

Section 2

Summary of Applicable Industries

3. Chemical industry

Ammonia

[Production Equipment]

Page	Serial No.	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refining	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
147	1	CA-PE-1	Multi-effect evaporator			⊙	○		○	○			○
148	2	CA-PE-2	Heat exchanger type primary reformer for waste heat recovery in ammonia production process			⊙							
149	3	CA-PE-3	High conversion rate synthesis reactor for ammonia production			⊙					○		
150	4	CA-PE-4	Low pressure difference synthesis reactor for ammonia production			⊙							
151	5	CA-PE-5	Isothermal CO converter for ammonia production			⊙	○						
152	6	CA-PE-6	CO oxidizer in ammonia production process	○		⊙							

[Machinery & Equipment]

153	7	CA-ME-1	Waste heat recovery unit for synthesis gas compressor exit gas in ammonia production process			⊙							
154	8	CA-ME-2	Membrane separation hydrogen recovery unit in ammonia production process			⊙	○						
155	9	CA-ME-3	High pressure water power recovery turbine in ammonia production process	○		⊙	○			○			○
156	10	CA-ME-4	Installation of pre-reformer in ammonia reforming process			⊙	○						
157	11	CA-ME-5	Primary reformer waste heat recovery unit for ammonia plant			⊙	○						

[Operation & Management]

158	12	CA-OM-1	Humidification process prior to primary reforming in ammonia production process			⊙	○						
159	13	CA-OM-2	Ammonia production process: Improvement in heating feed to ammonia stripper			⊙	○						
160	14	CA-OM-3	Ammonia production process: Carbonate removal process			⊙	○						

3. Chemical industry

Caustic soda

[Production Equipment]

Page		Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
161	15	CS-PE-1	Quadruple-effect concentration for diaphragm-type electrolytic caustic soda production			⊙							
162	16	CS-PE-2	Energy saving ion exchange membrane electrolysis bath for caustic soda production			⊙							
163	17	CS-PE-3	Ion exchange membrane NaCl electrolysis bath for caustic soda production			⊙							

[Machinery & Equipment]

164	18	CS-ME-1	Brine preheater using recovered heat of NaCl electrolysis in caustic soda production process			⊙							
165	19	CS-ME-2	Improvement of active cathode for ion exchange membrane electrolysis for caustic soda production			⊙							

[Operation & Management]

166	20	CS-OM-1	Caustic soda production process: Switching from diaphragm electrolytic process to ion exchange membrane electrolytic process			⊙							
167	21	CS-OM-2	Reduction of electrolytic power for NaCl electrolysis bath in caustic soda production			⊙							

3. Chemical industry

Naphtha

[Machinery & Equipment]

Page	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
168	22	CN-ME-1			☉	○						
169	23	CN-ME-2			☉	○						
170	24	CN-ME-3			☉	○						
171	25	CN-ME-4			☉	○						
172	26	CN-ME-5			☉	○						

[Operation & Management]

173	27	CN-OM-1		○	☉	○	○					○
174	28	CN-OM-2			☉	○						
175	29	CN-OM-3			☉	○						
176	30	CN-OM-4			☉	○						○

3. Chemical industry

BTX

[Machinery & Equipment]

Page	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
177	31	CB-ME-1			⊙	○						
178	32	CB-ME-2	○	○	⊙	○	○				○	○
179	33	CB-ME-3			⊙	○			○			
180	34	CB-ME-4			⊙	○			○	○		○

[Operation & Management]

181	35	CB-OM-1			⊙	○						
182	36	CB-OM-2			⊙	○						
183	37	CB-OM-3			⊙	○						
184	38	CB-OM-4			⊙	○						

3. Chemical industry

General

[Production Equipment]

Page	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
185	39	CG-PE-1			⊙				○			
186	40	CG-PE-2			⊙	○			○			

[Machinery & Equipment]

187	41	CG-ME-1			⊙				○			○
188	42	CG-ME-2			⊙							○
189	43	CG-ME-3			⊙	○						
190	44	CG-ME-4			⊙	○						
191	45	CG-ME-5			⊙							
192	46	CG-ME-6	○		⊙							○

4. Oil refining industry

[Machinery & Equipment]

