

TOYO

Products & Services

Japanese Foundry Know-how

Japanese Quality Control

Japanese State of Art Manufacturing



**TOYO, a Japanese Company with International Vision ,
Specializing in Manufacturing Wear and Heat Resistant Materials
for the World of Cement, Mining, Aggregates and Utilities.**



TOYO GRINDING BALL CO.,LTD

www.toyo-gb.com

- ▶ Save the earth resources
- ▶ Challenge to reduce power consumption
- ▶ Create TOYO value of quality, cost and service
- ▶ Touch the foreign cultures and get the mutual understanding



Shinichi Kasuga

Founder of TOYO INTERNATIONAL GROUP, Tokyo Japan

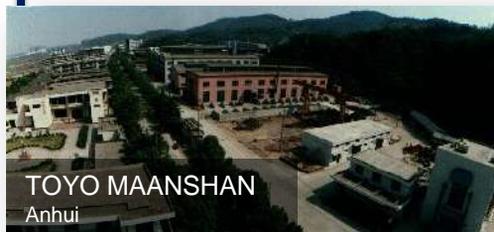
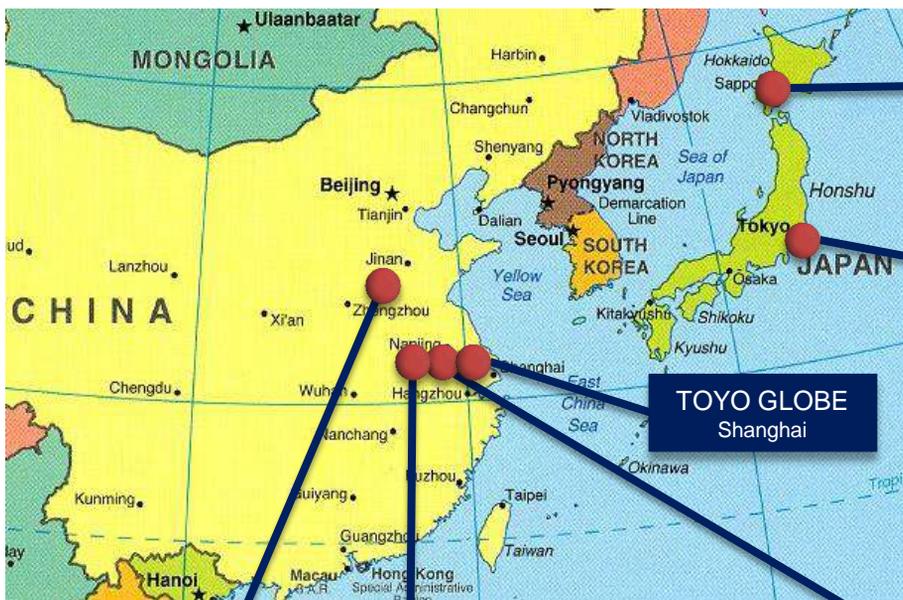
<TOYO Group History>

- 1937 Established **TOYO GRINDING BALL CO.,LTD.** in JAPAN
Manufacturing grinding media and wear resistant castings
- 1995 Established **TOYO GRINDING BALL (MAANSHAN) CO.,LTD.**
at Anhui China. Manufacturing grinding media & wear resistant castings
- 2002 TOYO MAANSHAN started to manufacturing heat resistant castings
- 2008 Established **TOYO KM CASTING CO.,LTD.** at Jiangsu China.
Manufacturing tube mill internals castings & crushing parts
- 2010 Established **TOYO GLOBE CO.,LTD.** at Shanghai China
Import & export sales office
- 2012 Established **TOYO LIDA CASTING CO., LTD.** at Zhejiang China.
Manufacturing grinding media & wear resistant castings
- 2013 New plant are being built in TOYO MAANSHAN
New Joint Ventures in oversea countries are under negotiations



TOYO Group Map

Toyo Headquarter and manufacturing plants locations



Sales Network

TOYO has established international sales network to serve the worldwide customers. With the advanced Japanese technology developed with research institutions, and the cost effective manufacturing sites in low cost manufacturing sites like China, India and Vietnam, Toyo is able to provide the high quality products with competitive price to our customers around the world.



