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SELECTED 150 INDUSTRIAL PROJECTS WITH FOREIGN TECHNOLOGIES

(Import substitutes / export-oriented / environmentally desirable projects, compiled in 23 sections)

GoodRich MAGMA Industrial Technologies Limited is a consulting company engaged in promoting new and innovative industrial projects in India, based on overseas technologies.

During the last 20 years, the Managing Director of the company, Mr. I. R. Rao travelled to technology-based countries over 90 times, including European Union, Russia, Ukraine, Belarus and China, to explore new industrial projects. He also travelled hundreds of times across India to meet various industrialists and entrepreneurs. Based on the huge information base, these projects have been compiled by the Technical Director of the company, Mr. Rohan Rao, who graduated with a Master's degree in Mechanical Engineering from Imperial College London.

'GoodRich' offers the following industrial projects, which include both green-field and brown-field that help existing industries to improve their productivity and to reduce the costs.

Below is the list of 150 innovative industrial projects compiled in 23 sections, all of which have been thoroughly studied and discussed with the overseas technology providers –

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A. Food and agro-based projects -

(Also projects 13, 14, 15, 16, 17, 18, 103, 104, 116, 124, 125, 126, 127 from other sections)

1. Automatic vacuum frying plant for fruits and vegetables, to make healthy snacks.

2. Soya protein concentrate and isolate manufacturing plants.

3. Direct activation of paddy husk and other agricultural residues to make activated carbon.

4. Electricity saving in cold storage, by using vortex gasification of biomass and absorption chiller technologies.

B. Pharmaceutical related projects -

(Also project 139 from other section)

5. Highly expanded graphite powder making technology for quick healing of medical wounds.

6. Electron beam / gamma irradiation of foods and medical products (to make them bacteria and virus - free), mainly for exports.

7. Molecular level blending technology for liquid pharmaceutical preparations (for example, Betadine gargle in different flavors), using Cavitation technology.

8. 4th generation human tissue welding equipment (also can be used for heart surgeries).

9. Hot water generators of 100 – 10,000 liters per hour, using Cavitation technology (heating up to 95°C with COP = 1.5 – 2; without any electrical heating elements, and without burning any fuel).

C. Fermentation and distillation projects -

10. Russian technology to make vodka in different flavours.

11. Complete reduction of COD & BOD in distillery wastes, by electromagnetic shock waves / cavitation technology.

12. Bio-degradable plastic (Poly-propylene carbonate) from CO_2, a by-product of alcohol units.

13. Starch, Glucose, Sorbitol, Vitamin C, Vitamin B_2 & Vitamin B_{12} making projects from corn (maize).

14. L-Lysine making project (an essential amino acid) from corn / secondary juice from sugar factories.

15. Mono-sodium Glutamate (MSG) making project (popularly known as Ajinomoto), using corn / secondary juice from sugar factories.

16. Citric Acid making project, using corn / secondary juice from sugar factories.

17. Lactic acid & Poly-lactic acid (bio-degradable plastic), using corn / secondary juice from sugar factories.

18. Xylitol from corn cobs.

D. Wood, bamboo and bagasse based projects -

(Also projects 95, 102, 115, 128, 129 from other sections)

19. Medium Density Fiberboard (MDF) project, using bamboo and plantation timbers.

20. Particleboard project using wood waste, bamboo and plantation timbers.

21. OSB (Oriented Stranded Board) making project from bamboo and plantation timbers.

22. Environmentally clean Pini-kay charcoal making plant (for barbecue and ferro-alloy units); charcoal cum activated carbon making plant (for water and air purification) from bamboo, bagasse, coconut shells and other agricultural residues.

23. Cube charcoal making project for shisha / hookah applications from coconut shells, coffee / tea stems and lemon trees.

24. TMP (thermo-mechanical pulp) and CTMP (Chemi-thermo Mechanical Pulp) making projects using cotton stalks, bamboo, and other plantation timbers.

25. Red oak barrel making project (for the maturation of whisky and wine in wooden vats).

E. Diamond related projects -

26. Lab-grown solitaire jewellery grade diamond making project (up to 50 carats), using HPHT process.

27. Technology to produce diamond anvils and single crystal super hard materials for optical lasers and semi-conductors.

F. Mining, mineral beneficiation and agglomeration projects -

(Also projects 38, 43, 53, 66, 68, 89 from other sections)

28. Electro-magnetic resonance technology for accurate detection of concealed and precious minerals, oil and gas – underground range up to 4 kilometers.

