

Figure 2. Kagaya's sales brochure for glass products in Edo period [Ref. 4; Imperial Glass Newspaper Inc., Superior Topics of Japanese Glass Industry, 1928]

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Cutting Technique of Satsuma Kiriko and Edo Kiriko Zur Geschichte der Glasindustrie in Japan 1834-1890

SG: Zum Abdruck:

In diesem Artikel wird nicht über Pressglas berichtet, sondern „nur“ über die Einführung der **Schleiftechnik aus Europa in Japan vor 1900**. Gleichzeitig begann damit auch die **fabrik-mäßige Herstellung von Gebrauchsglas** - die Massenproduktion. Bis dahin war die Herstellung von Gläsern **reine Handarbeit** mit Schleiftechniken, die aus der Bearbeitung von Edelsteinen wie Bergkristall oder Halbedelsteinen wie Jade übernommen wurden. Jedes Glas war damit wie die Stücke der Keramik, die Lackschachteln oder Schwerter ein **Einzelstück** für reiche und kunstsinnige Japaner. Wie bei ausgegrabenen Scherben von antikem oder altem Glas kann man oft nur durch **genaue Untersuchung der Spuren der Herstellung** heraus finden, wie das Glas geschliffen wurde und wann es entstanden ist.

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Er hat in der PK schon mehrmals über **gepresstes Uranglas aus Japan** berichtet.

Edo-Zeit: Abschnitt der japanischen Geschichte **1603-1868**, in dem die **Tokugawa-Shogune** herrschten

Meiji-Zeit: Meiji-Restauration, formal die Erneuerung der Macht des **Tennō / Kaisers** und die **Abschaffung des Shogunats** in Japan ab **1868**. Damit verbunden war nicht nur der Aufbau eines neuen, politischen Systems nach westlichen Vorbildern, sondern auch eine völlige Umgestaltung der japanischen Gesellschaft. Diese Phase endete praktisch mit dem letzten Widerstand von Samurai Saigō Takamori **1877**. Ihren formellen Abschluss fand die Restauration mit Inkrafttreten der Verfassung des Japanischen Kaiserreichs von **1890**.

Mit Gewalt **erzwungene Aufnahme westlicher Waren durch „ungleiche“ Freundschafts- und Handelsverträge: 1854** Vertrag von Kanagawa durch Perry, US Navy, 1854 England, 1858 Amerika, 1858 Russland, 1861 Preußen.

Satsuma: Provinz Satsuma
Satsuma Rebellion: Revolte der Samurai der Provinz Satsuma gegen die Meiji-Regierung **1877**. Es war der letzte und größte einer Reihe von Aufständen gegen die neue Regierung.

siehe:
<https://de.wikipedia.org/wiki/Edo-Zeit>
https://en.wikipedia.org/wiki/Edo_period
<https://de.wikipedia.org/wiki/Meiji-Restauration>

https://en.wikipedia.org/wiki/Meiji_Restoration
https://de.wikipedia.org/wiki/Ungleiche_Vertrage...
 Ungleiche Vertrage Japan ...
https://de.wikipedia.org/wiki/Vertrag_von_Kanagawa
<https://de.wikipedia.org/wiki/Satsuma-Rebellion>
https://en.wikipedia.org/wiki/Satsuma_Rebellion

Edo Kiriko: siehe GOOGLE Bilder:

http://japan-brand.jnto.go.jp/eng/crafts/other_craft/2782/

cut glass, a manufacturing method in which **clear colors and delicate patterns are cut into glass**. It's said that Edo *kiriko* was founded in **1834** by **Kagaya Kyubei**, who operated a glassware store in the **Odenmachi area of Edo**, now better known as **Tokyo**. After studying in **Osaka**, which had developed **advanced glassware manufacturing methods**, he returned to Edo and operated a **glassware store** that manufactured eyeglasses and thermometers. From there, cut glass gradually spread throughout Edo. In **1876**, aided by the **government's policy of promoting new industries in the hope of catching up to Western industries**, the **Shinagawa Glass Factory [SGF]** was established. With this, the **first modern glass production** started in Japan. In **1881**, **Emmanuel Hauptmann**, an **English engineer** versed in modern glass-cutting techniques, was invited to impart these skills to selected trainees. Consequently, by **combining the techniques that were passed down since the Edo Period and the latest methodologies of modern industry, the very unique style of Edo kiriko** was formed.

Satsuma Kiriko: siehe GOOGLE Bilder:

type of **cut glass** from Japan, manufactured by the **Satsuma clan** from the final years of the **Edo period** to the beginning of the **Meiji period**. Today, faithful reproductions are produced.

