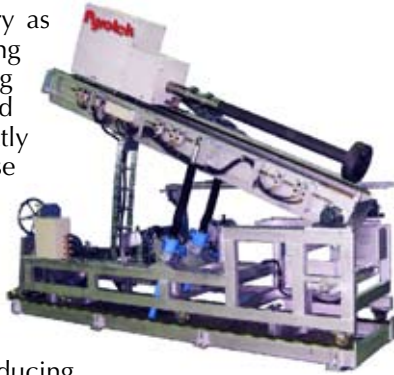


PYROTEK JAPAN EXTENDS PRODUCTION SCOPE WITH BATCH AND IN-LINE REFINING TREATMENT

For over 20 years, Pyrotek Japan has been introducing the in-line gas bubbling filtration (GBF) system developed by Showa Aluminum Corporation, currently the Aluminium Division of Showa Denko KK. To date more than 80 in-line systems have been installed in addition to SNIF equipment. When the GBF process was first launched in 1986, SNIF technology had already been established in the aluminium industry as a degassing pioneer, among a few other degassing systems, which had entered the market. It is greatly satisfying in the Japanese aluminium industry that the GBF process has been contributing significantly in realising high quality of slab, billet and strip caster sheet, as well as improving productivity, reducing costs and enabling safer operation. Today, the application of in-line metal refining is fundamental and vital to operations in aluminium casthouses. Meanwhile, Pyrotek Japan has also been installing the HD2000J batch rotary refining system for the injection of bi-gas or Promag RI into the holding furnace. A recently installed in-line GBF system in combination with HD-2000J injecting Promag RI is highlighted in this article.



RECENT DEVELOPMENT OF IN-LINE GBF SYSTEMS

One feature of the GBF system is high-speed rotation of the GBF rotor, up to 1,000 rpm. This high speed is achieved through a specially designed super rotor which enables the formation of very fine bubbles and also maximises the number of bubbles to increase contact with the metal. This leads to



increased efficiency in removing non-metallic inclusions as well as in degassing.

A patented horizontal electric immersion heating system is available when heating is required during

degassing.

The latest in-line GBF system is equipped with various measuring devices for process gas flow, pressure, rotor rotation speed, metal temperature, combustion gas flow and indication of the rotor position. An alarm is enabled if any error occurs during operation. All electric signals are monitored at the control centre and recorded for follow-up research following any problems.

Despite these various electrical devices, automation of the GBF makes operation very simple and sequential operation is featured, linked with the holding furnace and casting table. This helps the operator substantially and reduces malfunctions during processing, drop-off stage and heating operations.

BATCH REFINING PROCESS IN HOLDING FURNACE

Pyrotek Japan has been supplying flux injection machines for over 30 years, but in its experience, larger furnaces usually require several lance pipes to achieve a homogeneous reaction with molten metal throughout the furnace. Alternative in-furnace metal refining processes are continually requested to replace chlorine gas injection (chlorination) while not prejudicing refining performance, for example when using reducing hydrogen, alkali and alkali earth metals. The rotary flux injection process with the HD-2000 system can achieve a homogeneous reaction with a single rotary injector. For 10 years, Pyrotek Japan has been installing HD-2000J systems in aluminium



casthouses and in practice these systems injecting carnalite fused flux (Promag RI) have been contributing in the dramatic reduction or complete elimination of chlorination gas. Additionally, due to its environmentally harmful emissions, fluorine gas should not be present in the flux. In this respect, Promag is well accepted in the industry due to its advantage

Alloy	A6061
Holding Furnace	15 t
Temperature	740°C
Amount of Promag RI	3 kg - 0.02% of weight of molten metal
Treatment Time	30 minutes (15 minutes plus nitrogen injection only 15 minutes)
Ca content	Before 18 ppm after 3 ppm (15 ppm → 4 ppm by chlorination)

of being free of fluoride.

Through a combination of using the HD-2000J system and Promag RI the following benefits can be achieved.

- Reduction of carnalite flux “Promag RI” – The addition ratio of Promag RI can be reduced to less than 30% when injected with a conventional lance pipe. This is due mainly to the finer bubbles produced, diffused together with Promag RI through the rotary impeller of the HD-2000. This allows Promag RI adequate residence time to react with molten aluminium, reducing the levels of non-reactive flux. Furthermore, the specific gravity of Promag RI is very close to that of molten aluminium, which also contributes to increasing the residence time of Promag RI in the molten metal. With these, the addition ratio of Promag RI can be successfully reduced to 0.02% by weight of molten aluminium to be refined, 33–20% lower than the amount of flux injected with a conventional flux feeder.
- With full automation, the operation is much simpler and safer, and the operator does not need to handle the rotor manually.
- Reducing non-reactive flux (Promag RI) lowers the rates of harmful emissions.
- Through mixing molten metal by the rotary impeller, the treatment time can be reduced.
- Homogeneity of the molten aluminium can be achieved through high mixing efficiency throughout the furnace.
- Dross generation is reduced.

As a result of minimal turbulence of the metal surface with the HD-2000J system and with the advantages of Promag’s features, dross generation is much reduced. Compared with conventional injection of flux with a lance pipe flux feeder, the amount of dross generated with the HD-2000 and Promag RI is less than 50%. This also contributes to improved metal yield.

The HD-2000J system combined with Promag RI not only replaces the process of injecting chlorine gas but also reduces the workload for operators, contributes to environmental improvement with no fluorine gas, reduces emissions and odours, and reduces or removes chlorine gas completely, as well as reducing treatment time and dross generation, which all lead to improved metal yield.