :(380 6256)53148, 55153
Fax :(380 6256) 53711, 53674
Website: www.szhm.dn.ua
E-mail: himmash@szhm.dn.ua

Oil and gas condensate processing into petrol and diesel oil plant





Gas cooler



9. SUMMARY TABLE contains the names of the institutions, enterprises and companies, the addresses and contact information and a list of available technologies.

9.1. DRILLING EQUIPMENT

Company name	Contact information	Products
1. JSC "All-Russia research institute of drilling equipment"	9, Letnikovskaya St., 115114, Moscow, Russia Phone: +7(095)4115248 Fax:+7(095)4115249, 9596711 Web site: www.vniibt.ru E-mail: vniibt@vniibt.ru	Technical equipment for drilling, strengthening and well repair work: 1. hydraulic downhole engines; 2. equipment for controlled drilling; 3. equipment for strengthening of borehole lines and shanks; 4. special and core barrel instrument; 5. equipment for decline drilling.
2. JSC "Geomash"	54, Krasnaya St., 306530, Schcigry town, Kursk region, Russia Phone:+7(07145)42259 Fax:+7(07145)42270 Website: www.geomashcentre.ru E-mail: okgeo@front.ru	1. Drilling rigs; 2. Boring tools; 3. Water-driven machine for well flowing liquidation.
3. Volgograd drilling equipment plant Ltd.	16, Aviatorov Highway, 400075, Volgograd, Russia Phone:+7(8442)394070, 355775,315078 Fax:+7(8442)358511 Web site: www.vzbt.ru E-mail: info@vzbt.ru	1. Block-module drilling rigs; 2. Portable drilling rigs; 3. Blowout prevent equipment; 4. Circulating pumping systems for well repair work.
4. State-owned manufacturing association "Barricady"	400071 Volgograd-71, Russia Phone:+7(8442)781676,716275 Fax:+7(8442)758516 Website: www.barricady.ru E-mail: market@barricady.ru	Oil field equipment including Christmas-tree (gate) valves, discharge fittings, screw die presenters etc. Gas equipment including mobile gas stations, stationary gas modules, water-driven compressor modules etc.
5. JSC Corporation "Compomash"	40, 3 proezd of Maryina Roshcha, 127018, Moscow, Russia	

	Phone:+7(095)7205370 Fax:+7(095)7205371 Website: www.compomash.ccs.ru E-mail: info@compomash.ccs.ru	
6. JSC "Izhneftemash"	2, Ordzhonikidze St., 426063, Izhevsk, Russia Phones: +7(3412)515789 Fax: +7(3412)766179 Website:www.izhneftemash.ru E-mail: office@izhneftemash.ru	Oil field equipment including rocking-chair tools, deep sucker-rod pumps, spinning stationary wrenches, drill piston pumps of low and average power, cementing outfits, mixing plants, overhead pipe wrenches, pipe hydraulic wrenches and other oil production equipment.
7. JSC "OZNA"	60, Severnaya St., 452620, Oktyabrsky, Bashkortostan Republic, Russia Phones: +7(34767)40576,40841 Fax: +7(095)40841 Website: www.ozna.ru E-mail: ozna@ozna.ru	1. Stationary automated team gagging plants; 2. Transporting measuring equipment; 3. Reservoir pressure maintenance equipment; 4. Oil treating and pumping equipment; 5. Drilling produce and spare parts for slush pumps.
8. State-owned enterprise "Zvezdochka"	12, Proezd Mashinostroitelei, 164509, Severodvinsk, Arkhangelsk region, Russia Phone:+7(81842)70297 Fax:+7(81842)72850 Website: www.star.ru E-mail: info@star.ru	1. Oil/gas exploration pipelines, pump units and tanks; 2. Self-elevating floating drilling rig; 3. Floating drilling rig.
9. JSC "Machine works"	9, Smolenskaya Street, 196084, Saint – Petersburg, Russia Phone:+7(812)1468381, 3163125, 1468398 Fax:+7(812)2522145 E-mail: mms@mashzavod.spb.ru	1. Mobile drill rig.

9.2. WELL OPERATION EQUIPMENT

Company name	Contact information	Products
1. JSC "ALNAS"	423461, Almetievsk-11, Russia Phone: +7(8553)254600 Fax:+7(8553)259079, 259289 Web site: www.alnas.ru E-mail: asc@alnas.ru	Units of submersible pumping rig for oil production and reservoir pressure maintenance.
2. Borets Ltd.	6, Skladochnaya St., 127018, Moscow, Russia Phone:+7(095)3639757 Fax:+7(095)3639758 Website: www.borets.ru E-mail: ooo@borets.ru	1. Submersible screw pumps; 2. Gas injections stations for technological operations at oil and gas wells; 3. Reservoir pressure maintenance stations.
3. JSC "Livgidromash"	23/1, Mira St., 303851, Livny, Orlov region, Russia Phone:+7(08677)31758, 71729 Fax:+7(08677)71241,71243,72069 Web site: www.livgidromash.ru E-mail: sbyt@livgidro.orel.ru	1. Pumps and pumping equipment.
4. JSC "Motovilikha plants"	35, 1905 year St., Perm, 614014, Russia Phone:+7(3422)607301 Fax:+7(3422)651518 Website: www.motovilikha.perm.ru E-mail: zil@perm.ru	A wide range of deep-well pumps and rod motors.
5. JSC Corporation "Compomash"	40, 3 proezd of Maryina Roshcha, 127018, Moscow, Russia Phone:+7(095)7205370 Fax:+7(095)7205371 Website: www.compomash.ccs.ru E-mail: info@compomash.ccs.ru	1. Block pumping plant for water injection to bed; 2. Complex of technological apparatus and equipment for gas-impulsive well treatment; 3. Oil-gathering system; 4. Pumping well plant.
6. JSC "Izhneftemash"	2, Ordzhonikidze St., 426063, Izhevsk, Russia Phones: +7(3412)515789 Fax: +7(3412)766179 Website: www.izhneftemash.ru E-mail: office@izhneftemash.ru	1. Mixing plants; 2. Tubing deep sucker-rod pumps; 3. Centrifugal vertical pumping plant; 4. A wide range of driving gears for sucker-rod pumps.

