Messrs.

Date:

Proposal on the Belt Conveyor Roller

TOUWA Industries CO.,LTD

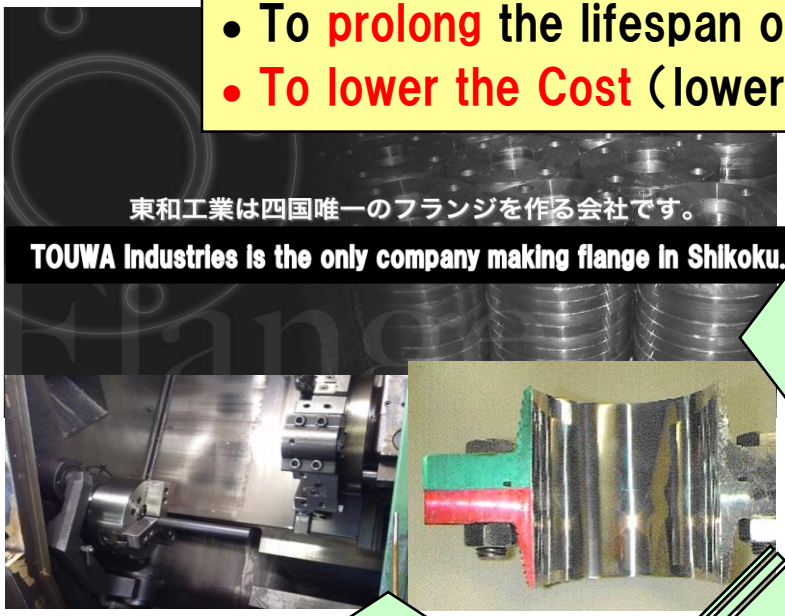
HAGIO High Pressure Containers CO.,LTD

History of the development of the Belt Conveyor Roller

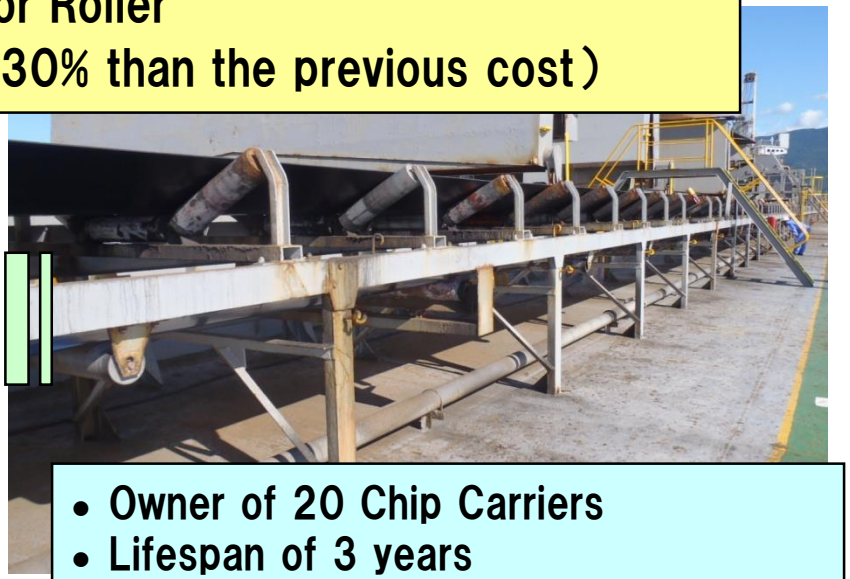
TOUWA Industries CO.,LTD

Ship Company

- To prolong the lifespan of the Conveyor Roller
- To lower the Cost（lower the Cost by 30% than the previous cost）



Request of the Development



- Owner of 20 Chip Carriers
- Lifespan of 3 years
- Belt Speed of 180m/min（400rpm）

Joint Development

HAGIO High Pressure Containers CO.,LTD

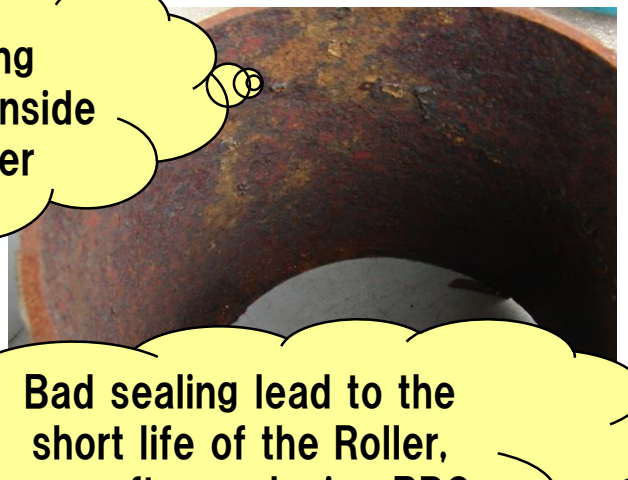
【Questions】

The life of the BRG used in the Roller is apparently Shorter than the life expectancy calculated from the Specifications of the BRG; type, load, rotating speed.

