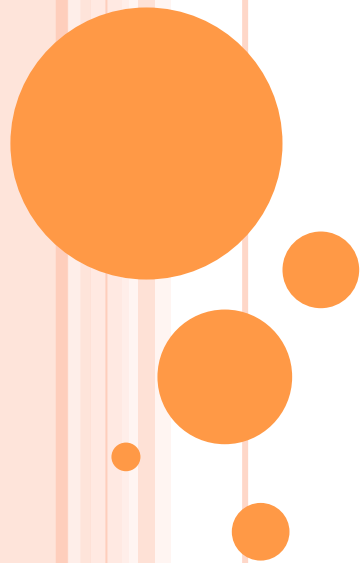


Introduction of Continuous Aluminum Melting and Holding Crucible Furnace



NIPPON CRUCIBLE CO., LTD.

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Introduction

We have supplied over 200 furnaces in not only Japan but also in China, South East Asian countries, USA, Mexico and UK.

Then, We have made some improvements of the furnace after studying actual melting and holding operations.



2.Furnace Structure and Advantages

This furnace has a compact structure for aluminum casting which makes possible to melt and hold aluminum continuously by using a melting and a holding crucible. It is the furnace that has both a melting chamber and a holding chamber.

It also has three major advantages, which is energy saving, high yield rate, and high quality molten metal, required for the aluminum melting and holding compared with conventional non-crucible type furnace



3. Aluminum Melting Process

Charged aluminum is preheated by the exhausted gas in the tower and melted in the melting crucible. Then molten aluminum passes through the run out tube preheated by the heat from the holding burner, and is held in the holding crucible.