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1. Introduction

“**Kiriko**” is a **glass decorated by cutting or grinding facets**. **Satsuma Kiriko** and **Edo Kiriko** were manufactured mostly in **Edo period** in Japan [SG: Tokugawa-Zeit, 1603-1868]. Especially Satsuma Kiriko is **covered by color-glass and very rare** (Figure 1).

As for the **cutting technique** of Satsuma Kiriko and Edo Kiriko at Edo period up to the beginning of **Meiji era** [SG: Meiji-Restoration, Erneuerung der Macht des Tennō / Kaiser, Abschaffung des Shogunats, 1868-1912], it was believed for long time that they were manufactured by a **rotating wheel or a disc** (wheel method). But, in **1990s**, **Katsuaki Yamaguchi** and **Junji Tanahashi** made it clear that they were not manufactured by a wheel method, but by **linear motion of metal bar by hands** (bar method), which is described in a Yamaguchi's book in **1993** [Ref. 1], and a Tanahashi's research paper in **1987** [Ref. 2].

However, there is an **objection for their explanations** still now among **glass artists** both in **England** and in

Japan. For example, they say “It is incredible that craftsmen in Edo period did not use an easy wheel method and they used only a bar method which requires harder labor.

This article is the **summary by the** author to describe what is the fact based on these two discussions.

The author is interested in the **uranium glass**, which was manufactured at the **first time** in the **Shinagawa Glass Factory (SGF)**. The **SGF was the first European-style glass factory in Japan at Meiji era**, and it was an important starting point of **modern glass industry** in Japan. Therefore, the author imagines that the SGF might be a turning point of cutting technique on Kiriko too.

Figure 1. Satsuma Kiriko bowl by Hidejiro Miyagaki [Ref. 3]



2. Discussion points from both sides

Both Yamaguchi and Tanahashi claim as follows.

- A1) There are **no drawings or paintings** which show **Kiriko technique at Edo period**. The only available evidence is the literatures on Kiriko at Edo period, and all of them say that **only metal bar** (bar method) was used for Kiriko manufacturing. On the other hand, there are **no literatures which say that rotating wheel** (wheel method) was used.
- A2) A footprint of **wave pattern**, which is caused by a wheel method, is not observed on Satsuma Kiriko and Edo Kiriko. On the other hand, some of them show the trace by **linear motion of metal bar**.
- A3) All **Kiriko items, which were imported from Europe at Edo period**, were manufactured by a **wheel method**. Since they show a footprint of wave pattern, they do not use a bar method. This means that cutting technique in Europe was a wheel method at Edo period.
- A4) In the middle of **Meiji era** (days of **SGF**), **both a wheel method and a bar method coexist**, but after that time until today, the cutting technique becomes a wheel method in Japan.
- A5) As for the labor issue for craftsmen, **lead (PbO)** content in glass of Kiriko was **very high at Edo period**. Therefore, cutting by a **bar method was relatively easier** than expected.

A6) Glass products were imported from Europe to Japan at Edo period, but as for the technique, a **traditional bar method was preserved for manufacturing Satsuma Kiriko and Edo Kiriko**.

On the other hand, there is an **objection** to the above claims by glass artists both in England and in Japan, as shown below.

B1) It is **incredible** that craftsmen in **Edo period** did not use an **easy wheel method** and they used only a **bar method which requires harder labor**.

B2) If a wheel method is applied as a rough cutting, and bar method is used after that, then a **footprint of wave pattern is not seen**. That is, a footprint on Satsuma Kiriko and Edo Kiriko is not an evidence that only a bar method is used.

B3) Some of the **grooves on Kiriko** cannot be manufactured by a bar method, and are possible only by a wheel method.

As for the **first one** among the above objections, **Yamaguchi** says in his book “At first, I expected that its cutting technique must be a wheel method, but after the investigation, I was very much surprised that my expectation was incorrect”. Therefore, it is natural to have a similar question.

Also, the **second one** is theoretically possible, and the **third one** may be probable. Therefore, confirming the historic fact is decisive, and it is described at first.

3. Kiriko technique in Edo period

3.1. Literature by glass industry

There are **no drawings or paintings** which **show glass cutting technique in Edo period**, but there is a **famous**

sales brochure for glass products in Edo period, which is known as “**Kagaya’s Hikifuda**” (Figure 2). The explanation on this brochure was published in **1920s**, saying “**All glass cuttings were made by a file (iron bar method) in Edo period.**” [Ref. 4].