7. JSC "OZNA"	60, Severnaya St., 452620, Oktyabrsky, Bashkortostan Republic, Russia Phones: +7(34767)40576,40841 Fax: +7(095)40841 Website: www.ozna.ru E-mail: ozna@ozna.ru	1. Block group pumping stations.

9.3. OIL AND GAS PROCESSING EQUIPMENT

Company name	Contact information	Products
1. JSC "Motovilikha plants"	35, 1905 year St., Perm, 614014, Russia Phone:+7(3422)607301 Fax:+7(3422)651518 Website: www.motovilikha.perm.ru E-mail: zil@perm.ru	Gas - sand separator.
2. JSC Corporation "Compomash"	40, 3 proezd of Maryina Roshcha, 127018, Moscow, Russia Phone:+7(095)7205370 Fax:+7(095)7205371 Website: www.compomash.ccs.ru E-mail: info@compomash.ccs.ru	1. Block pumping plant for water injection to bed; 2. Complex of technological apparatus and equipment for gas-impulsive well treatment; 3. Oil-gathering system; 4. Pumping well plant.
3. JSC "Belgorod energy machinery plant"	11/1, Khmelnicky Prospekt, Belgorod, 308800, Russia Phone: +7(0722)223639 Fax; +7(0722)265857 Website:www.belenergomash.ru E-mail: info@belenergomash.ru	1. Hydrocarbons processing unit constructions; 2. Gas treatment equipment; 3. Pipelines.
4. JSC "Kazan motor production enterprise"	1, Dementjev str., 420036, Kazan, Russia Phone: +7(8432)719915 Fax: +7(8432)719915 www.kmpo.ru E-mail: support@kmpo.ru	1. Engine for gas-transfer plants; 2. Gas-transfer plant; 3. Automatic gas distributing station.
5. JSC "Snezhnyanskhimmash"	Sovetskaya Str., 86510, Snezhnoe, Donetsk region,	1. Oil and gas condensate processing into petrol and

	Ukraine Phone:(380 6256)53148, 55153 Fax:(380 6256) 53711, 53674 Website: www.szhm.dn.ua E-mail: himmash@szhm.dn.ua	diesel oil plant.

9.4. EQUIPMENT FOR TRANSPORTING AND STORAGE

Company name	Contact information	Products
1. JSC "Motor Sich"	Zaporpzhye, 69069, Ukrain Phone: (380 612) 614953 Fax: (380 612) 614552 Website: www.motovilikha.perm.ru E-mail: untv.vtf@motorsich.com	1. Gas-turbine power generating set of 1 MW, 2,5 MW, 6 MW power; 2. Universal gas-turbine drives of 6,3 MW, 10 MW power.
2. JSC Corporation "Compomash"	40, 3 proezd of Maryina Roshcha, 127018, Moscow, Russia Phone:+7(095)7205370 Fax:+7(095)7205371 Website: www.compomash.ccs.ru E-mail: info@compomash.ccs.ru	1. Block pumping plant for water injection to bed; 2. Complex of technological apparatus and equipment for gas-impulsive well treatment; 3. Oil-gathering system; 4. Pumping well plant.
3. JSC "Belgorod energy machinery plant"	11/1, Khmelnicky Prospekt, Belgorod, 308800, Russia Phone: +7(0722)223639 Fax; +7(0722)265857 Website:www.belenergomash.ru E-mail: info@belenergomash.ru	1. Hydrocarbons processing unit constructions; 2. Gas treatment equipment; 3. Pipelines.
4. JSC "Kazan motor production enterprise"	1, Dementjev str., 420036, Kazan, Russia Phone: +7(8432)719915 Fax: +7(8432)719915 www.kmpo.ru E-mail: support@kmpo.ru	1. Engine for gas-transfer plants; 2. Gas-transfer plant; 3. Automatic gas distributing station.

Intellectual property rights on the above mentioned technologies belong to the institutions and enterprises accordingly. This property is legalized in the form of the following documents – patent for invention, industrial designs, certificates for trade marks and utility models.

These institutions and enterprises own know-how and technologies. Price, terms and conditions for transfer of authority limited or unlimited should be discussed during direct negotiations.

10. A plan of follow up actions and modality of the implementation is as follows.

1. Specification by Venezuelan party of technologies, equipment and materials which they are interested in and the enterprises owning the property rights.
2. Forming the Venezuelan delegation and its visit to Russia and COMECON countries to the chosen enterprises in order to inspect the technologies on site and initiate negotiations on signing a contract for technology and equipment transfer.
3. Forming the delegation from the chosen companies from Russia and COMECON countries and its visit to Venezuela in order to examine local peculiarities and climate conditions for using given technologies and equipment. Conducting negotiations with the Venezuela party for practical implementation of technology transfer.
4. Preparing the legal and technical documentation for practical realization of reached agreements.
5. Assistance of all the meetings and negotiations by the International congress of industrialists and entrepreneurs as organizer and guarantor of follow up actions implementation.