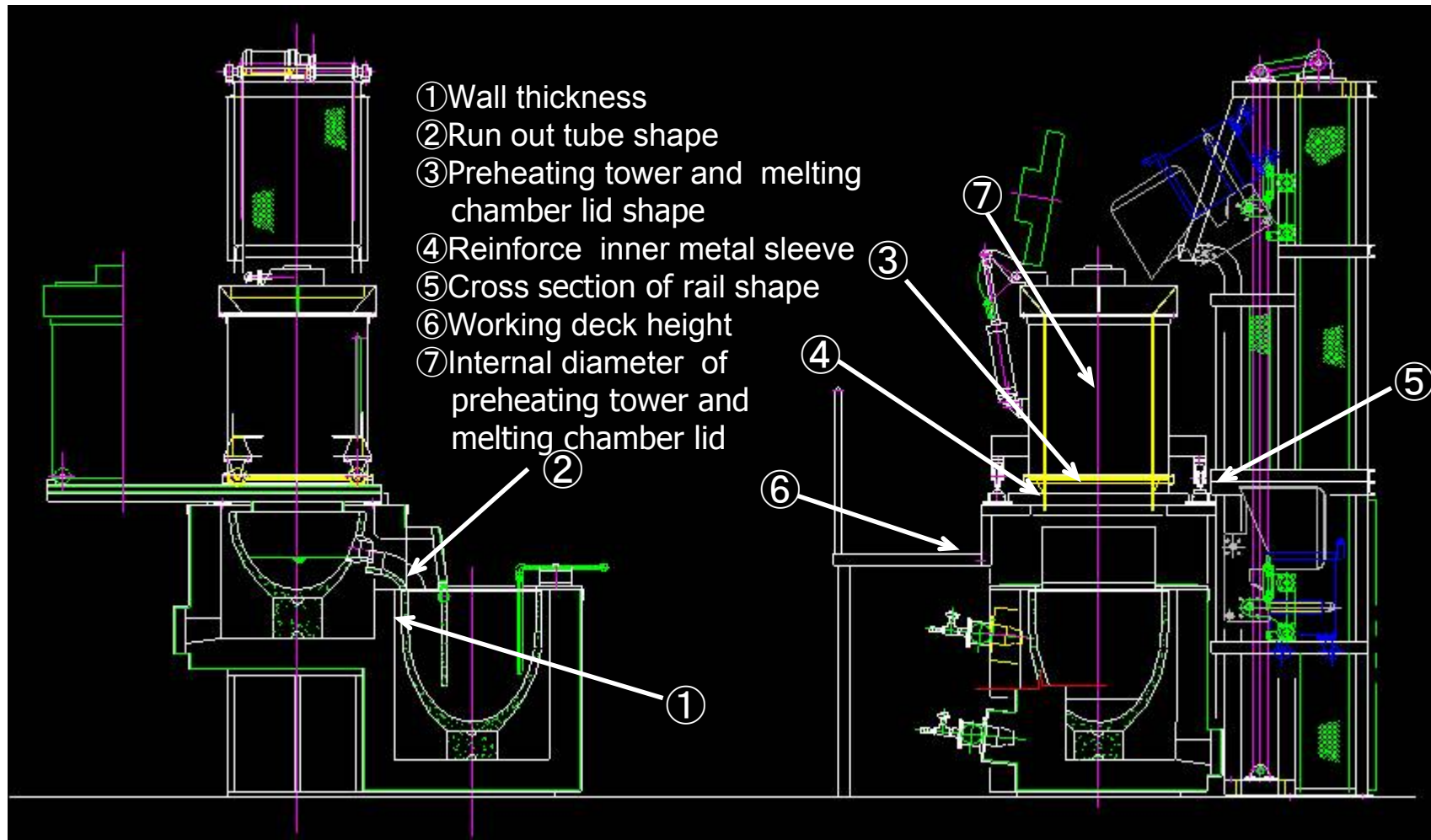
4.Feature

- Operation starting up time is minimized with light refractory and high insulating lining.
- Molten metal is not required for holding during night and holiday.
- Regular lining repair is not required because the metal does not contact with the furnace lining.
- The furnace can be easily reset in the original condition by simply replacing with new crucible.
- Melting various alloys are possible by simply replacing the crucible.

This prevents metal contamination.



Outline of the Improvement (7 improvements)

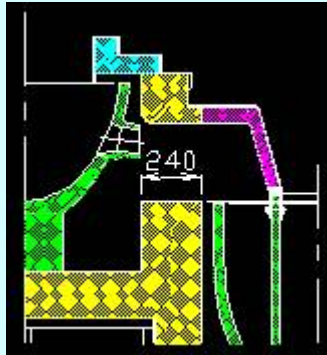


6.Explanation of the improvement

①Change of the wall thickness between the melting and the holding chamber

BEFORE

Wall thickness 240mm (minimum)



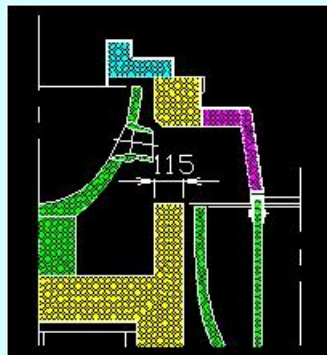
Problem

- Temperature decline is large at run out tube, which leads to molten metal temperature to decline and this may solidify molten metal.
- The distance between the cover and the pipe is longer and the cleaning of the run out tube is not easy.



AFTER

Wall Thickness 115mm (minimum)



Advantages

- The space at the run out tube is reduced by 25%, which minimizes the temperature decline.
- Heat accumulated in the wall reduced and the melting time reduced by 5 minutes.
- The distance between the cover and the pipe shortened.

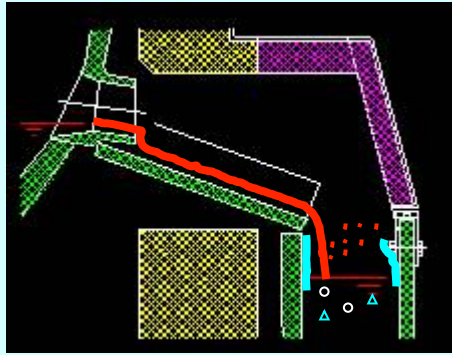


6.Explanation of the improvement

②Change of the run out tube shape

BEFORE

Straight tube (Carbon grade)



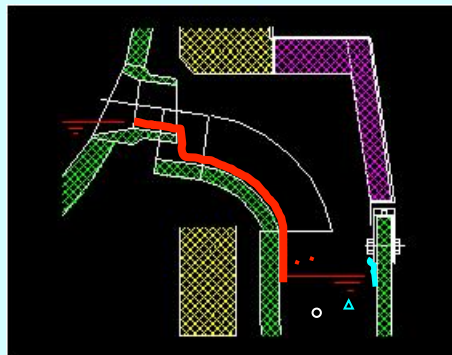
Problem

- More splashing of molten metal
→ Causes the frequent entrainment of the air
→ Causes the frequent adhesion of the oxide
- Carbon grade is more oxidized