The above document also explains the **cutting process** at the **Takenaka Glass Factory** (in **Osaka** city) in **Meiji era** as follows. The company was established in **1879**, and hand-scrubbing method was used at first. Then, a **rotating wheel by hands** was used, next by **foot-pedal**, and in **1895** a **power-driven wheel** was introduced.

This transition period corresponds to the days of **Shinagawa Glass Factory** (SGF), when SGF **invited a glass expert (Emanuel Hauptmann) from England**. He instructed **glass cutting and engraving technique** by a **wheel method** to Japanese trainees from **1881 to 1882**. After that period, a wheel method became popular in Japan.

3.2. Official record

At the **First Domestic Industrial Exhibition** held in **1877**, **11 glass products** were exhibited. In the official record [Ref. 5], all of them are described that they were manufactured by **iron bar** with “**Kongosha**” [“**Kongosha**” is powder or sand of natural garnet / **Granat**. Some of current dictionaries translate it to “**emery**” / **Schmirgel**, but emery is not a garnet but another mineral named as corundum / **Korund**.] In this record, it is described that **rotating wheel** (potter’s wheel) were used for manufacturing some **precious stones**. But, Tanahashi concludes that this wheel was used for **drilling a hole for stones**, and **not applied to the glass products**.

Figure 3. Glass Factory at Nagasaki city in Meiji 18(1885) [Ref. 1]



3.3. Yamaguchi' s book

Yamaguchi' s book shows an illustration of the **Ozone-Shimaji's Glass Factory** at **Nagasaki** city in Meiji 18 (1885) (Figure 3). It shows that **several workers use a whetstone** in a basin, and they **scrub a glass product by hand**. Also, a **hand-rotating wheel** is seen. This year is just **after SGF introduced a wheel method**, and it suggests that **both methods were used in parallel at that period**.

As is explained above, the literatures show that a **bar method** was used as a **Kiriko cutting technique from Edo period to the beginning of Meiji era**, and there are **no literatures that a wheel method** was used. Therefore, **historic fact is that a bar method was used for Satsuma Kiriko and Edo Kiriko**.

3.4. Investigation on footprint

Tanahashi's paper shows investigations for **several dozens of Satsuma Kiriko and Edo Kiriko**, and it was confirmed that there were **no footprint of wave pattern**. Of course, this fact does not deny the possibility that those Kiriko were roughly manufactured by a wheel method at first, and then a bar method was applied as final polishing. But, it is not reasonable to assume that all Kiriko products were manufactured by the above process, because a **perfect Kiriko can be manufactured only by a wheel method and there is no necessity to add a bar method** for these perfect Kiriko products. This conclusion may be changed in future, if Satsuma Kiriko or Edo Kiriko with wave pattern is discovered, but the current fact is described above.

Meanwhile, this investigation shows a **footprint of wave pattern for glass products which were imported from Europe at Edo period**, and it means that a **wheel method** was used for these beautiful items. Actually, these glasses were called as "**Giyaman**" in Japan, which means a **diamond**. As is described above, perfect Kiriko products can be manufactured **only by a wheel method**.

Related to this issue, the author had a chance to take photos of both **Edo Kiriko** and an **imported glass product**, by courtesy of **Masahiro Miyake**, who is a shop master of Ebiya Antique Shop in Tokyo.

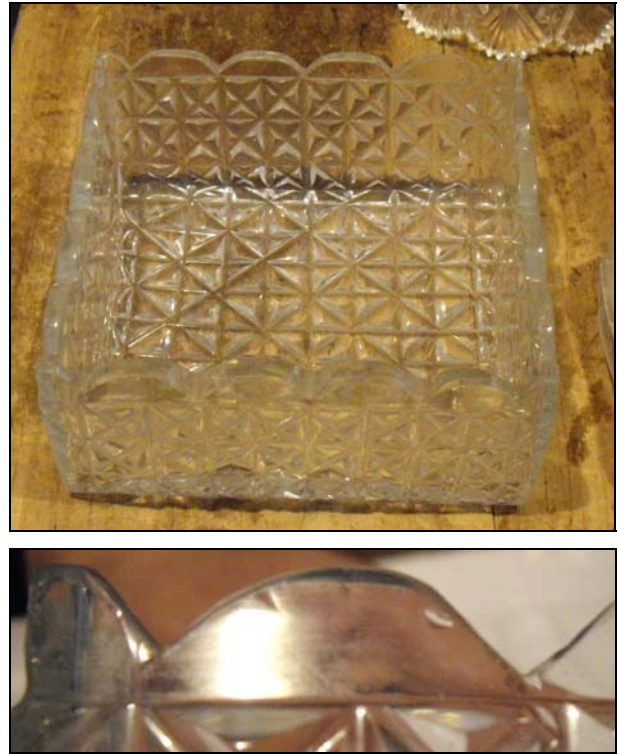
Figure 4. Giyaman from Europe at Edo period [photo by author]



One is a **bottle with a stopper from England**, which looks like a wine decanter, and Miyake says it a typical "**Giyaman**" from **Scotland**. A footprint of wave pattern can be seen at its neck portion (right of Figure 4).