29. Fluidized bed reduction roasting plant to re-beneficiate iron ore tailings, old iron ore mining dumps and low grade ferruginous manganese ores.

30. Dry beneficiation of BHQ / BHJ / iron ore wastes, using ultra high-gauss rare earth magnetic separators.

31. Dry beneficiation of manganese ore, chrome ore and metallurgical slags, using sensor-sorter technology.

32. Dry beneficiation of nickel-laterite ore by tunnel kiln primary reduction and subsequent magnetic separation.

33. Ultra-high pressure briquetting of iron ore fines, mill scale, sponge iron fines, manganese ore fines, chrome ore fines, lime (without any binder), and other mineral powders.

34. Iron ore pelletisation plant, using grate kiln / straight grate technologies, and also direct conversion of hot pellets into sponge iron.

G. Iron and steel, and other metallurgical projects -

(Also projects 84, 87, 88, 90, 92, 109, 119 from other sections)

35. Gas Oxygen Refiner (GOR) to make high quality carbon steels, alloy steels and stainless steels, and also to refine steels from Induction furnaces.

36. Ladle desulphurization technology, using 100% granulated magnesium in iron and steel making units.

37. DC arc furnace with a bottom electrode, for efficient melting of non- conductive materials like sponge iron and other metallurgical wastes.

38. Reduction of iron ore briquettes / titaniferous magnetite ores into DRI in third generation tunnel kilns; also reduction of steel mill scale into metal powders by tunnel kiln + hydrogen reduction process.

39. Carbon composite briquetting; DRI and steel production in the Rotary hearth furnace + mini blast furnace, or in the Rotaryhearth furnace + DC electric arc furnace routes.

40. Ferro chrome making plant (high-carbon and medium-carbon), using chrome ore fines + coke fines, by oxygen melting in the GOR + Induction furnace route (without the need for power-intensive submerged arc furnaces).

41. Production of chrome-containing pig iron and manganese-containing pig iron in mini-blast furnaces for direct production of 200 series (utensil grades) of stainless steels.

42. Granulated magnesium making project.

43. Technology for using non-coking coals up to 80% in stamp-charged coke oven plants.

44. Metallic electrodes to replace graphite electrodes, in steel refining.

45. Vertical grinding mill to make ground, granulated blast furnace slag (GGBS) on a large scale.

46. Rock wool making plant to utilize blast furnace slag.

47. Direct crushing of converter liquid slags into 50 – 600 mm sized stones for road construction, with capacities up to 300 tons per hour.

48. Ductile Iron pipe making project.

H. Ferro alloy related projects -

(Also projects 130, 135 from other sections)

49. Conversion of high carbon ferrochrome into medium carbon ferro chrome / low silicon ferro chrome, in Gas Oxygen Refiner.

50. Manufacture of low carbon ferro chrome by smelting ferro-silico chrome and chromium ore.

51. Conversion of low carbon silico manganese into metallic manganese in Gas Oxygen Refiner.

52. Pre-heating technology for manganese ore + coal, and hot-charging into submerged arc furnace.

53. Technology to remove phosphorous and silicon from manganese ores.

54. Ferro nickel production in modified ferro alloy plants.

I. Forging, casting and automobile technologies -

(Also projects 108, 146, 149 from other sections)

55. Flat type cross wedge rolling process to make automobile axles, railway axles, gear wheels, pinions, connecting rods, balls and other roll-forged engineering components.

56. Pulse plasma hardening of gear boxes, shafts and automobile products (both cast and forged).

57. Ion beam surface hardening and coating of dies for forging and hot-stamping (to make the dies 3 – 5 times harder).

58. Light weight metal making technology from iron, copper, titanium, etc. (with added hydrogen) for engine blocks / castings / metal filters, having 50% of normal metal weight.