AFTER

Curve tube (Silicon carbide grade)



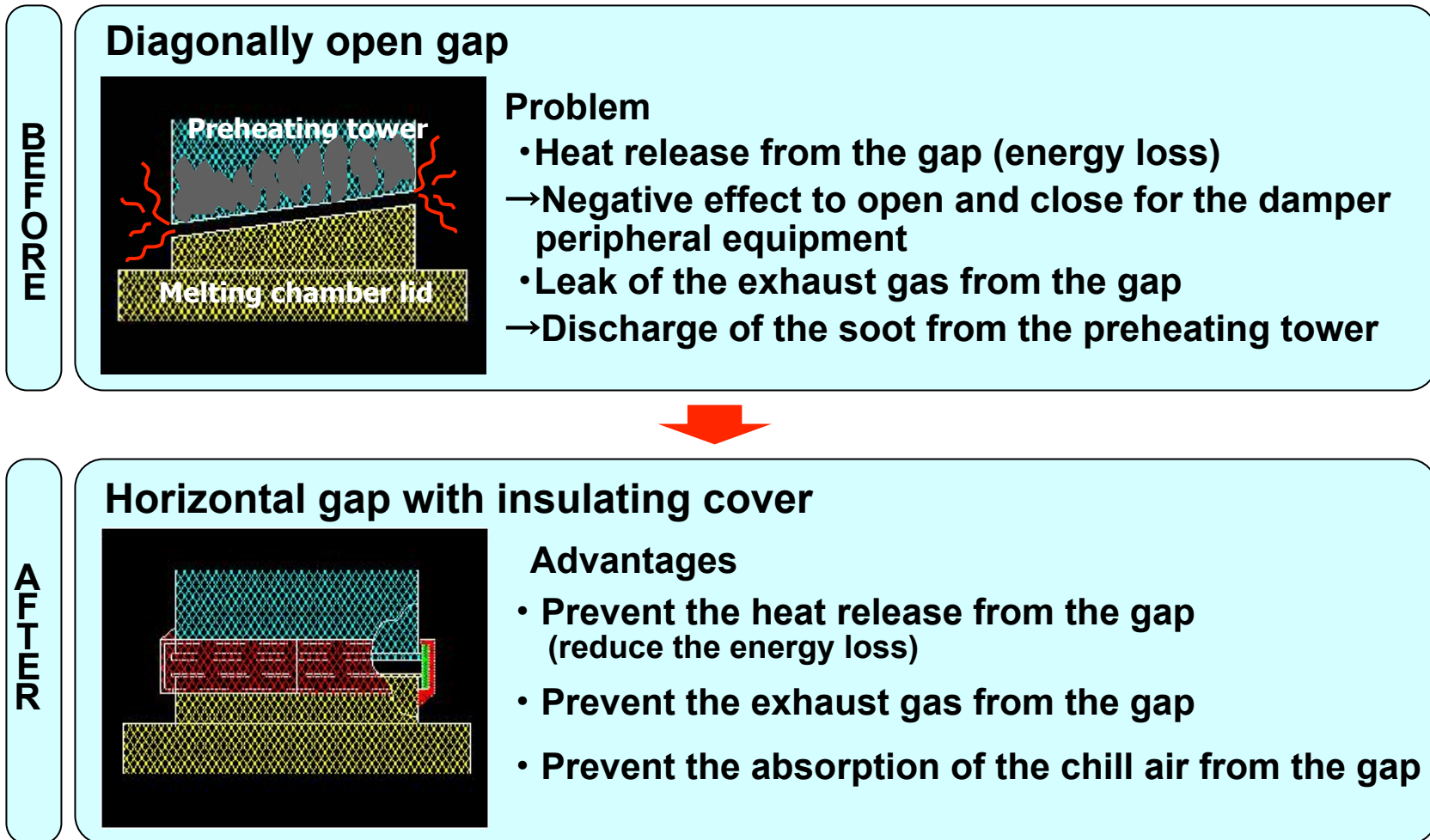
Advantages

- Molten metal flows through the crucible wall
→ Reduce the entrainment and the oxide adhesion
- Durable for the oxide than the carbon grade and higher strength



