

# DAYTON DATA SHEET

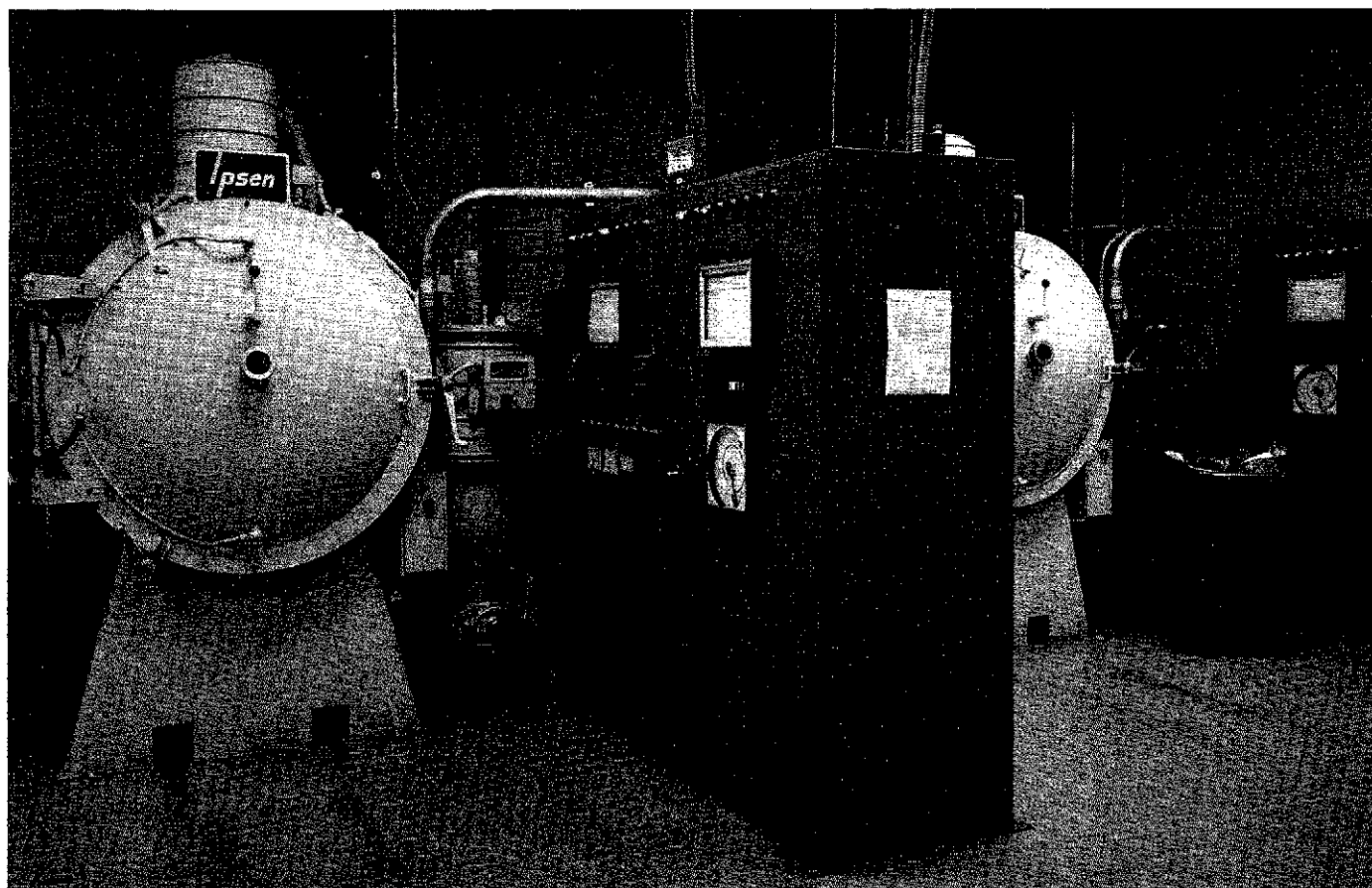
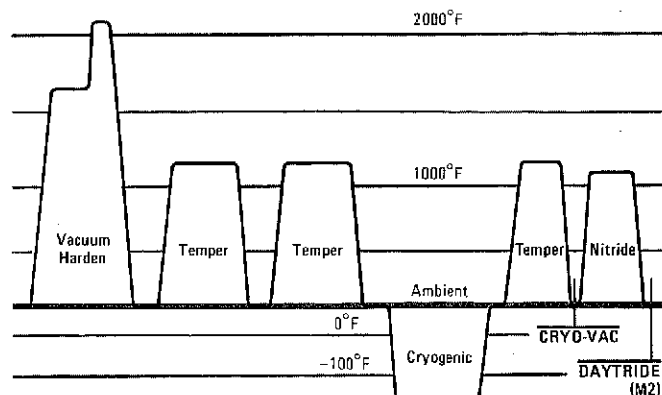
## HEAT TREATMENT OF A2 • M2 • D2