Another item is a square bowl of typical Edo Kiriko, which does not show wave pattern in its cutting portion. And in several cutting grooves, there is a footprint of linear motion of metal bar (right of Figure 5).

Figure 5. Edo Kiriko at Edo period [photo by author]



4. The reason why Kiriko technique in Edo period was different from European one

Even if we admit the above historic fact, there would be a question **why Kiriko craftsmen in Edo period did not apply a wheel method which were used at that time in Europe**, and used only a bar method which would require hard labor. That is, **cutting technique** in Europe, such as a wheel method, might be known to Japanese through **literatures even in Edo period**. Therefore, there would be a question why they did not use a wheel method.

As for this question, there is **no direct evidence** showing its reason, and **only indirect consideration on Kiriko history** is possible. In this section, the following two possible questions and answers are described at first, which are "Does a bar method require hard labor or not?" and "Where did Kiriko technique come from in Edo period, and how was it changed at Meiji era? ". At the end of this section, contribution of **SGF** (Shinagawa Glass Factory) on **cutting technique** is discussed.

4.1 Does a bar method require hard labor or not?

As for the question that "Does a bar method require hard labor or not?", both Yamaguchi and Tanahashi address a point that it was **possible to manufacture by**

a **bar method**, because both **Satsuma Kiriko and Edo Kiriko were soft due to its higher lead content**.

Table 1 is a copy from **Tanahashi's** paper, and **Figure 6** is a simplified summary of Table 1 by the author. A **glass density** of Satsuma Kiriko and Edo Kiriko is as high as **3.5 gram/cc** at Edo period to the beginning of Meiji era. This density corresponds to the **lead (PbO)** content of about **45 %**. Since there is no footprint of wave pattern for these Kiriko products, Tanahashi classified them as Kiriko by a **bar method**.

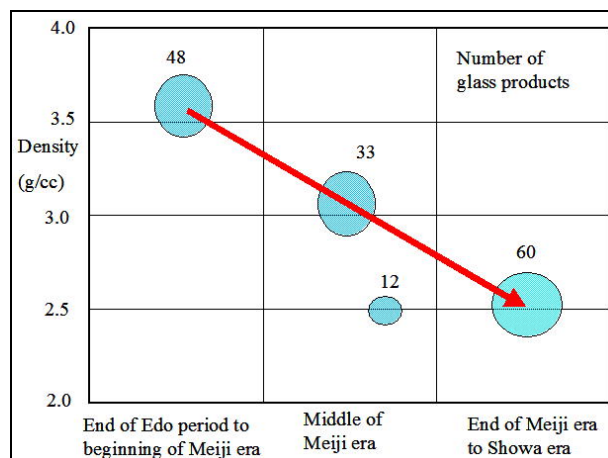
The glass products in the **middle of Meiji era** have **3.0 gram/cc** density, and some of them are manufactured by a **bar method** and others by a **wheel method**. The above 3.0 gram/cc corresponds to **lead** content of about **25 %**, and these values are the same as **current typical crystal glass**.

At the **end of Meiji era**, **all of them are manufactured by a wheel method**. Its density further decreases to **2.5 gram/cc**, which suggests that they are **not a lead glass** (crystal glass).

Table 1, Density of Kiriko for different age

比重	往復		回		転	
	江戸後期 ~明治前期	明治 中期頃	明治中期 ~昭和前期頃	現代	近代	現代
2.4		5	11		5	
2.5		7	43		7	
2.6			6	2	2	1
2.7						
2.8		1				
2.9		3	3		1	2
3.0		3			11	1
3.1		7	1	1		1
3.2		4	3	3	2	3
3.3		6	2			
3.4	17					
3.5	15					
3.6	11					
3.7	5					

Figure 6. Density of Kiriko for different age



Even if it was possible to use a bar method for Kiriko at Edo period, which is soft because of its higher lead content, it is true that a **wheel method is easier than a bar method**.

As for this point, both Yamaguchi and Tanahashi assume that a **wheel method required more labor and larger equipment at that time**. On the other hand, a bar method was preferred because **one-man operation** was possible with **simple equipment**.