J. Coal and coke related projects –

(Also projects 43, 78, 79, 95, 101, 113, 114, 123 from other sections)

59. Dry beneficiation of coal and separation of stones and mud, using pneumatic aspiration.

60. Separation of magnetic stones from half-burnt coal, char and dolochar, using ultra-high gauss magnetic separation.

61. Median coal washing plant, to beneficiate and use low grades of non-coking coals in stamp-charged coke oven plants.

62. Coal agglomeration technologies, such as briquetting and extrusion.

63. Coke fines briquetting and binding technology, to replace coke in ferro alloy plants.

64. Heat-recovery type vertical coke-oven plant, combined with power plant.

K. Crushing and grinding projects -

65. Centrifugal crusher, centrifugal grinding mill and centrifugal classification system, to grind hard materials such as quartz, iron ore, manganese ore,chrome ore, granite, other stone aggregates, steel mill slag, corundum, etc.

66. High-pressure roller grinder in large capacities, to increase the efficiency and production of ball mills by 30 – 40%.

67. Rubberized bitumen making project by efficient grinding of old tyres, using magnetic impulse grinding technology.

68. Technology to make grinding media balls from old railway tracks.

L. Construction, insulation, ceramic and refractory projects -

(Also projects 46, 107, 120, 144 from other sections)

69. Automatic clay brick making project (from 30,000 to 3,00,000 bricks per day using low grades of soil) by hard extrusion / toggle press, and subsequent tunnel kiln curing process.

70. Large quartz slab making project (a replacement for granite slab / Italian marble) with in-house quartz grinding plant.

71. Amorphous silica and alumina powder making technology, using cyclone furnace.

72. Roofing sheet + basalt / rock wool sandwich panels for outdoor thermal insulations (for container homes and insulated factory buildings).

73. Ceramic wool making project from alumina.

M. Chemical and fertilizer projects -

74. Methanol / Ammonia making project from coal gas, and the manufacture of urea from ammonia (at 50% of the present cost of production, using natural gas); also other ammonium based fertilizers - Ammonium nitrate, Ammonium sulphate, Mono-ammonium phosphate (MAP) and Di-ammonium phosphate (DAP).

75. Compound fertilizers like NPK; and fertilizer-related projects like Nitric acid, Sulphuric Acid and Phosphoric acid making plants.

76. Combined Caustic Soda and PVC plants.

77. Combined Soda ash and Ammonium Chloride plants.

78. Hydrogen making plant from biomass producer gas / coal gas using water shift reactor.

79. Methanol to DME (to replace LPG) and methanol to petrol (in the DME route) making projects from coal gas.

N. Fuels and petroleum based technologies -

(Also projects 82, 121, 122, 123 from other sections)

80. Fractionation technology for the recovery of base oil, slack wax and bitumen from furnace oil / mazut, and conversion of slack wax into paraffin wax.

81. Mini bio-refinery for the conversion of wood waste + motor oil waste to make Diesel for stationary power generators by vertical pyrolysis, distillation and purification.

O. Power projects (including non-conventional) -

(Also projects 110, 111, 112 from other sections)

82. Hydrogen production by Water Electrolysis.

83. External combustion engines (rotary vane engine, sterling engine, etc.).

84. Centrifugal separation of fly ash, to recover ultra-fine fly ash particles for cement making.

85. Environmentally clean power generation from high ash thermal coal, using MAGMA smelter technology.

86. Coal gas-based IGCC power plants, using fluidized bed / entrained bed gasifiers.

P. MAGMA smelter related projects -

(Also project 85 from other section)

87. Coke - free production of pig iron / cast iron, using iron ore fines, blast furnace and steel mill wastes, and tailings from iron ore beneficiation plants.

88. Conversion of sponge iron making plants into pig iron making plants, while doubling their capacities.

89. Conversion of small pellet plants (3,00,000 to 6,00,000 tons/year) into pig iron making plants.

90. Simultaneous recovery of iron and cement clinker from steel mill slags of electric arc furnace / converter.

91. High-temperature recycling of unsorted municipal solid wastes, to make electricity + cement clinker / hydrogen + cement clinker.