⇒ ？ ？ ？

Problems of the conventional Conveyor Rollers

Occurring Corrosion inside the Roller



Damage of the BRG is caused by iron corrosion powder.

Bad sealing lead to the short life of the Roller, even after replacing BRG.

The flange and Roller pipe are crimp-fitted.

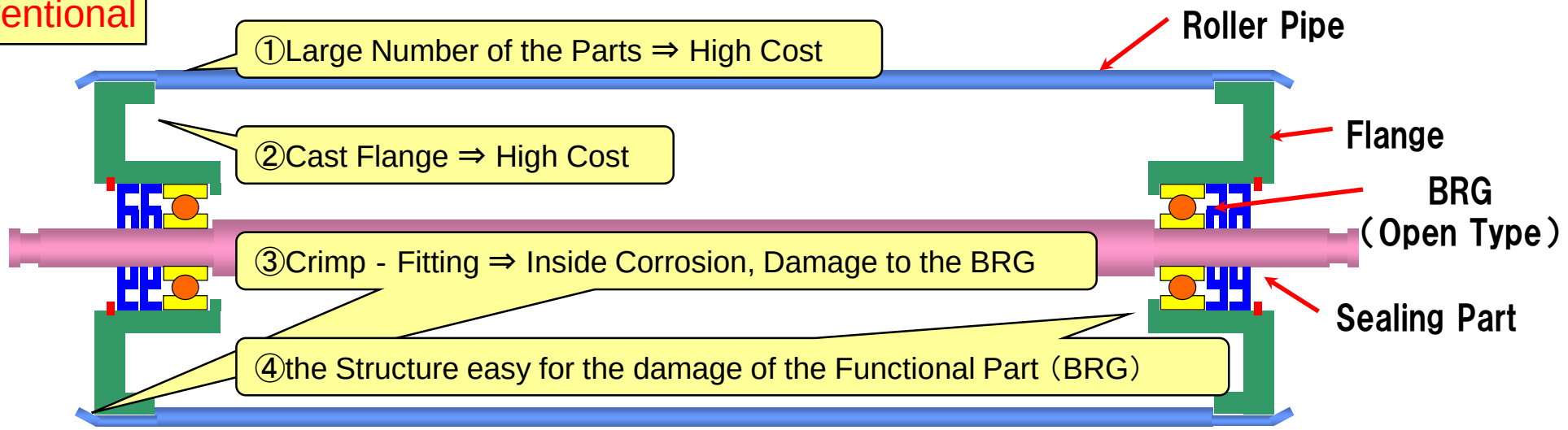
Maintenance is done by replacing whole Roller assembly.

【Probable mechanisms of the failure】

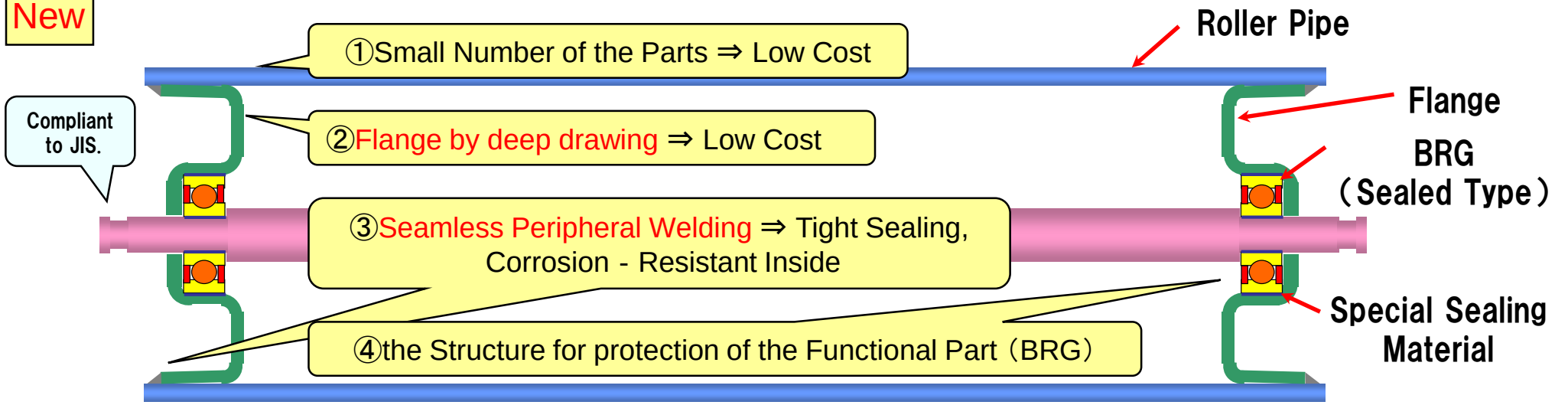
- Increase and Decrease of the temperature and pressure inside the Roller due to the rotation and stopping of the Roller
- Corrosion due to the atmosphere containing saline vapor ⇒ Failure of BRG
- Stopping of rotation ⇒ Uneven wearing of the Roller ⇒ Failure of the Belt