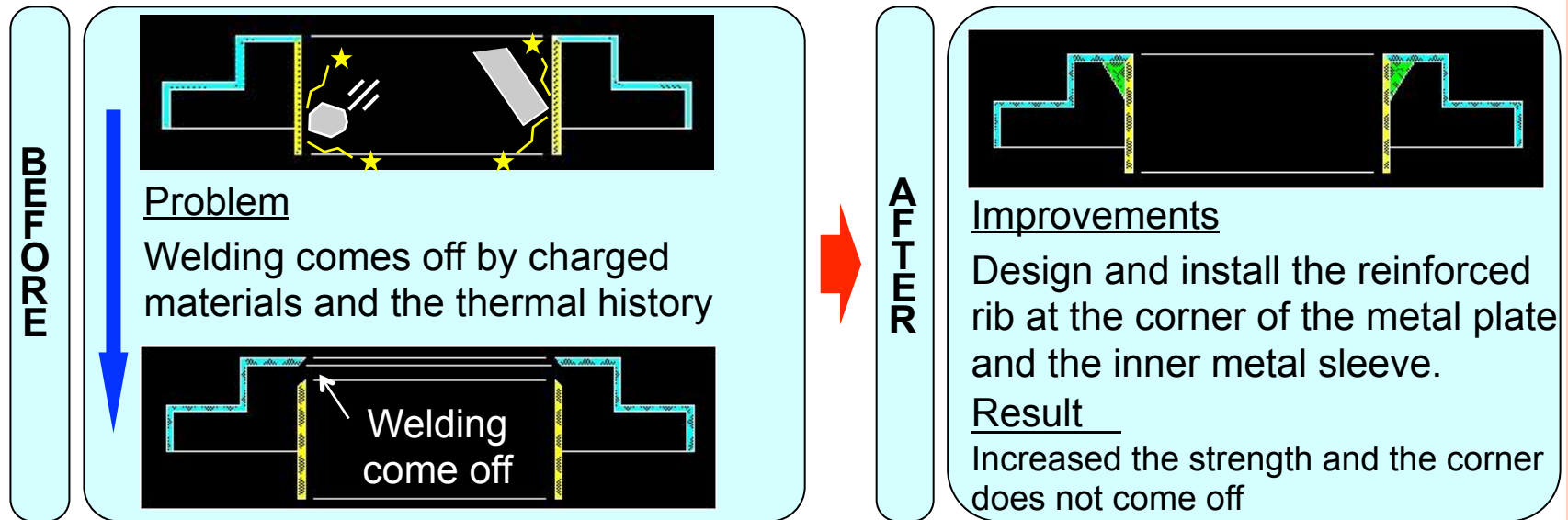
6. Explanation of the improvement

③ Change of the lid shape of preheating tower and the melting chamber

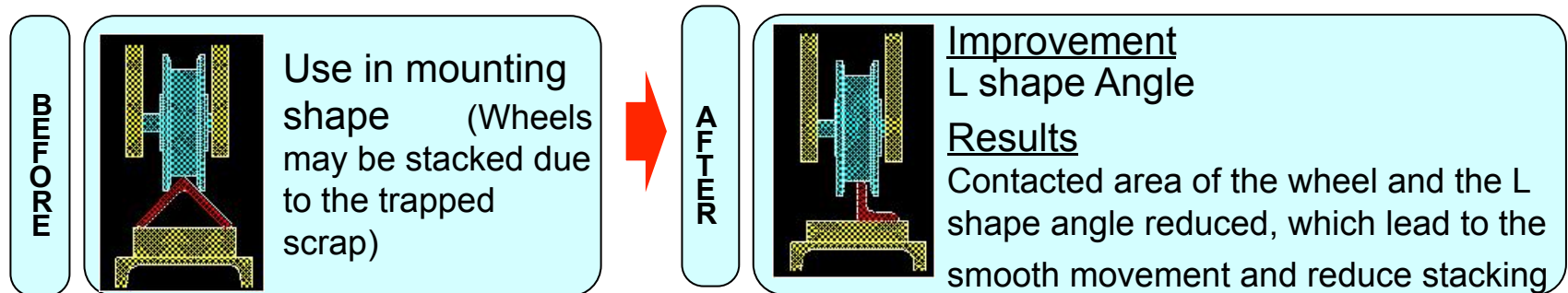


6. Explanation of the improvement

④ Reinforce the inner metal sleeve of the preheating chamber



⑤ Change the cross section of the rail

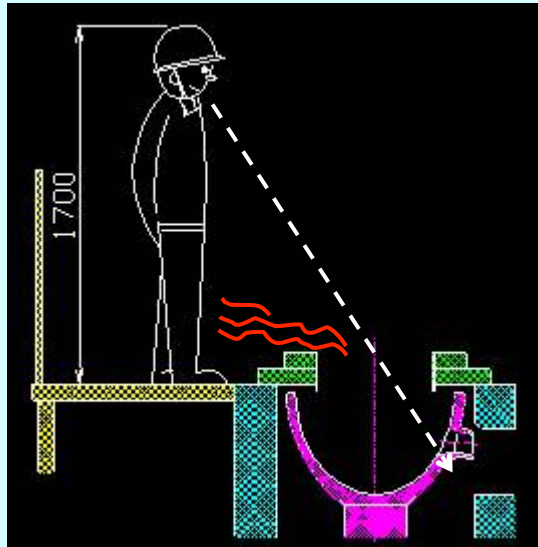


6. Explanation of the improvement

⑥ Change of the working deck height

BEFORE

Melting chamber level $\pm 0\text{mm}$

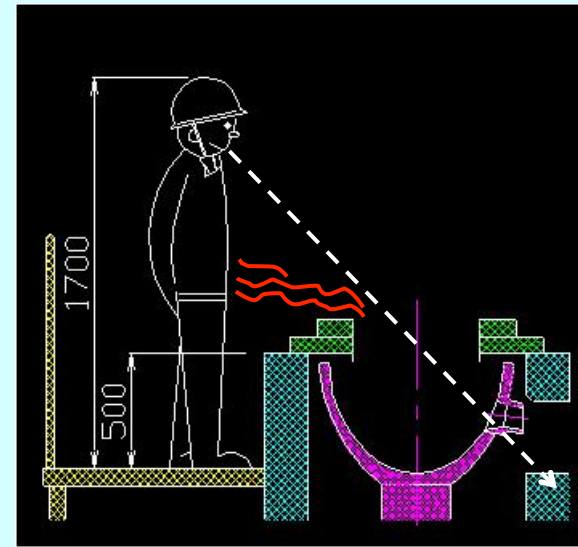


Problem

- The distance between eyes of the worker and the melting crucible is longer and the worker's posture becomes strained.