Yamaguchi's book shows an illustration of a **lathe** (rotating machine for processing) in **18th century at Europe** (Figure 7). This machine requires a **large rotating wheel**, which transmits its rotation to a small wheel through a belt and a pulley. He addresses that a **similar system was introduced to SGF**. Also, he mentioned that a **smaller machine** was used, which required another worker to activate its foot pedal. His book does not show its machine, but may be similar to Figure 8.

Figure 7. Lathe in Europe

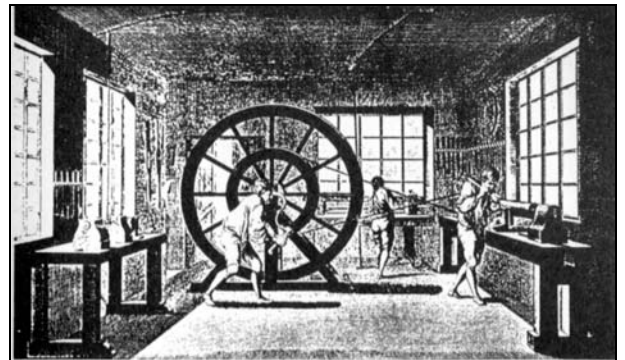


Figure 8. Foot-pedaled machine



On the other hand, there is an illustration about **polishing of precious stones at Edo period** (Figure 9 is a reprint from Tanahashi's paper, and its source document is shown in the reference [Ref. 6]). It explains that "**Pouring water to Kongosha, and scrubbing using an iron-bar**". It is estimated that **similar technique (bar method) was used for glass cutting** too.



Figure 9. Polishing of precious stones at Edo period [Ref. 6]



4.2. Where did Kiriko technique come from in Edo period, and how was it changed at Meiji era?

As for the **first production of Kiriko**, it is known that **Kyubei Kagaya** in **Edo city** [Tokio] started both **glass engraving and glass cutting using Kongosha** in Tenpo 5 (1834).

The 10th lord of Satsuma domain [a current Kagoshima prefecture] **Narioki Shimazu** began a pharmaceutical business in Koka 3 (1846), and they **needed glassware** for that business. Therefore, he invited **Kamejiro Shimoto** from Edo, who was a **glass engineer** at **Kyubei Kagaya**.

After the 11th lord: **Nariakira Shimazu** took over his father's position, he **constructed various factories**, and named them as "Shusei-kan" in Ansei 4 (1857), where **Satsuma Kiriko** was manufactured.

The **cutting technique in Europe might be introduced to Japan in Edo period** through literatures, but in general, **actual introduction of new technology requires both actual equipments and experts**. As for cutting

technique, these two factors were not imported to Japan in Edo period. Therefore, **traditional cutting technique** (bar method) was applied to Satsuma Kiriko.

However, **Satsuma Kiriko reached an end**, because Nariakira passed away in Ansei 5 (1858). Besides that, there was the **Satsuma-England war** (Bombardment of Kagoshima) in Bunkyo 3 (1863), and **most of the factories were destroyed**.

Most of glass engineers, such as **Hidejiro Miyagaki** and **Chuzemon Ooshige**, moved to **Edo** (later Tokyo), and they participated in the **Shinagawa Glass Factory** (SGF) as workers or experts.

In this way, the **cutting technique** (bar method by hands) for Edo Kiriko was transferred to **Satsuma**, and it was **integrated with new technique** (wheel method), which was introduced by the **English instructors with wheel equipments to SGF**. And, finally, the **SGF** became a **starting point of glass industry in Japan**.

4.3 Contribution of Shinagawa Glass Factory on cutting technique

Akiko Inoue made it clear how the Shinagawa Glass Factory (**SGF**) acted as a **foundation of modern glass industry** in Japan [Ref. 7, 8, 9]. In SGF, four **British glass experts** (**Thomas Walton, Elijah Skidmore, James Speed, and Emanuel Hauptmann**) were invited to Japan with **required technology**, and they taught modern glass technology to Japanese trainees, who later moved all over Japan and started various glass business.

Sally Haden, who is a great-grandchild of the British glass experts (**James Speed**), showed how these four British glass experts acted for **various missions** at the required timing (see Table 2) [Ref. 10].

The **SGF accepted many trainees**, and as for the **cutting experts, about 20 names were known**. Some of them have been glass experts of Satsuma Kiriko or Edo Kiriko [Ref. 8] [Ref. 1].

Thus, **traditional cutting technique** (bar method) was **switched to a modern wheel method at SGF**, and later, it spread all over Japan.