Comparison between the conventional parts and the new ones

Conventional



New



(JIS means Japanese Industrial Standards)

Development of a Belt Conveyor Roller with a long life span

【Concepts of the Development】

① Increase the Air Tightness to prevent the Failure of BRG due to the inside corrosion of the Roller
- ⇒ Seamless welding around the periphery of the flange and Roller
- ⇒ Application of the sealing technology used in manufacturing gas cylinders

② Decrease the Number of parts and Decrease Machining as much as possible to lower the cost
- ⇒ Built-in BRG（Also helps protect the outside condition as ultraviolet rays.）
- ⇒ Maintain the BRG fitting by High Precision Press Forming.
  NO Influence of Heat given the BRG by the High Speed-Low Heat Welding.

③ Use Materials and Parts MADE IN JAPAN to increase the Reliability

List of Supply

Shipment History of the Belt Conveyor Roller

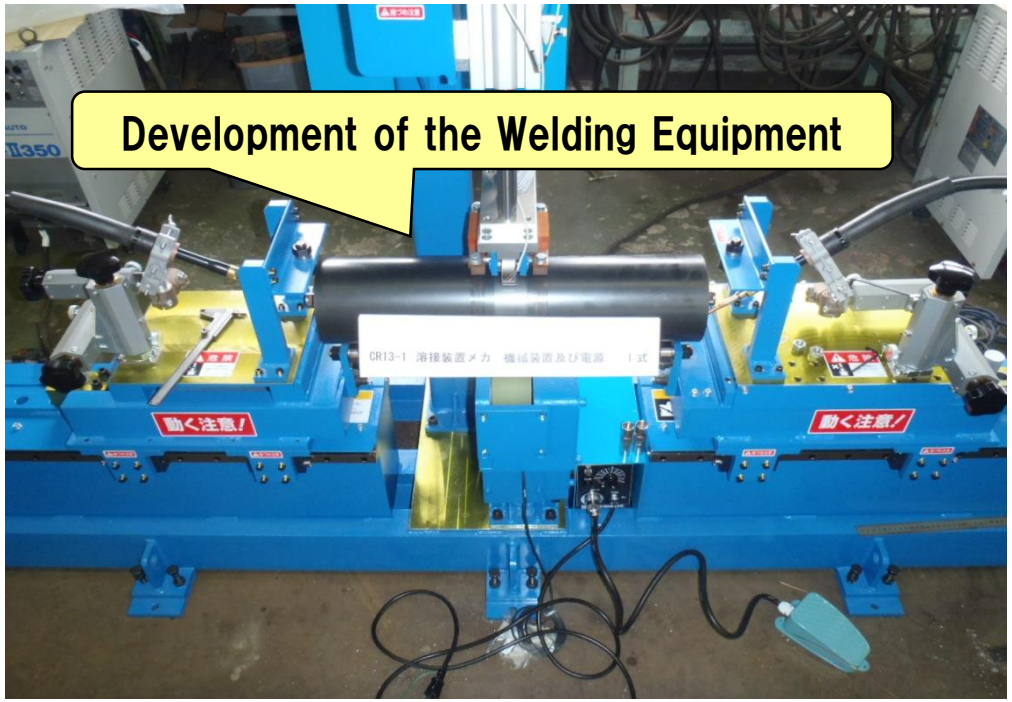
As of the end of December, 2014

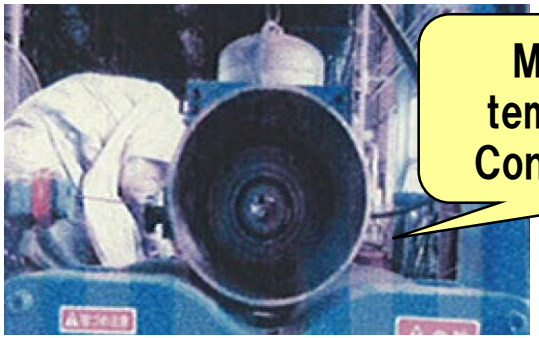
Year	Number of times of the shipment	Roller Length / Number of products									
		370L	525L	550L	620L	700L	900L	1530L	1750L	1950L	Total
【Product for shipping lines】											
2011	11	56	4	480	250	36		187	111	25	1,149
2012	22	108	15	550	266	30	70	235	95	62	1,431
2013	30	145		350	564	50	50	185	95	122	1,561
2014	40	112		406	854	81	4	196	100	117	1,870
Total for shipping lines		674	34	2,686	2,764	277	244	1,223	591	510	9,003
【Product for equipment manufacturers】											
2013	2				477			80		60	617
Total		674	34	2686	3,241	277	244	1,303	591	570	**9,620**