Products & Services

Grinding Media



- High Cr Casting
- Low Cr Casting
- Forged Media

Tube Mill Internals



- Head Liners
- Wave Liners/Step Liners
- Classifying Liners
- Diaphragms/Grates
- Back Plates

Hammers



- High Mn Hammer
- High Cr Hammer
- Bimetal hammer
- Composite hammer with super hard alloy rods

Heat Resistant Parts



- Dipping Tube for Preheating
- Dampers
- Brick Retainers
- Cooler Plates/Grate Plates

Products & Services

Vertical Mill Parts



- Segmented roller and table liner
- Monobloc roller
- Composite roller and table liner

Engineering Services



- Mill Audits
- Technical data analysis
- Improvement proposal report
- Guarantee of increasing customer's production

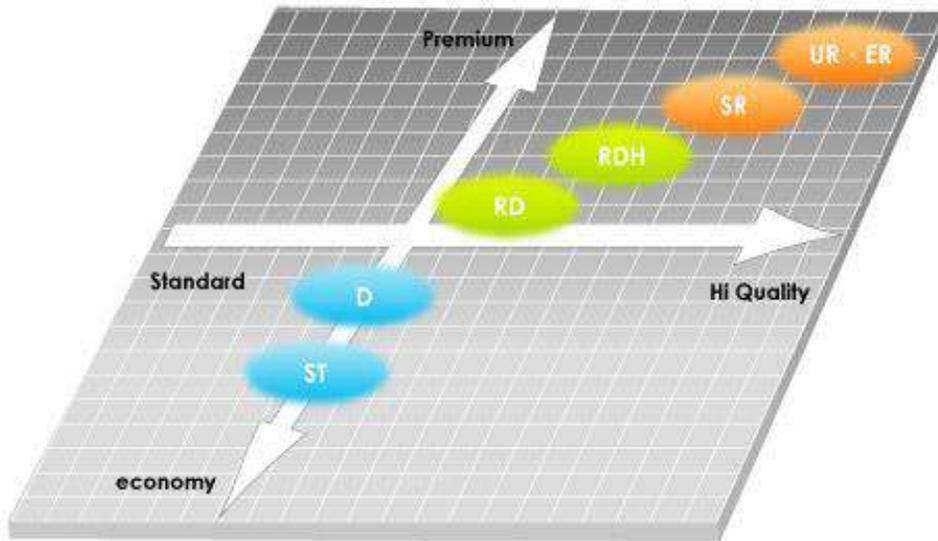
All types of spare parts for cement & mining industry



- Hardfacing Plates
- Spare parts for vertical mill, roller press, crusher, cooler, gearbox, belt conveyor, separator, bearing, valves, hosing etc.
- Hydraulic and lubricant parts

Grinding Media

TOYO can propose the optimal grinding media alloy and gradation according to be customer's actual production process.



Products	Cr(%)	Hardness(HRc)	Industry	Size(mm)
UR(Casting)	26-29	≥60	Mining	15-90
ER(Casting)	20-22	≥60	Mining /Cement/Coal	15-90
SR(Casting)	16-18	≥58	Mining /Chemical/Silica/Cement	15-100
RDH(Casting)	11-13	≥60	Mining/Chemical/Silica/Cement	15-90
RD(Casting)	11-13	≥50	Mining/Chemical/Silica/Coal	30-100
D(Casting)	1-3	≥48	Mining/Chemical/Silica/Aggregate	25-120
ST(Forged)	<1	≥55	Mining/Silica/Aggregate	20-125