Table-2. Meiji 7: 1874 ... Meiji 16: 1883

Meiji	7	8	9	10	11	12	13	14	15	16	Mission
Walton	●	●	●	●	●	●					Factory construction
Skidmore				●	●	●	●	●			Crucible making
Speed						●	●	●	●	●	Glassware production
Hauptmann								●	●		Cutting & graving



Figure 10. Hauptmann at Shinagawa Glass Factory



The reason **why SGF did not introduce steam engines** can be considered as follows.

In July 2015, a certain Japanese TV program “**Craftsmanship of Edo Kiriko**” explained the history how British expert (Emanuel Hauptmann) brought a wheel method at SGF. These trainees at SGF succeeded glass cutting technique, and operate current Edo Kiriko business until now.

SGF imported a man-powered rotating wheel in Meiji 13-14 (1880-1881), and **Emanuel Hauptmann** from England instructed glass cutting and engraving at SGF in Meiji 14-15 (1881-1882) [Ref. 9].

James Watt of England invented a **steam engine** in 1769, but **Edo Government prohibited a trade with Western countries**, and **Japan could not import steam engines** at that time.

Japan could **import steam engines for factories only after Meiji era**, and it was almost **100 years later after Watt’s invention**.

Some major examples are as follows. The **Takashima coal mine imported a coal transportation machine** driven by a **steam engine** from England in Meiji 1 (1868). The **Tomioka silk factory imported a reeling machine driven by a steam engine from France** in Meiji 4 (1871). Since these factories needed **large power source**, and they were **very important industries in Japan for Meiji Government**, they had to import steam engines even if they were expensive. The **first domestic production of steam engines began at the military’s Osaka factory** in Meiji 14 (1881) [Ref. 11].

Thus, **wide introduction of steam engines began in the middle of Meiji era**. Actually, in Meiji 17 (1884), only **less than 4% factories used steam engines** among all Japanese factories, meanwhile, half of the rest was **water-powered** and another half was **man-powered**. In Meiji 25 (1892), then, the share of **steam engine became 25 %** [Ref. 11].

Therefore, SGF and Hauptmann could not import steam engines.

5. The last question: Can some Kiriko grooves be manufactured only by a wheel method?

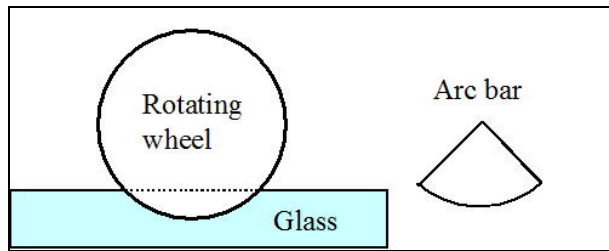
The last objection is “Some of **grooves on Kiriko cannot be manufactured by a bar method**, and are possible only by a wheel method”.

Although most of Satsuma Kiriko and Edo Kiriko in Edo period can be manufactured by a bar method, some grooves cannot be manufactured by linear motion of an iron bar. For example, a U-shaped groove may be manufactured only by a rotating wheel, and not possible by linear motion with a **straight metal bar** (Figure 11, left).

As for this case, **Tanahashi** describes in his paper [Table in p. 26 of Ref. 2] as follows. Although the above case is impossible by a straight bar, **glass experts at Edo period might utilize an arc bar** instead of a straight bar (Figure 11, right).

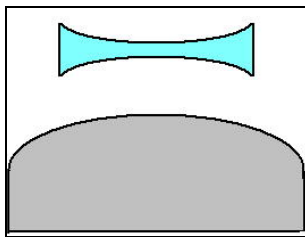


Figure 11. U-shaped groove



For example, it is a historic fact that a shortsighted lens (**concave lens**) was manufactured by polishing with a **convex stone** (Figure 12). The same process can be applied to the above U-shaped groove of Kiriko. That is, U-shaped groove can be manufactured by an arc (U-shaped) bar.

Figure 12. Manufacturing process of concave lens at Edo period



6. Conclusion

Based on the literatures for Kiriko technique in **Edo period**, **Kiriko was manufactured only by a bar method**, which utilize a **metal bar with Kongosha**.

A **footprint of wave pattern**, which is caused by a rotating wheel (wheel method), is **not observed** on Satsuma Kiriko and Edo Kiriko.

The above fact means a **traditional bar method was used in Japan of Edo period**, which was preserved from the beginning of Edo Kiriko production, although a wheel method was used as cutting technique in European countries in Edo period.

After **Shinagawa Glass Factory** introduced a **wheel method by a British glass expert**, then a wheel method was used from the **middle of Meiji era until now**.