Page	Serial No.	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
198	1	OR-ME-1	Vacuum distillation unit: Reduction of injection steam by recycling overhead steam			○	◎						
199	2	OR-ME-2	Fluid catalytic cracking (FCC) unit: Power recovery system (1)			○	◎						
200	3	OR-ME-3	Fluid catalytic cracking (FCC) unit: Power recovery system with humid steam condensing turbine (2)			○	◎						○
201	4	OR-ME-4	Petroleum refining unit: Installation of waste heat boiler to sulfur recovery unit				◎						
202	5	OR-ME-5	Oil refining unit: Installation of a side reboiler on a distillation column in the petroleum refining process			○	◎			○			○
203	6	OR-ME-6	Petroleum refining unit: Installation of a membrane separator for hydrogen				◎						

4. Oil refining industry

[Operation & Management]

204	7	OR-OM-1	Vacuum distillation unit: Hot charge to the vacuum distillation unit				◎						
205	8	OR-OM-2	Atmospheric crude oil distillation column: Recovery of waste heat of heavy gas oil				◎						
206	9	OR-OM-3	Vacuum distillation unit: Recovery of waste heat of the overhead vapor			○	◎						
207	10	OR-OM-4	Vacuum gas oil desulfurization unit: Improvement of heat recovery system				◎						
208	11	OR-OM-5	Heavy oil direct desulfurization unit: Reduction of oxygen content in the flue gas			○	◎			○			○
209	12	OR-OM-6	Heavy oil direct desulfurization unit: Rotation control of the recycle gas compressor			○	◎						
210	13	OR-OM-7	Fluid catalytic cracking (FCC) unit: Improvement of heat recovery by modification of operating conditions of the main fractionator.				◎						
211	14	OR-OM-8	Fluid catalytic cracking (FCC) unit : Energy saving by reducing the pressure inside the regeneration column				◎						
212	15	OR-OM-9	Oil refining process: Reduction of the quantity of the recycled gas in the reforming unit			○	◎						
213	16	OR-OM-10	Catalytic Reforming Unit: Energy Saving by Low-pressure Operation of Distillation Columns				◎						
214	17	OR-OM-11	Petroleum refining process: Rearrangement of heat exchangers of a distillation plant				◎						
215	18	OR-OM-12	Hydrogen production unit:Reduction of steam/carbon ratio				◎						
216	19	OR-OM-13	Hydrodesulfurization process: Effective utilization of steam				◎						
217	20	OR-OM-14	Hydrogen production unit: Computer-controlled reduction of surplus hydrogen				◎						

4. Oil refining industry

218	21	OR-OM-15	Petroleum Refining Process: Flare Gas Recovery System			<input type="radio"/>	<input checked="" type="radio"/>						
219	22	OR-OM-16	Increased concentration of amine solution in the off-gas desulfurizing process			<input type="radio"/>	<input checked="" type="radio"/>						
220	23	OR-OM-17	Vacuum gas oil desulfurization unit: Reduction of steam supply to the reboiler for the amine regenerator			<input type="radio"/>	<input checked="" type="radio"/>						

5.Ceramic industry

Cement

[Production Equipment]

Page	Serial No.	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
227	1	YC-PE-1	Cement raw material preparation: introduction of a large vertical roller mill for raw material crushing					◎					
228	2	YC-PE-2	Cement clinker burning process: Adoption of suspension preheater (SP)					◎					
229	3	YC-PE-3	NSP-type cement calcining furnace					◎					
230	4	YC-PE-4	Cement clinker burning process: Adoption of vertical roller mill for coal crushing					◎				○	
231	5	YC-PE-5	Cement production finishing section: Introduction of pre-grinding roll crusher in the finishing section (Roller press)					◎					
232	6	YC-PE-6	Cement production finishing section: Introduction of clinker pre-grinding roll crusher (Pre-grinder)					◎					
233	7	YC-PE-7	Adoption of a high-efficiency separator in the finishing process					◎					
234	8	YC-PE-8	Cement clinker burning process: Adoption of high-efficiency quenching cooler					◎					

5.Ceramic industry

Cement

[Machinery & Equipment]

236	9	YC-ME-1	Rock crushing process: Adoption of external rock transfer system to the roller mill crusher					◎					
237	10	YC-ME-2	Cement burning process: Modification of a conventional suspension preheater to a five-stage cyclone suspension preheater					◎					
238	11	YC-ME-3	Clinker burning process: Small-pressure-drop suspension preheater					◎					
239	12	YC-ME-4	Burning of used tires as substitute fuel for cement kiln	○	○	○	○	◎					○
240	13	YC-ME-5	Cement production process: Medium-to-low-temperature flue gas power plant					◎					