Other various cylpebs

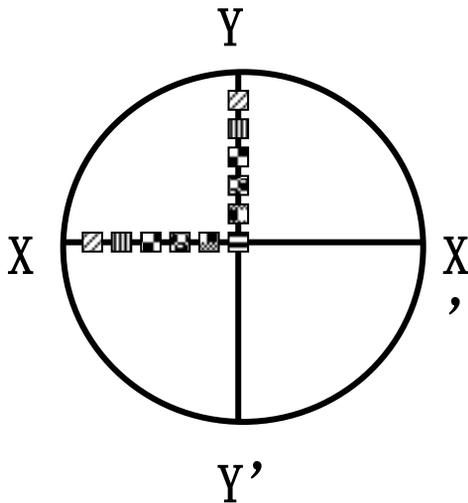
<Standard Specification>



(1) Diameter and weight

mm	15	17	20	25	30	40	50	60	70	80	90	100
Inch	0.6	0.7	0.8	1.0	1.2	1.6	2.0	2.4	2.8	3.1	3.5	3.9
Weight (g)	15	24	36	63	110	265	510	870	1480	2150	2940	4100

(2) Hardness



	X	X'	Y	Y'
	63.0	63.5	63.0	63.0
	62.5	62.5	62.5	62.5
	62.5	62.5	62.5	62.5
	62.0	62.5	62.5	62.5
	62.0	62.0	62.5	62.0
	62.0			

(Example of sectional hardness)

(3) The difference of structure (SR90×400)

Metal mold cools down smelted metal faster than sand mold. The faster cooling speed makes structure finer and more uniform. TOYO grinding media is the least wear and the best quality with our special heat treatment process.



TOYO Metal mold

Strong Structure



General sand mold



General sand mold

Tube Mill Internals

TOYO offer a variety of liners and diaphragms with choosing suitable design and kinds of alloys, depending on customer's requests and mill working conditions.

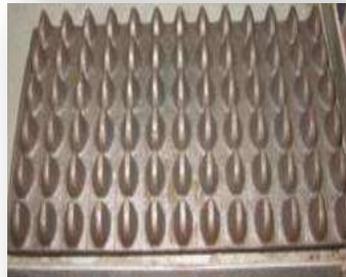


Type	Name	Basis	Surface Hardness	Tensile strength	Charpy impact
				N/mm ² =Mpa	J/cm ²
High-Mn	SCMnH11	Mn-Cr	---	≥740	---
	SCMnH21	Mn-Cr	---	≥740	---
	TZM1	Mn	---	≥635	---
	TZM2	Mn-Cr	---	≥735	---
	TXM2	Mn-Cr-Mo	---	≥600	---
	TXM1	Mn-Cr	---	≥590	---
Low Alloy	TZL1	Cr	≥48(HRc)	---	≥49(N)
	TZL2	Cr-Mo	≥50(HRc)	---	≥49(N)
	TXL1	Cr-Mo	≥46(HRc)	≥1200	≥15(U)
	TXL2	Cr-Mo-Ni	≥45(HRc)	≥980	≥10(N)
	TZL2	Cr-Mo-Ni	≥50(HRc)	---	≥15(N)
	TZL3	Cr-Mo	≥52(HRc)	---	≥15(N)
High-Cr	TXS1	Cr-Mo-Ni	≥48(HRc)	≥790	≥5(N)
	TXS2	Cr-Mo-Ni	≥52(HRc)	≥690	≥3(N)
	TXS3	Cr-Mo	≥52(HRc)	≥780	≥3(N)
	TZS1	Cr-Ni	≥50(HRc)	≥780	≥3(N)
	TXC2	Cr	≥56(HRc)	≥480	≥3(N)
	TXC3	Cr-Ni	≥56(HRc)	≥480	≥3(N)
	TZC1	Cr-Mo-Ni	≥55(HRc)	≥680	≥3(N)

Hammer & Wear Resistant Castings

<Crushing Parts>

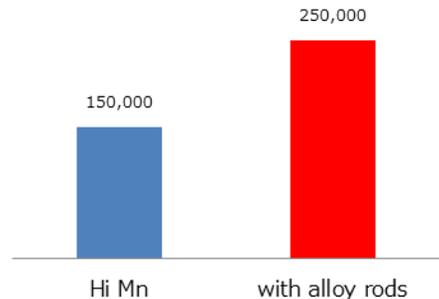
TOYO manufactures a wide range of hammers in different alloys and is able to propose the most suitable materials to give optimum performance in given crushers



TOYO has developed several kinds of Mn hammer, bi-metal hammer or hammer with super hard alloy inserts.