Although a bar method requires **more labor** than a wheel method, glass material of Kiriko was softer because of **higher lead content** and cutting is easier than expected. Also, a **wheel method required more workers and larger equipment** than a bar method,

Some of **grooves** cannot be manufactured by linear motion of a metal bar, but it can be manufactured by an **arc bar**.

Acknowledgments

Since this study has been inspired by the inquiry from **Sally E. Haden** on **Kiriko cutting technique**, the author would like to express thanks to her. Based on her recent study with this paper, the author could confirm the **important role of Shinagawa Glass Factory on Kiriko production**. Nowadays, Edo Kiriko is assigned as a Traditional Art Craft, and loved by many people.

Also, the author would appreciate **Junji Tanahashi** for helping my correct understanding of his long paper. He also introduced me an antique shop, where they own typical Kiriko products (Figure 4&5).

References:

(All in Japanese except Ref. 9 & 10)

- [Ref. 1] Katsuaki Yamaguchi, Edo Kiriko, Ribun Publishing, 1993
- [Ref. 2] Junji Tanahashi, Technique of Kiriko from End of Edo period to Beginning of Meiji era, Research report at the Shoin Women's University, 1987
- [Ref. 3] Photo by courtesy of Tokyo National Museum. Exhibited at the **Second Domestic Industrial Exposition** in Meiji 14 (1881)
- [Ref. 4] Imperial Glass Newspaper Inc., Superior Topics of Japanese Glass Industry, 1928
- [Ref. 5] Domestic Industrial Exhibition Secretariat, Official Descriptive Record for **Domestic Industrial Exhibition Items** in Meiji 10 (1878), No. 2-214, pp. 126-132, No. 910, pp. 9397, 1878
- [Ref. 6] Yurai Miyake, Bankin Sugiwai Bukuro, Kyoho-17 (1732)
- [Ref. 7] Akiko Inoue, Shinagawa Glassworks (1), Journal of Art Glass Society in Japan, No. 6, 1979
- [Ref. 8] Akiko Inoue, Shinagawa Glassworks (2), Journal of Art Glass Society in Japan, No. 7, 1979
- [Ref. 9] Akiko Inoue Osumi, British Influence on the Shinagawa Glassworks - Japan's First Industrial Glass Factory, AIHV, 2003
- [Ref. 10] Sally E. Haden, They went "to larn `em": British Glassmakers Help to Establish Japan's First Western-style Glassworks, 1874-1883, Glass Science Technology 54 (1), 2013
- [Ref. 11] Ryosin Minami, Electrification and its Effect at Manufacturing Industry before World War II, Bulletin of Hitotsubashi University, 71 (4), 1974



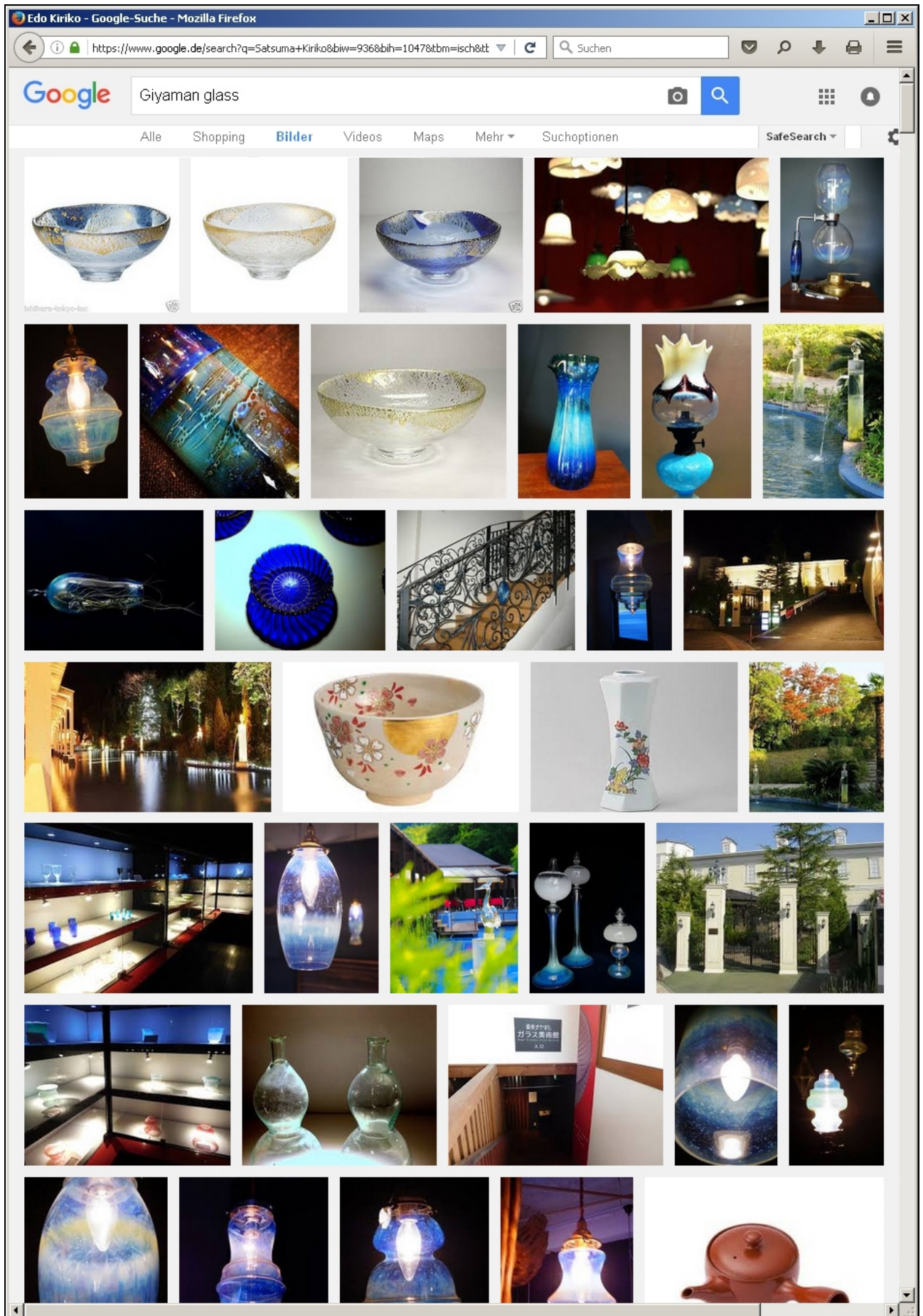
Abb. 2016-2/07-01; Google-Suche Bilder: Edo Kiriko (2016-07)



