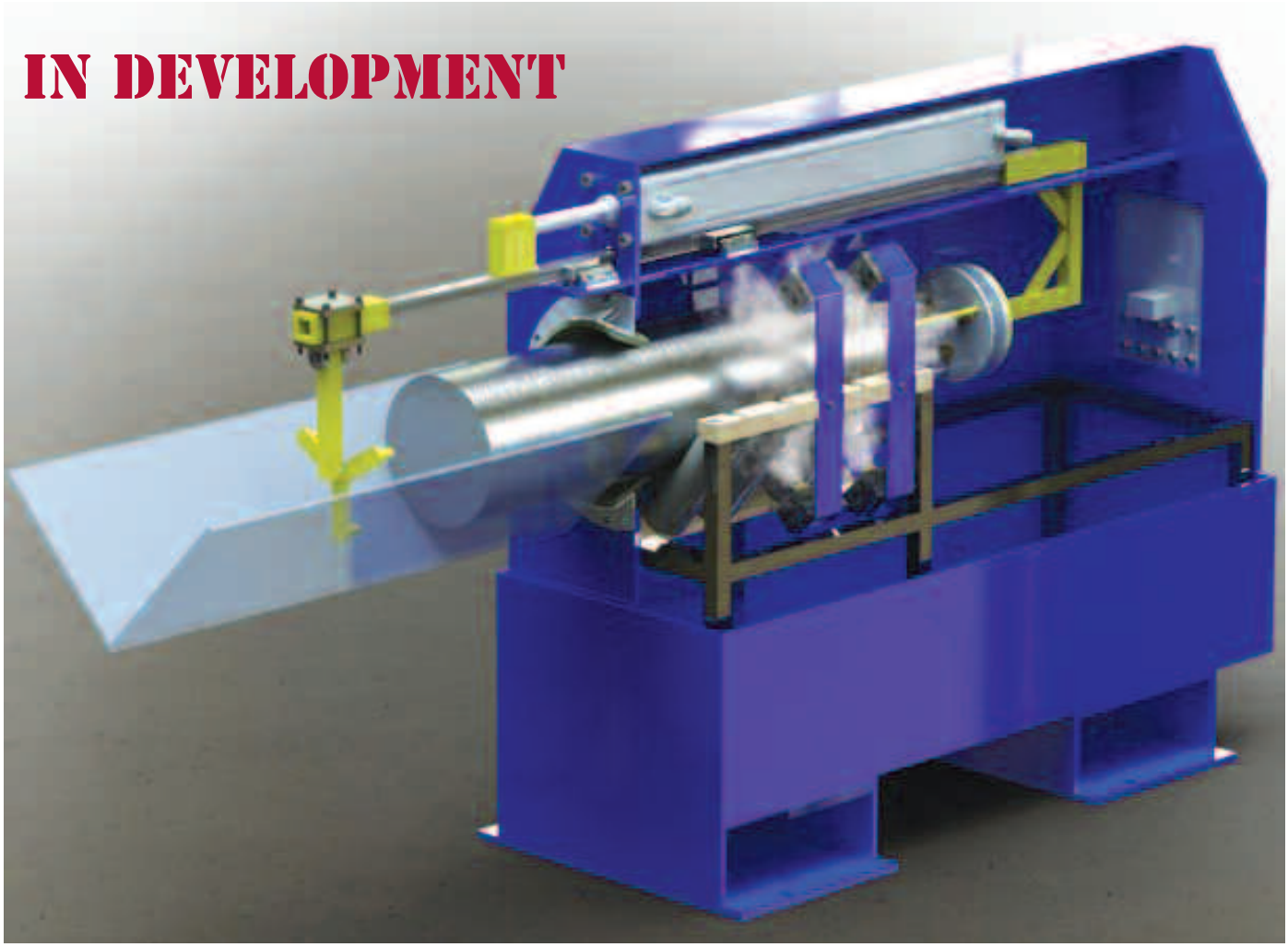
CASTOOL
TOOLING SYSTEMS

BILLET LUBRICATION



EXTRUSION

Liquid Boron Nitride Application:

Extruders apply boron nitride traditionally with a dry powder electrostatic application, using the release agent characteristics of boron nitride to avoid dummy block surfaces sticking to the rear face of the billet to ensure any extrusion butt stays attached to the die prior to shearing. Use of boron nitride is successful in that it satisfies the objective of acting as an effective release agent. However, difficulties in maintaining a full electrostatic charge often results in the need for over application with resulting powder overspray losses and housekeeping issues around both the boron nitride applicator and billet loading equipment.

Castool Tooling Systems has developed a unique process of application of liquid boron nitride to a preheated extrusion billet prior to loading into the press. The process enables improved coverage compared to boron nitride powder application with much less overspray and lower consumable costs, with the additional benefit of cooling the rear of the billet prior to extrusion, thus enabling higher extrusion speeds.

The process applies liquid boron nitride solution using high pressure low volume atomization nozzle technology. High pressure atomized spray is capable of penetrating the thermal barrier (insulating steam layer) normally generated during most water spray quenching processes. Penetration of the thermal barrier, which has been an obstacle to successful liquid application in the past, is now possible. The use of high pressure atomization therefore allows more effective adhesion of boron nitride and improved efficiency of boron nitride application = lower consumable costs.

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It is well recognized that taper preheating of billet is an effective means toward high productivity isothermal extrusion. During transfer of a billet from billet oven to press, there is opportunity to hold the billet at the liquid boron nitride station, and prior to application of a boron nitride solution the rear face of the billet can be sprayed with atomized water for up to 20 secs (or longer if the extrude cycle allows). Low volume high pressure application of a fine droplet spray ensures most of the water is evaporated, resulting in high heat transfer from the billet. Modeling predicts that 20 seconds spray can create a 50-100º C taper difference in billet temperature front to back end immediately prior to loading the billet into the container. Trials have demonstrated that this level of taper can result in a 15% extrusion speed improvement. After spraying with water for a predetermined interval to cool the billet rear face, the unit then efficiently sprays with a boron nitride solution. While atomization is designed to ensure close to 100% vaporization, any excess water or solution that may result can readily be captured and recycled for re-use.

Using a colder rear end on a billet is effectively the same as extruding with a colder dummy block. It is known that colder dummy block temperatures are effective in reducing rear end scrap %. Using the relationship developed by Jowett in his ET2000 paper on Simulation of Flow of Billet Surface, it can be estimated that a colder dummy block and colder billet back end, when lubricated with BN will reduce extrusion rear end scrap with a net recovery gain greater than 1%, plus additional live cycle time benefits of not having to extrude that material.

Efficient application of a boron nitride liquid solution using the Castool spray atomization method offers benefits of not only reducing boron nitride costs, improving adhesion of boron nitride to the preheated billet surface, but more so is capable of significantly increasing extrusion speed, recovery and net productivity by cooling the rear end of the billet. Payback can be close to immediate!

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