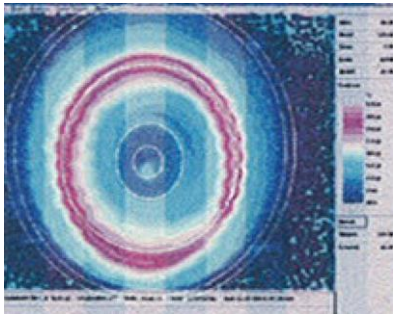
Conclusion

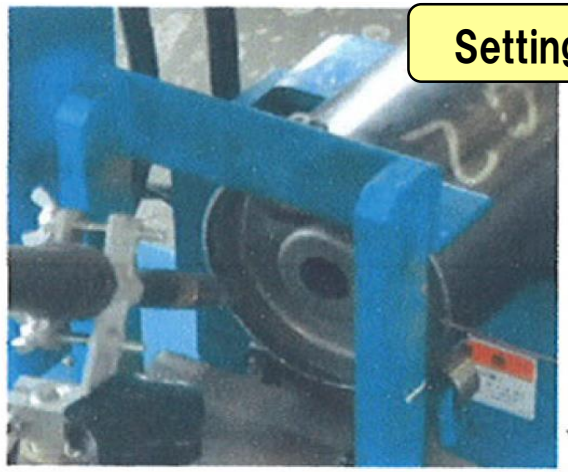
- We improved the life span and lowered the cost of 5 inches Conveyor Roller.
- We contribute to a stable operation of the material handling equipment now in action with the reliability of “Made in Japan.”
- We recommend you to adopt our product with the confidence from our various tests and experience.