Glass

[Production Equipment]

241	14	YG-PE-1	Introduction of electric furnace instead of crucible furnace for melting glass		○			◎					○
242	15	YG-PE-2	High-efficiency melting furnace and shaping system for glass					◎					○

[Machinery & Equipment]

243	16	YG-ME-1	Adoption of a combustion system with oxygen burners for melting glass	○	○	○	○	◎		○			○
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[Operation & Management]

244	17	YG-OM-1	Intensified insulation of tank furnace for melting glass	○	○	○	○	◎		○			○
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6.Pulp & paper industry

[Production Equipment]

Page	Serial No.	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
248	1	PP-PE-1	Improvement of chemical pulp cooking process for energy saving						⊙				
249	2	PP-PE-2	Medium-concentration replacement-type pulp washer for pulp manufacturing						⊙				
250	3	PP-PE-3	Secondary separation pulper in maceration process of waste paper						⊙				
251	4	PP-PE-4	High-concentration size press						⊙				
252	5	PP-PE-5	Oxygen delignification for delignification process of chemical pulp						⊙				
253	6	PP-PE-6	High-concentration pulper for maceration process of waste paper						⊙				

6.Pulp & paper industry

[Machinery & Equipment]

254	7	PP-ME-1	High-temperature odorless Heat Recovery Boiler							⊙	○			○
255	8	PP-ME -2	Plate-type multi-effect liquid-film evaporator for condensing black liquor of chemical pulp			○	○			⊙	○			○
256	9	PP-ME-3	Dryer with dryer bars installed inside for paper-making machine							⊙				
257	10	PP-ME-4	Installation of steam-recompression heat pump on paper-making dryer	○	○	○	○			⊙	○	○		○
258	11	PP-ME-5	Heat recovery from thermo-mechanical pulp (TMP) in mechanical pulp manufacturing							⊙				
259	12	PP-ME-6	High efficiency dehydrator for dryer of paper-making machine							⊙				
260	13	PP-ME-7	Heat recovery by sludge incinerator							□				
261	14	PP-ME-8	Re-powering system and gas turbine waste heat boiler	□	□	□	□	□		⊙	□	□		□
262	15	PP-ME-9	Medium-concentration chemical mixer in oxygen delignification and bleaching processes for manufacturing chemical pulp							⊙				
263	16	PP-ME-10	Integration of punched metal screen, slit screen and maceration machine for processing waste paper							⊙				
264	17	PP-ME-11	Multi-functional combined screen for waste paper processing							⊙				
265	18	PP-ME-12	Energy saving in crown controlling roll			○				⊙	○			
266	19	PP-ME-13	High-temperature soft calender for paper making							⊙				
267	20	PP-ME-14	AC driving of paper-making machine and winder system			□				⊙		○		○
268	21	PP-ME-15	Rotation control of equipment in paper-making process	○	○	○				⊙		○		○

6.Pulp & paper industry

[Production Equipment]

269	22	PP-OM-1	Improvement of dryer part hood to closed type			○	○	◎	○	○		○
270	23	PP-OM -2	Energy saving of vacuum pump for paper-making machine			○	○	◎	○	○		○
271	24	PP-OM-3	Energy efficient production process of thermo-mechanical pulp (TMP)					◎				

7. Food industry

Sugar

[Production Equipment]

Page	Serial No.	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refinery	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
280	1	FS-PE-1	Drum-type beet slicer			○			○	◎			○
281	2	FS-PE-2	Horizontal twin-screw pulp press			○				◎			○
282	3	FS-PE-3	Clarifying sugar solution with magnesia							◎			
283	4	FS-PE-4	Forced circulation automatic crystallizing evaporator with mixer							◎			
284	5	FS-PE-5	Uniform fan nozzle washer (washing nozzle for centrifuge)							◎			

[Machinery & Equipment]

285	6	FS-ME-1	Recovery of waste heat from the sugar solution concentration process and crystallizing			○	○			◎			○
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[Operation & Management]

286	7	FS-OM-1	Steffen waste water concentration							◎			○
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7. Food industry

Beer

[Production Equipment]

287	8	FB-PE-1	Malt extract boiling equipment using hot water			<input type="radio"/>	<input type="radio"/>			<input checked="" type="radio"/>			<input type="radio"/>
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[Machinery & Equipment]

288	9	FB-ME-1	Use of a heat pump with a malt extract boiling flask	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>		
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Edible oil