92. Oxygen melting of low grades of nickel, copper, tin, zinc and lead ores, to recover non-ferrous metals.

93. Processing of metal radio-active wastes from nuclear power plants.

Q. Pyrolysis, gasification and waste recovery projects -

(Also projects 91, 105, 118 from other sections)

94. Stationary / mobile fast pyrolysis and vortex combustion plant for controlled burning of unsorted municipal wastes and also for re-

mediation of old dumps, to generate medium pressure steam / hot air for cold storage of fruits and vegetables (using absorption chillers).

95. Ablative type Flash pyrolysis plant to convert biomass, lignite and coal waste into bio-oil, butane - propane gas and partially activated carbon.

96. Vertical pyrolysis plant to treat oil sludge, plastic and plastic-paper wastes, latex rubber wastes, medical wastes and 300 types of other industrial wastes for the recovery of oil and carbon; and to treat E-waste for additional recovery of copper and precious metals like gold, silver, platinum and palladium by electrolysis / repulsive magnetic extraction.

97. High-temperature pyrolysis-gasifier to produce heat and electricity from multi-fuel wastes (using any carbon containing waste material with a minimum heat value of 2,000 Kcal/kg and size up to 1 meter - such as coal waste, RDF, poultry processing waste, saw dust, paddy husk, etc.).

98. Vortex gasification plant, using fine particles of biomass and coal wastes.

99. Polyester staple fiber (PSF) making plant from pet bottle wastes.

100. Hydro pyrolysis plant for processing medical and other hazardous wastes (2,000 - 4,000 kgs per day) for large hospitals and chemical industries, to replace highly pollutant incinerator plants.

101. Large-sized entrained bed coal gasifiers, using coal-water slurry to make Hydrogen / Methanol.

R. Vortex technologies -

(Also project 98 from other section)

102. Vortex burner system for efficient burning of saw dust and agricultural residues of 0 – 10 mm sizes.

103. Vortex dryer system for low-temperature drying of agricultural and other heat-sensitive products.

S. Plasma technologies -

(Also projects 131, 141, 148 from other sections)

104. Plasma technology to make high-yielding and disease-free agricultural seeds.

105. High temperature plasma pyrolysis plant to make syngas ($CO + H_2$) in 1:1 ratio from RDF (Refuse Derived Fuel) briquettes of municipal solid wastes.

106. Plasma technology to split natural gas into acetylene and hydrogen; and also to make acetylene gas from oil waste.

107. Plasma technology to make fused quartz, fused alumina and fused zirconia for refractory applications and for investment casting.

108. Plasma technology to make very fine powders of different metals and alloys, such as titanium (for gas turbine fins) and tungsten carbide for powder metallurgy.

109. Microwave plasma chemical process to separate zinc and sulphur from Blast furnace gas.

110. Arc plasma-assisted combustion in boilers, to increase their efficiency by 30%, and to reduce carbon in ash, to reduce emissions, to increase combustion temperatures and to burn low grades of coal.

111. Microwave plasma to start and stabilize coal burning in power plants.

112. Microwave plasma chemical process for exhaust gas purification, conversion of compounds such as H_2S into elements (H_2 and S), and for complete reduction of emissions in the power plants.

113. Microwave plasma for efficient combustion of coal washery reject powders (having low heat value of around 1,500 Kcal per kg).

114. Vapour plasma to burn coal water slurry (having low heat value of around 1,500 kcal per kg).

115. Three stage arc plasma process (using standard transformers), to make hydrogen from wood wastes.

116. Plasma technology to make solar grade silicon from paddy husk, replacing highly pollutant chloride process.

117. Plasma assisted skull melting crucible furnace to make super-thin basalt fibres.

118. Plasma technology for the destruction of hazardous and toxic wastes, outdated pesticides and dangerous chemicals.

119. Plasma process for direct production of steel from iron ore pellets / carbon composite briquettes.

120. Plasma induction furnace for making magnesium and zirconium oxides for refractory applications.

T. Cavitation technologies -

(Also projects 6, 7 from other sections)

121. Fuel blends at molecular levels (to make 75:25 blends of diesel + water / LDO + water) for efficient and pollution-free combustion in boilers, furnaces, industrial burners and stationary power generators.