Life comparison (tons)



Crashed sample: Lime stone
Crashed size : 800mm
Chemical comp: SiO₂ 10%, Mg₂O₃ 2.3%

Heat Resistant Castings

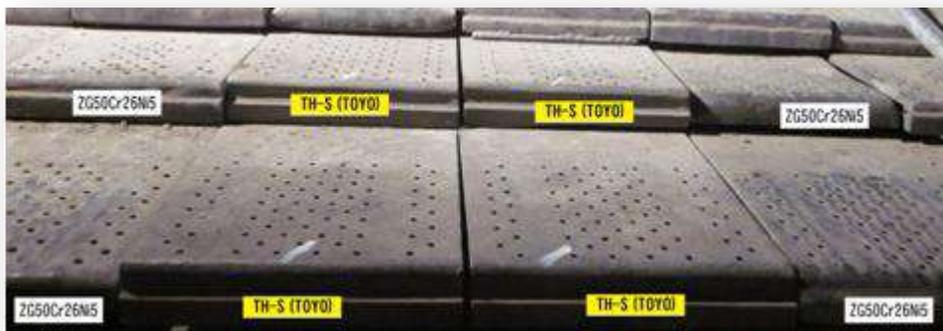
<Cooler Plates>

TOYO can offer standard heat resistance castings but also special alloys developed by us.



<TH-S>

TOYO developed the clinker cooler plate which combines performances of both heat resistance and thermal shock resistance. The lifetime is extended more than twice compare with a standard material (ex. Cr26Ni5 alloy) from the middle part to the exit in a clinker cooler.



Heat Resistant Castings

<Others>

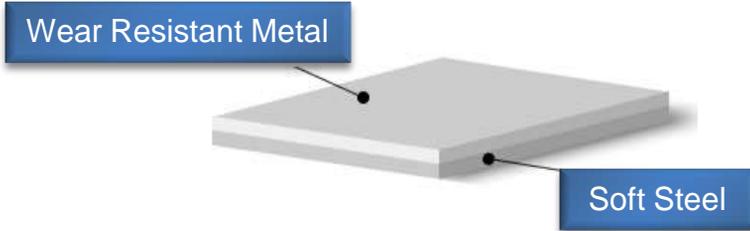
TOYO is challenging to developing new products and new alloys for longer life and economical solution with avoided customer's trouble.



Type	Name	ASTM	Chemical composition(%)			Surface Hardness	Tensile strength
			C	Ni	Cr		N/mm ² =Mpa
Heat Resistant	SCH11	A297HD	0.2~0.5	4.0~6.0	24.0~28.0	---	≥588
	SCH12	A297HF	0.2~0.4	8.0~12.0	18.0~23.0	---	≥490
	SCH13	A297HH	0.2~0.5	11.0~14.0	24.0~28.0	---	≥490
	SCH21		0.25~0.35	19.0~22.0	23.0~27.0	---	≥440
	SCH22	A297HK40	0.35~0.45	19.0~22.0	23.0~27.0	---	≥440
	SCH23	A297HL	0.3~0.4	18.0~20.0	30.0~32.0	---	
	SCH24	A297HP	0.35~0.75	33.0~37.0	24.0~28.0	---	≥440
	TH-S		Closed	Closed	Closed	≥52(HRc)	≥780
Stainless Steel	SCS2	A743CA40	0.16~0.24	≤1.0	11.5~14.0	≥170(HB)	≥558
	SCS13	A743CF8	≤0.08	8.0~11.0	18.0~21.0	≤183(HB)	≥440
	SCS24	A743CB7Cu 1	≤0.08	3.0~5.0	15.5~17.5	≥269(HB)	≥850

Hardfacing Plates (TOP PLATE)

Wear Resistant Metals are mainly chromium cast iron, tungsten carbide and satellite on cobalt base.