[Production Equipment]

289	10	FE-PE-1	Edible oil refining process: Energy-saving improvements in vacuum equipment for deodorization towers			<input type="radio"/>				<input checked="" type="radio"/>			<input type="radio"/>
290	11	FE-PE-2	Edible oil refining process: Energy-saving improvements in solvent removal equipment			<input type="radio"/>				<input checked="" type="radio"/>			<input type="radio"/>

General

[Production Equipment]

291	12	FG-PE-1	High temperature, high humidity drying equipment			<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>			<input type="radio"/>
292	13	FG-PE-2	Fluidizing granulation spray dryer			<input type="radio"/>		<input type="radio"/>		<input checked="" type="radio"/>			<input type="radio"/>
293	14	FG-PE-3	New ion exchange membrane method for salt production			<input type="radio"/>		<input type="radio"/>		<input checked="" type="radio"/>			<input type="radio"/>

[Machinery & Equipment]

294	15	FG-ME-1	Use of waste products as an energy source	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
295	16	FG-ME-2	Anaerobic waste water treatment equipment			<input type="radio"/>			<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>		<input type="radio"/>
296	17	FG-ME-3	Gas turbine co-generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Textile

Fiber

[Production Equipment]

Page	Serial No.	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refining	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
303	1	TF-PE-1	High performance Rapier Loom								⊙		
304	2	TF-PE-2	Water Jet Loom								⊙		
305	3	TF-PE-3	High speed comber								⊙		
306	4	TF-PE-4	High speed ring-type fine spinning apparatus								⊙		
307	5	TF-PE-5	High speed spinning apparatus of a dope spinning type (except for urethane polymer)			○					⊙		
308	6	TF-PE-6	High-speed, multi-filament, spinning apparatus of a melt spinning type (for nylon and polyester filament production)			○					⊙		
309	7	TF-PE-7	High speed carding machine										

[Machinery & Equipment]

310	8	TF-ME-1	Highly efficient driving system for draw-twist yarn machine								⊙		
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Dyeing

[Production Equipment]

311	9	TD-PE-1	Micro-wave dyeing machine			○					⊙		○
312	10	TD-PE-2	Jet dyeing machine			○					⊙		○
313	11	TD-PE-3	Counter flow cleaning machine			○					⊙		○
314	12	TD-PE-4	LP microwave drying machine for cheese dyeing			○				○	⊙		○

[Machinery & Equipment]

315	13	TD-ME-1	Steam consumption saving by adopting a steam			○					⊙		○
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9.Electricity Generation

[Production Equipment]

Page	Serial No.	Item No.	Technology Item/Title	Iron & Steel	Non-ferrous	Chemical	Oil Refining	Ceramic	Pulp & Paper	Food	Textile	Electricity Generation	Many Industries
319	1	EG-PE-1	High efficiency steam turbine blade	○	○	○	○	○	○	○		◎	○
320	2	EG-PE-2	Supercritical pressure power generation									◎	
321	3	EG-PE-3	Combined gas and steam turbine power generation	○	○	○	○	○	○	○		◎	○
322	4	EG-PE-4	Waste heat recovery power generation	○		○			○			◎	○
323	5	EG-PE-5	Fluidized bed combustion coal fired boiler	○								◎	○
324	6	EG-PE-6	Pressurized fluidized bed composite coal fired power plant (PFBC)	○								◎	○

[Machinery & Equipment]

325	7	EG-ME-1	Rotating regenerative air preheater automatic seal gap controller	○					○			◎	○
326	8	EG-ME-2	Carbon-sealed regenerative air preheater for	○		○	○		○	○		◎	○
327	9	EG-ME-3	Separate type heat pipe heat exchanger									◎	○
328	10	EG-ME-4	Removal method of scale from inside condenser tubes	○		○	○		○	○	○	◎	○
329	11	EG-ME-5	Air cooler for gas turbine combustion air	○	○	○	○	○	○	○		◎	○
330	12	EG-ME-6	Large sized boiler soot blower	○	○	○	○	○	○	○		◎	○
331	13	EG-ME-7	Repowering combined cycle system of exhaust repeat combustion type	○	○	○	○					◎	○
332	14	EG-ME-8	Industrial repowering system	○	○	○	○	○	○	○		◎	
333	15	EG-ME-9	Rotation speed control of large boiler blower and exhauster through wet type multi-plate speed reducer	○	○	○	○	○	○	○		◎	○