Abb. 2016-2/07-02; Google-Suche Bilder: Satsuma Kiriko (2016-07)



Abb. 2016-2/07-03; Google-Suche Bilder: Giyaman glass (2016-07)



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 (Set of 8 Russian Enamelled Vaseline Uranium Glass Goblets, ca. 1850)
(SG: Die Pressglas-Korrespondenz ist endlich auch in Japan angekommen!!!)

www.pressglas-korrespondenz.de/aktuelles/pdf/pk-2010-2w-japan-uranium-glass.pdf
www.pressglas-korrespondenz.de/aktuelles/pdf/pk-2011-2w-yoshioka-uranglas-museum.pdf
www.pressglas-korrespondenz.de/aktuelles/pdf/pk-2011-3w-yoshioka-uranglas-japan-tv.pdf
www.pressglas-korrespondenz.de/aktuelles/pdf/pk-2013-4w-yoshioka-uranglas-japan-tv-2013.pdf
www.pressglas-korrespondenz.de/aktuelles/pdf/pk-2015-3w-sg-schale-uran-gruen-zabko-1910.pdf
www.pressglas-korrespondenz.de/aktuelles/pdf/pk-2015-3w-yoshioka-uranglas-japan-exhibition-2016.pdf
www.pressglas-korrespondenz.de/aktuelles/pdf/pk-2016-2w-yoshioka-japan-glasindustrie-1890.pdf

<http://uranglass.gooside.com/UG8jamboree/jamboree2016.htm> (Bilder)
www.youtube.com/watch?v=roHm9gh4JH8&feature=youtu.be (Video)
<https://youtu.be/roHm9gh4JH8> (Video)
<http://uranglass.gooside.com/english.htm> (Literaturangaben)
https://en.wikipedia.org/wiki/Uranium_glass
www.vaselineglass.org (Vaseline Glass Collectors, Inc., VGCI)
www.glassassociation.org.uk/sites/default/files/Uranium_Glass_sample_article.pdf
www.glass.co.nz/Davidson.htm
<http://1st-glass.1st-things.com/vaselineglass.html>

Abb. 2016-2/07-04; Google-Suche Bilder: Edo Kiriko (2016-07)
www.jshoppers.com/shohin.asp?shocd=W04145: Tokyo Prefecture, Edo Kiriko Glassware, Wave Fuji & Crossing Boat
www.japansquare.com/craft/product.asp?shocd=W04144: Tokyo Prefecture, Edo Kiriko Glassware, Red Fuji & Crossing Boat
www.ebay.com/itm/JAPANESE-SAKE-Cut-Glass-Edo-Kiriko-Old-Fashion-Japanese-/160624903427