The total performance of a punch is in direct proportion to the quality of the heat treat process. Inferior heat treatment results in poor performance, increased wear and less hits between grinds. There are other punch characteristics such as finish, geometry, size control, straightness, etc., that are easily checked, but are only a small function of the total performance. Yet heat treat, the element that more directly affects results is normally overlooked or taken for granted by the user, and most manufacturers, but not Dayton Progress.

furnaces. The results are the normal inconsistencies associated with the human element. At Dayton, A2, D2, & M2 are all run through the two pre-programmed vacuum furnaces, thereby, eliminating the human error. The final result is a tool with fine grain structure, shock resistance, wear resistance and consistently done day after day, year after year.

### VACUUM HEAT TREATMENT

Whenever tool steel is heated in excess of 1200°F, the best atmosphere is no atmosphere in preventing decarbonization or carburization. The effect of these two can be: loss of wear resistance, cracking, size instability, and low fatigue resistance. Punches are heated in a vacuum and then quenched with an inert gas (without removing them from the furnace). They are so bright and clean, it is difficult to differentiate between hardened and unhardened punches. Temperature, time at temperature, pre-heat time and quench rate are all equally as important as the furnace atmosphere. These are controlled manually under every method except vacuum



Two programmable vacuum furnaces in a laboratory environment at Dayton's plant.

## CRYO-VAC

A leading steel company chart indicates that proper heating and quenching of high speed steel followed by a single temper yields 16% retained austenite. After the second temper there is 4.7% retained austenite. The phase tool steel is in, at the heat treating temperature, is austenite and upon quenching transforms to martensite, which is a larger, wear resistant structure. The obvious objective is as complete a martensitic transformation as possible. A modern method of insuring complete martensitic transformation is exposing the tool to sub-zero temperatures often called cryogenic treatment. All Versatile punches, in addition to being vacuum heat treated, are cryo-genically treated (Cryo-Vac) at no additional cost.

The advantages of Cryo-Vac are:

1. Most complete martensitic transformation.
2. Additional wear resistance.
3. Increase fatigue resistance.
4. Relievs stresses and increases aging stability.
5. Increases shock resistance (breaking).

## DAYTRIDE™

A unique wear resistant treatment, integrating Cryo-Vac with Nitriding (M2 only) is a process that introduces nitrogen into the metal surface. The tool is immersed in a 950° to 1050°F salt bath. The depth of penetration is a function of time and temperature. Too great a depth results in embrittlement, unsuitable in punching applications. Daytride™ has a controlled depth of .0003 to .0005 deep case with a hardness of 68 to 70 RC.

Daytriding can improve the life of most any application with the exception of when the problem is punch breakage. Daytride should be tried when there is a pickup or galling of the punch. Shave punches, which wear up the flank, are improved by Daytriding. The extreme high surface hardness is beneficial on materials such as stainless, glass epoxy boards, blue temper spring steel, high silicon steel and painted steel. The relative low additional cost could make it practical to use universally.