- The worker has the risk of stepping into the furnace.

AFTER

Melting chamber level $-300\sim-500\text{mm}$



Advantages

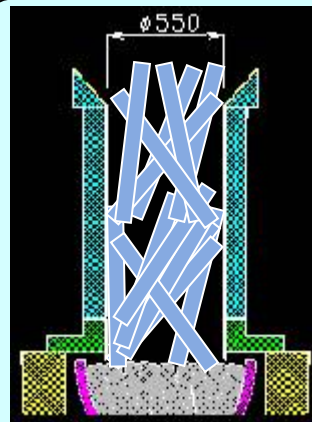
- The distance is closer and the unreasonable posture can be avoided.
- The risk that the worker may step into the furnace is reduced.



6.Explanation of the improvement

- ⑦ Inner diameter change of the preheating tower and the melting chamber lid

BEFORE



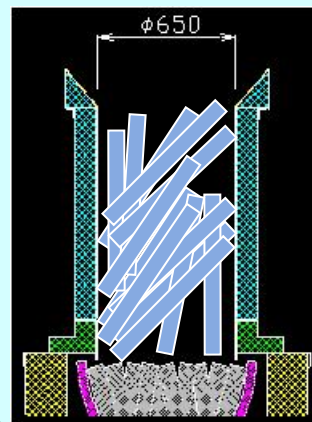
$\phi 550\text{mm}$

Problem

- Ingots could not be charged efficiently in a short time because they tend to be vertical.
- Metal amount in the preheating tower is not enough to hold required amount of metal to be melted.