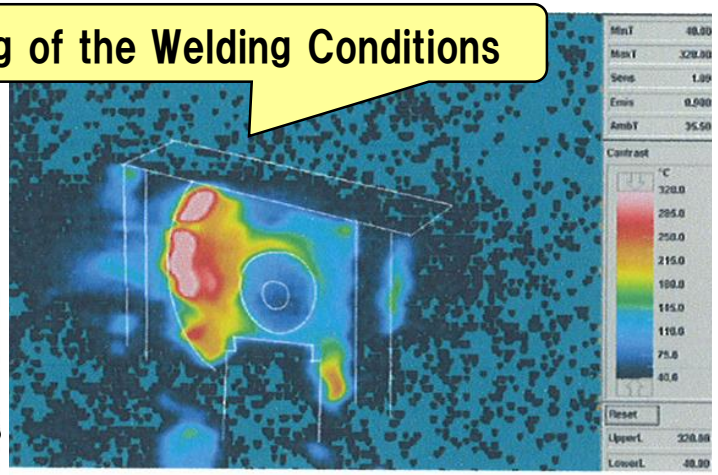
Process of the Development

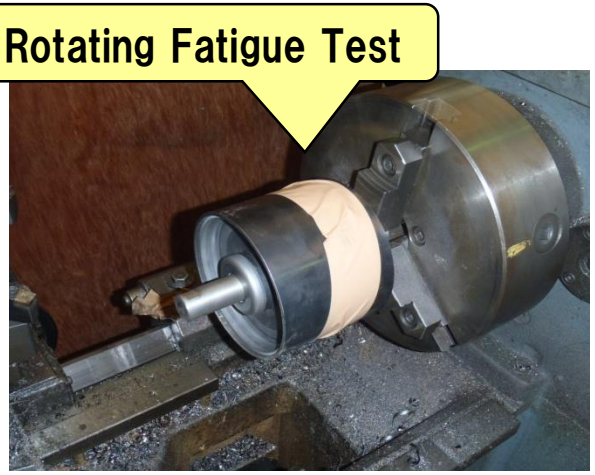




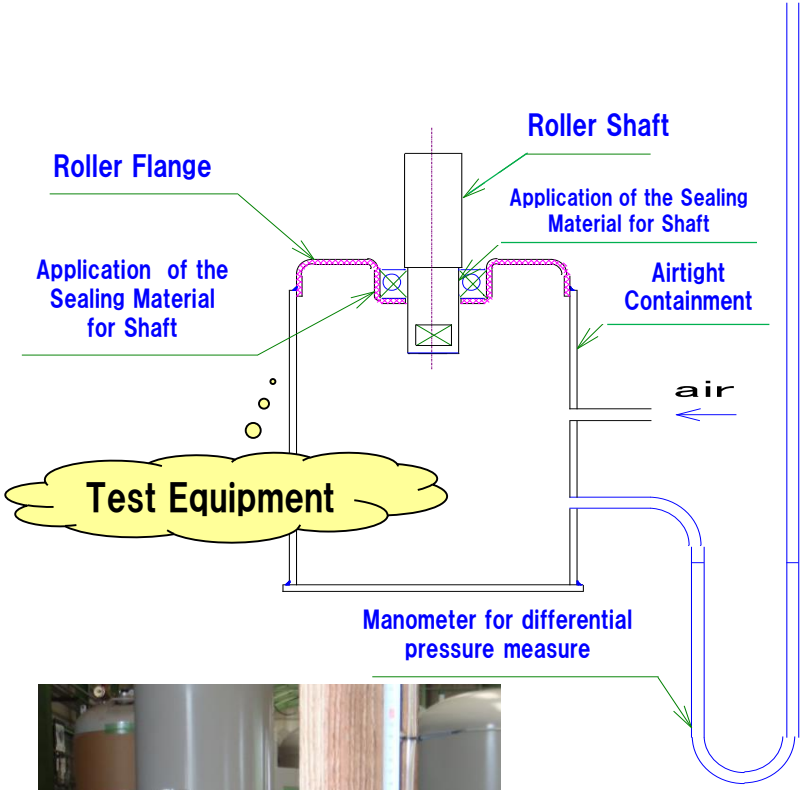








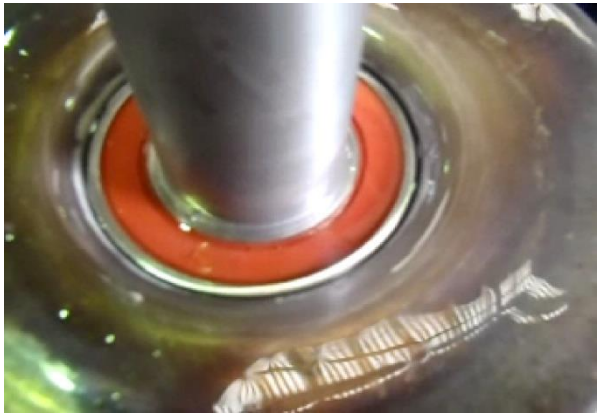
Leakage Test



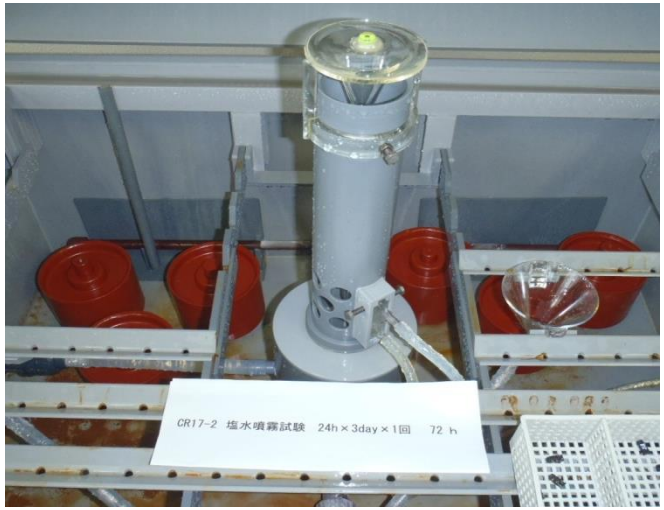
【Purpose】
To verify the air tightness of the Roller.
To verify the air tightness at the pressure difference of 5kPa.

【Test Method】
Assemble the pressed flange, sealed type BRG, Roller shaft (only the end portion), (apply sealing material as usual,) and give the pressure difference of 5kPa to verify the air tightness.