122. Cavitation technology to reduce the viscosity of crude oils for higher recovery of lighter oil fractions.

123. Coal-water slurry making and stabilizing plant, to replace furnace oil in boilers and furnaces.

124. Low-temperature milk sterilization plant, to enhance its taste and to improve its storage qualities.

125. Egg sterilization and mini-egg powder making plant.

126. Sterilized liquid feed making plant, for 25-30% higher milk yield from livestock.

127. Technology to increase the recovery of oleoresins and essential oils; to produce oleoresins without solvent residues (surpassing the efficiency of super critical fluid extraction technology).

128. In-house plant to make wax emulsions, for Particleboard and MDF industries.

129. In-house plant to improve the quality of UF resin for making E1 grades of Particleboard and MDF.

U. Titanium and vanadium based projects -

130. Ore thermal furnace technology, to convert ilmenite into synthetic rutile.

131. Technology to convert natural rutile / synthetic rutile into titanium dioxide (TiO_2) pigment powder, using chloride process / sulfide process. Also another new technology of plasma chemical process for making TiO_2.

132. Technology to convert synthetic rutile into titanium sponge, with simultaneous production of magnesium metal from magnesium chloride. Also another new technology of high resistance furnace to make titanium sponge from ilmenite or rutile.

133. Conversion of titanium scrap and titanium sponge into titanium alloy

metals / ferro titanium, using Electron beam melting technology.

134. Rolling of titanium metal into titanium sheets, and the manufacture of welded or seamless titanium tubes for strategic applications.

135. Titanium special welding technology for critical applications.

136. Production of ferro titanium in submerged arc furnaces, using ilmenite / synthetic rutile / titanium scrap / titanium sponge.

137. Ferro vanadium making plant, using aluminium-vanadium cake from aluminium plants, after fluidized bed roasting.

V. Graphite and graphene technologies -

(Also project 5 from other section)

138. Ultra-purification of graphite powders up to 99.99% using fluidized bed furnaces, for making lithium ion batteries.

139. Highly-expanded graphite (multi-layered graphene) making technology, which can be used as an absorbent in automobiles and machines, in oil spillages, in semi-conductors, and in plastics and rubbers for modifying their physical and chemical properties.

140. High-temperature graphene sheet pressing technology from expanded graphite, for strategic applications (including aero planes invisible for radar detection).

W. Military, aerospace, nuclear and other strategic technologies -

(Also projects 117, 140 from other sections)

141. Carbon fibre making project for aerospace applications (from coke resin), using plasma pyrolysis technology.

142. Level 4 bullet-proof jackets for soldiers and Level 5 bullet-proof jackets for VIPs.

143. Laser-supported 'machine eye' for day and night vision images up to 6 kms (third generation technology, after night vision binoculars and thermal imagers).

144. Continuous basalt thread making / basalt fibre making technology, with down-stream products like basalt mats and boards, sandwich panels, basalt woven cloth (for rain-proof tents, for fire-fighting and for high-altitude weather-proof military clothing), and making composites for bullet-proof jackets.

145. Centrifugal test stands with air cushion bearing technology (without the need for heavy foundations) to test objects weighing up to 2,000 kgs at 100 G force (or up to 100 kgs at 600 G force), exceeding global standards. This technology can be used for making the parts for civil aviation, missiles, rocket and spaceship applications (which are subject to high frictional load while escaping from / entering into Earth's gravitational fields).

146. Electron beam molecular level vacuum welding technology for all metals (up to 160 mm thick sheets) for military, aircraft, turbines, nuclear and space equipment, and rocket body / engines. It can also be used for

programmed welding of several components at a time (for example - 200 automobile components of 1 ft. height and 6" dia can be welded simultaneously in one hour).

147. Aluminium, copper and brass scrap-melting and centrifugal casting of cylinders at 300 G force (up to 5-meter dia., and 1-meter height), to produce metals with improved microstructure (for example - aluminium with 40% higher strength / 40% lower weight) for cryogenic rocket engines and long distance missile bodies.

148. Supersonic plasma for spraying and hard-coating of strategic materials such as tungsten carbide / diamond powder (for example - coating inside the plates of bullet-proof jackets).

149. Electroslag re-melting, to make products with double hardness (using the same metallurgy, but by changing the speed of crystallization) to make strong dies for forging, and for other strategic applications.

150. Growing of flat, super-hard and transparent sapphire crystal for military applications, including face shields for soldiers.

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