The metal structure of a chromium cast iron

- Application : To protect heavy wear and fast wear zone
For Industry of cement, steel, mining, paper, etc.
Where quick wear is the weak point and needs to be reinforced such as Mill inlet chutes, Shoot, Hoper, Fan, Mixer, Mill, Cyclone and Separator etc.
- Characteristic : The surface is very smooth due to the special manufacturing process with the TOKUDEN "TOP PLATE" welding technology
- Performance : 3-10 times of wear resistance comparing with traditional hardfacing plates

Grade	Material
TOP Gr-A	High chromium cast iron
TOP Gr-B	High chromium cast iron + Compound carbide
TOP Gr-C	High chromium cast iron + Compound carbide
TOP Gr-E	High chromium cast iron + Compound carbide

Base plate thickness + Welding layer thickness (mm) / TOP PLATE A										
3+2	4+2	4+3	6+4	6+6	10+4	10+6	10+10	15+4	15+6	15+10
No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



Duct



Impeller



Cyclone

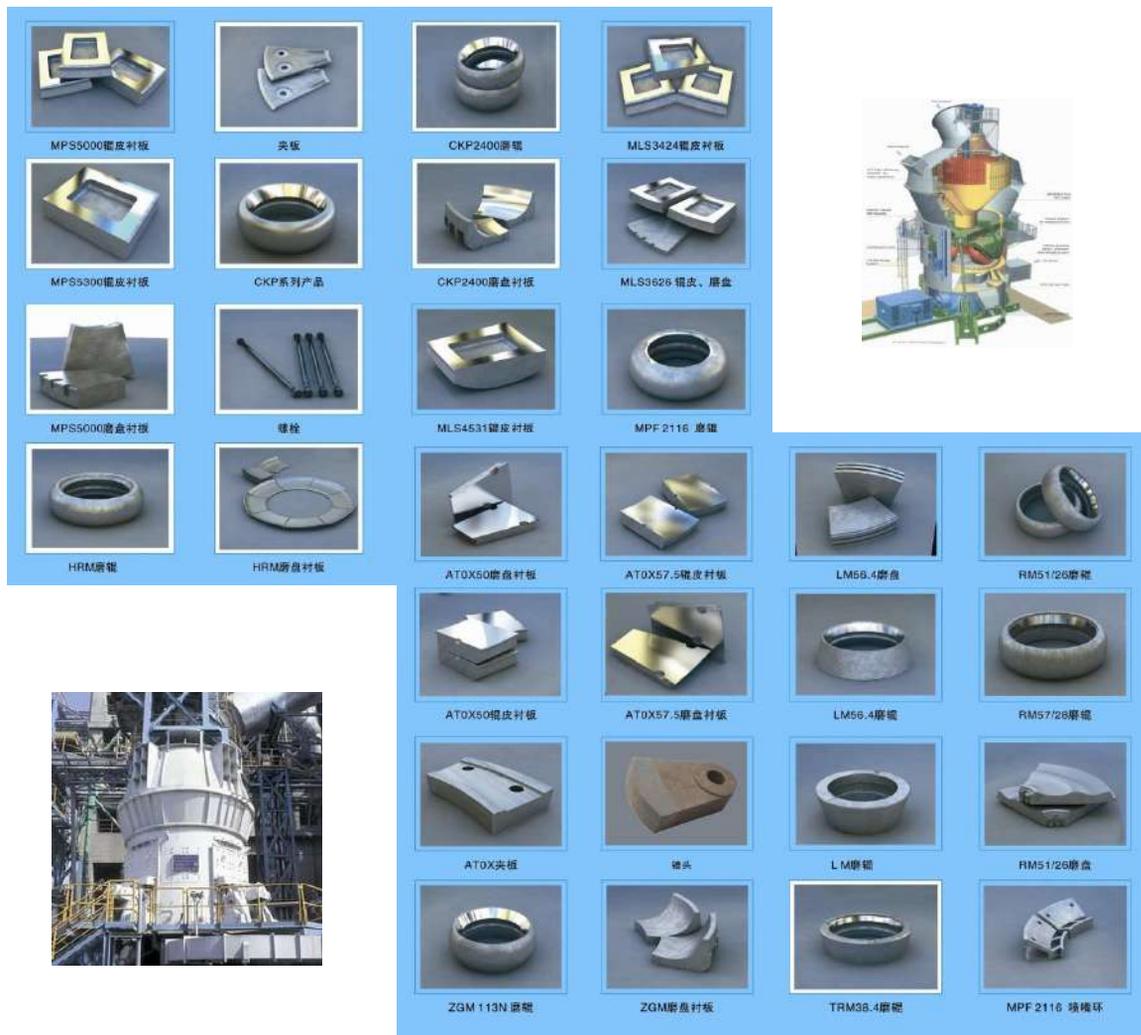


Screw casing

Vertical Mill Parts

Alloy 1: High Cr with 20-25% Cr, 60 HRc

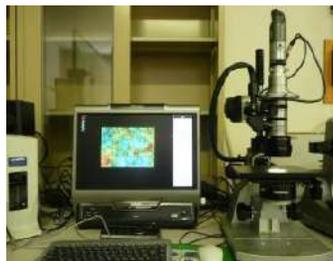
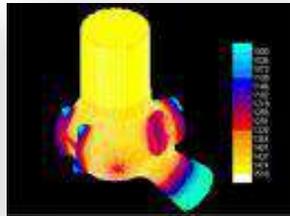
Alloy 2: High Cr base with Ceramic composite



- Polysius: RM and RMK monobloc roller and table liner
- FLS: Atox and OK segmented roller and table liner
- Pfeiffer: MPS and MPF roller and table liner
- Loesch: LM monobloc roller and table liner
- UBE: UM monobloc roller and table liner
- TCDRI: TRM monobloc roller and table liner
- HCDRI: HRM monobloc roller and table liner

R & D

Toyo understands that constant R&D to develop new, better and ecological friendly wear and heat resistant alloys is the key for the future. For more than 70 years, we invest in various projects such as foundry technology improvement, development of new alloys and new heat treatment process etc. The information and expertise garnered through these efforts have created numerous new products to achieve the target of longer lifetime, more safety, more environment friendly and energy saving.



We also concluded an agreement with Muroran Institute of Technology, one of Japan's top notch research center for casting technology, to jointly research on casting alloys, on Grinding Media, Wear and Heat Resistant Castings. We believe that these joint research projects will strength our development of new materials, and will improve the performance of our products, thus contributes to the further market growth and the benefits the operations of our customers.

Engineering Services

TOYO is reserving reliable engineering solutions for the optimization of ball mills. We provide mill auditing service to optimize the grinding efficiency of cement mills, to decrease the energy consumption for saving of mill operation cost.