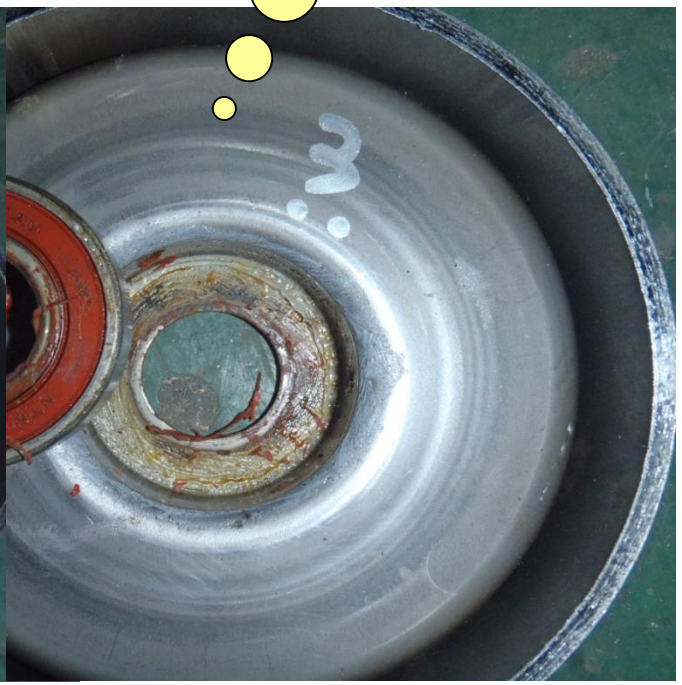
【Result】
NO Leakage at the pressure difference of 5kPa.
[Between the outer ring of BRG: Flange] and [Between the inner ring and shaft]



Result of the Spray Test of Saline Water (72hr)

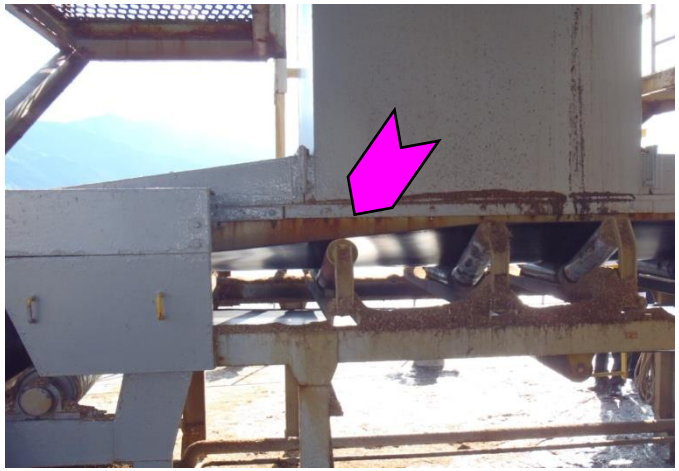


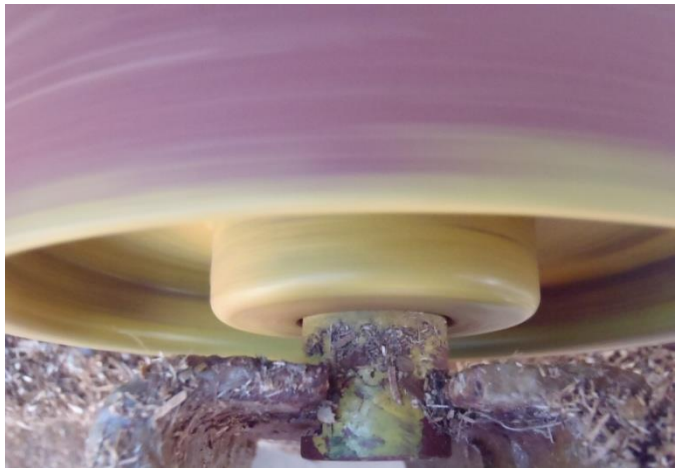
Intrusion of the saline water or occurrence of corrosion was not observed.



Field Test on the Ship（Ship Company）

The newly developed Roller was mounted on the conveyor system of a ship（in the duration of 10 months）. ⇒ The photos are the results after about 5 trips.





Results of the Field Test on a Ship

Trips on a Bulk carrier

1st trip	Vietnam
2nd trip	Coos Bay (USA)
3rd trip	Vietnam
4th trip	Coos Bay
5th trip	Vietnam

【Evaluation by the Ship Company】

- NO Corrosion inside the Roller. • NO Leakage of Grease through the BRG Sealing
- Smooth Running of the BRG with NO Problem
- NO Intrusion of Chip Powder inside the Roller

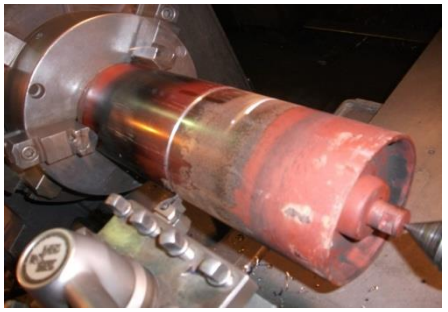
The ship company adopted our Conveyor Roller as their standard parts.
The Number of Rollers sold: Total 3850 units (2011/5-2013/8) with No Claim, No trouble