AFTER



$\phi 650\text{mm}$

Advantages

- Ingots can be charged efficiently in a short time because they can be lean.
- Cleaning and flux disposal operation around the melting crucible can be improved.



7. Pictures of the improvement for each changes

① Melting and holding chamber



② Run out tube shape



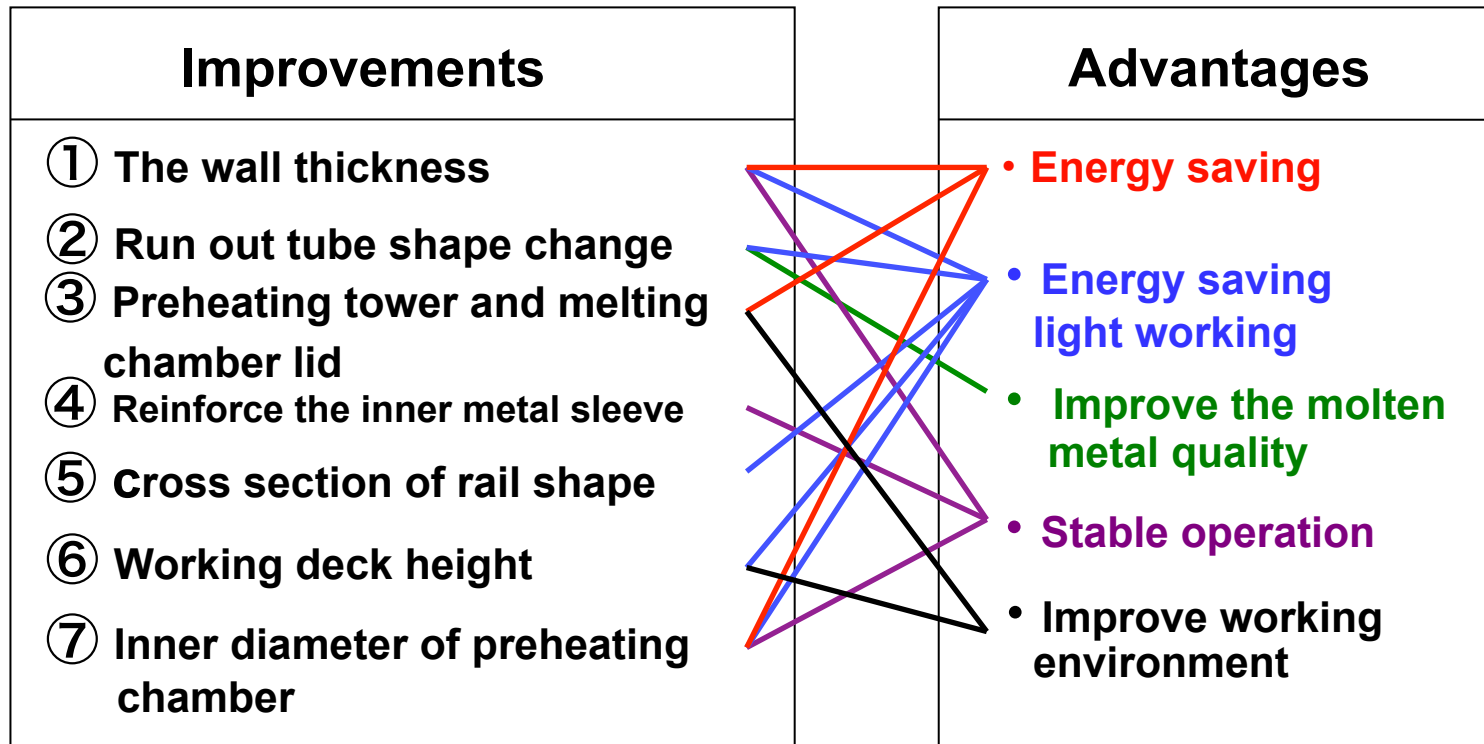
③ Preheating tower and melting chamber lid



⑥ Height of the working deck



8. Conclusion



We would provide required improvements to make the furnace operation to be more efficient and better.