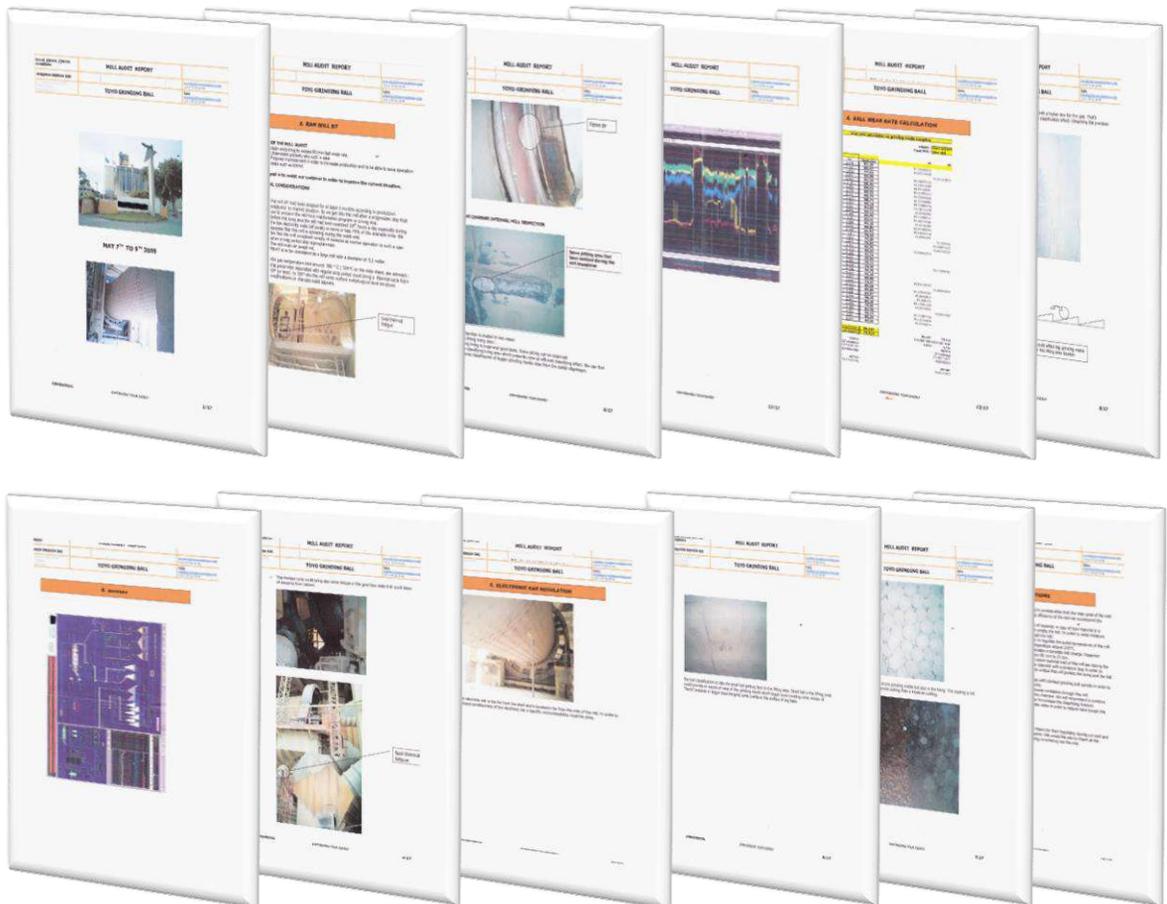


<Engineering Contents>

- General flow sheet considerations
- Particle size distribution of material
- Ball charge and wear rate calculation
- Mill ventilation & mill filters
- Separator tromp curve
- Mill & Separator air swept improvement
- Power installed vs power consumption
- Noising & dusting
- Recommendations



<Mill Audit Report> Sample



Mill Process Optimizing

--Guarantee of increasing mill production and decreasing energy consumption---

<Open & In-company Seminar>

TOYO can provide open and in-company seminar for optimization of ball mills.



Dubai open seminar 2007



Nanjing open seminar 2008



Conch in-company seminar 2008



Sunsy in-company seminar 2009

We, Toyo Engineers,

Serve You with Quality and Service,

Around the world.



ver.201309

<Head office>

TOYO GRINDING BALL CO.,LTD.

ADD: TOYO BLDG, 1-2-4, Koishikawa, Bunkyo, Tokyo JAPAN

Zip : 112-0002 TEL: +81-3-38155861 FAX: +81-3-38119238

Email: hiroyuki@toyo-gb.com t-morinaga@toyo-gb.com

<Sales office>

TOYO GLOBE CO.,LTD.

ADD:500-1210, Xiangyang south rd, Shanghai China

Zip : 200031 TEL: +86-21-54655673 GSM: +86-13701791482

Email: charles.gu@toyo-gb.com