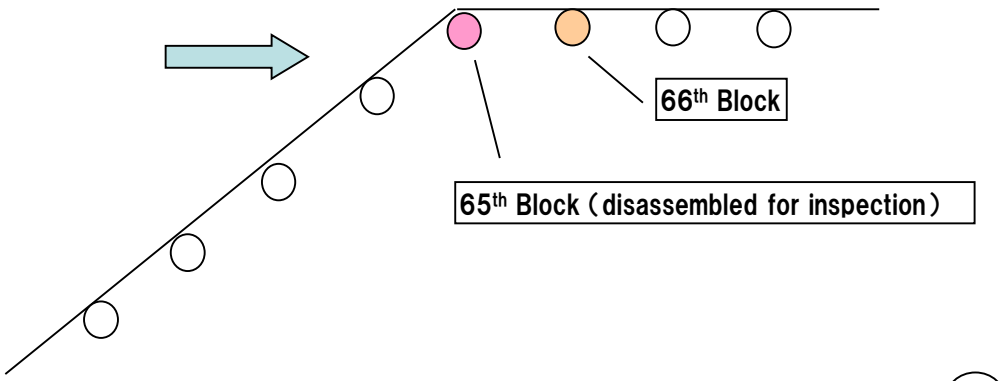
Others Sold: A chip unloader manufacturing company used our Conveyor Roller as their standard parts for new ships.

Results of the Field Test on Land (D Co.)

【Test Items】
Start of the Test: 2012/2
Equipment: Chip Unloader C-4 Line in the plant of company D on the coast
6 Rollers were installed to the 2 troughs.
65th Block---disassembled and inspected on 2012/7
66th Block---running now
Other Conditions:
①The customer designated 65th and 66th Blocks for test under maximum load.
②Other Rollers of the C-4 Line are with #6206 BRG, but for the test the Rollers with #6205 BRG were used.

Bearing Number	Inner Diameter (mm)	Outer Diameter (mm)	Width (mm)	Basic Load Ratings (kgf)	Basic Static Ratings (kgf)	Limiting Speeds (rpm)
6205	25	52	15	1, 430	800	8, 900
6206	30	62	16	1, 980	1, 150	7, 300



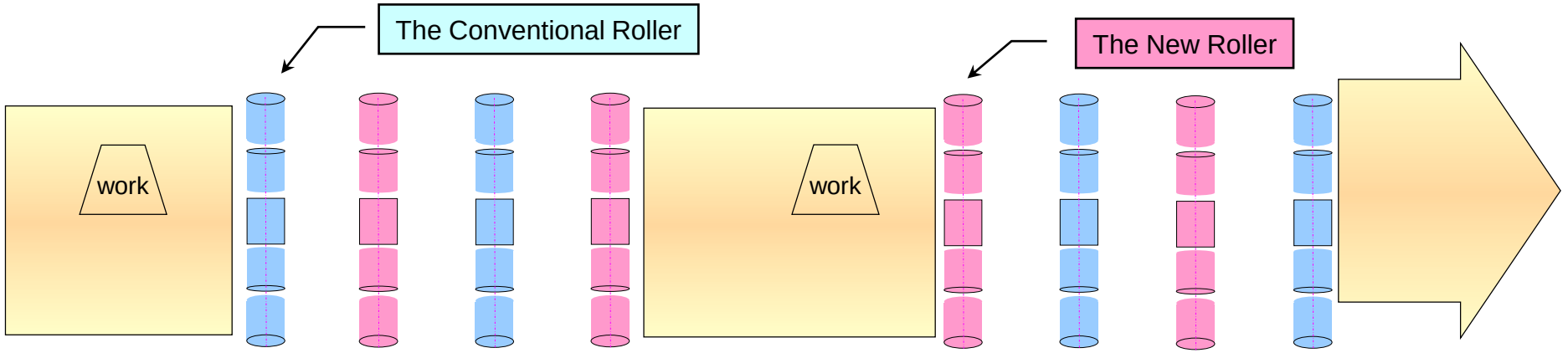


【Results】
- The rotating conditions did not change from the new products. No Problem.
- Corrosion inside Rollers: No corrosion was observed expect for the initial corrosion of the material. No Problem.
- 66th Block is still running smoothly (2013/3).

Results of the Field Test on Load (S Co.)

【Test Items】
Place: on the Coast of Ehime Prefecture　　Start of the Test: 2013/4
Equipment: S Co.'s Handling Line for Dehydrated Cake.
Size of the Roller: φ5 inches×240　　Carrier with 5 Rollers　　Belt width: 1200
Details and Evaluation:

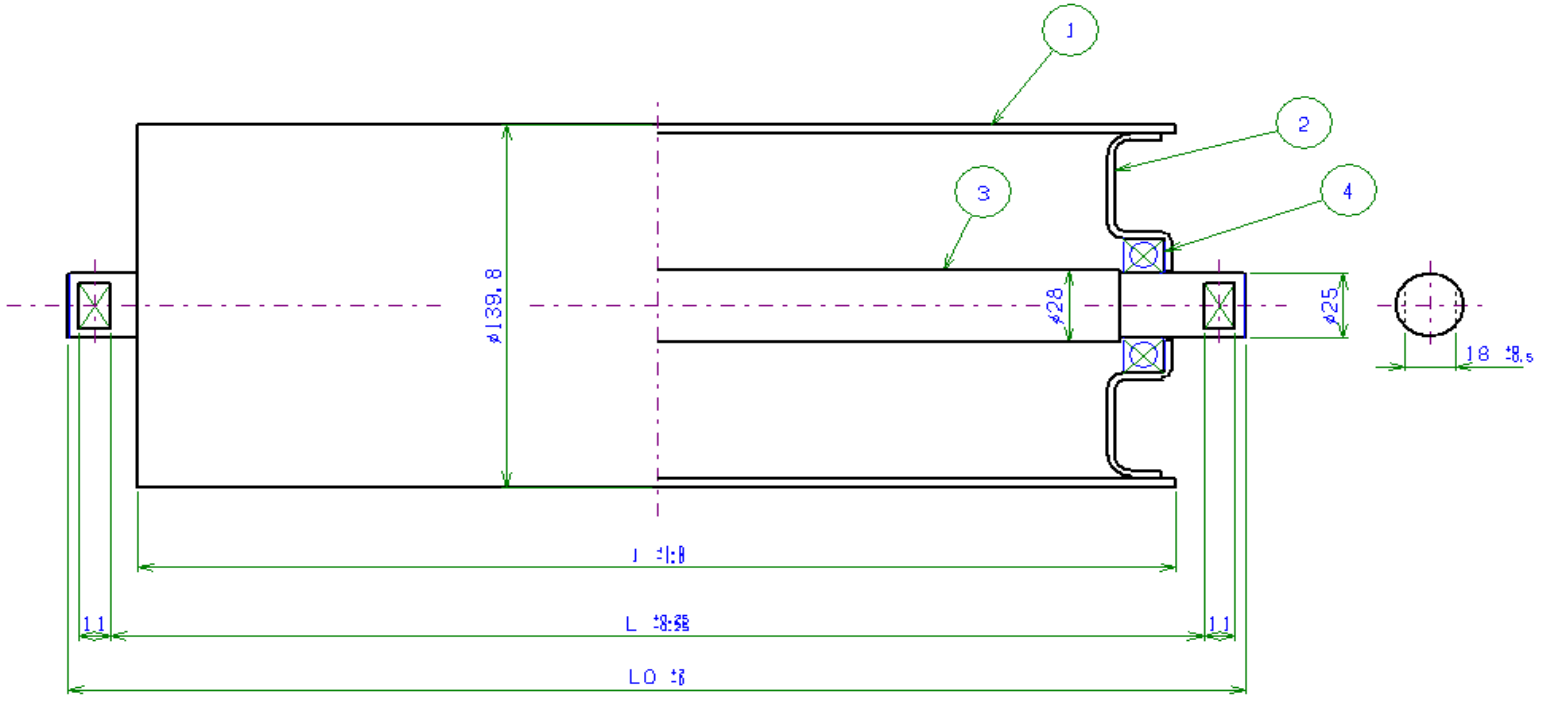
①Place the new products and the conventional products of 8carriers after another. The conditions such as belt tension are the same. The conventional Roller has #6202 BRG, while the new Roller has #6205 BRG.
②Place the new Rollers to 4 blocks (20 Rollers) each and perform usual operation. Inspect and evaluate the working conditions at the interval of 6 months.
③Measure quantitatively the lives of the conventional and new products. Evaluate the merit of adopting the new product from the view point of the cost and measured lives.



The Conveyor condition of Field Test and Rollers Arrangement Plan　in ground plan

【Working Condition】
・Both of the conventional and new products are smoothly running 2013/7.
・Temperature rising is observed to the conventional product (possibility of a failure of the BRG).
No temperature rising is observed to the new product.

Drawing



l : Roller Pipe Length

L : Roller Mounting Length

Lo: Roller Shaft Length

comment	ローラ径長 l	ローラ取付寸法 L	ローラ軸長 LO	notes
370W	370	390	420	
525W	525	545	575	
550W	550	570	600	
620W	620	640	670	
700W	700	718	748	
900W	900	918	948	
1530W	1530	1548	1578	
1750W	1750	1768	1798	
1950W	1950	1968	1998	