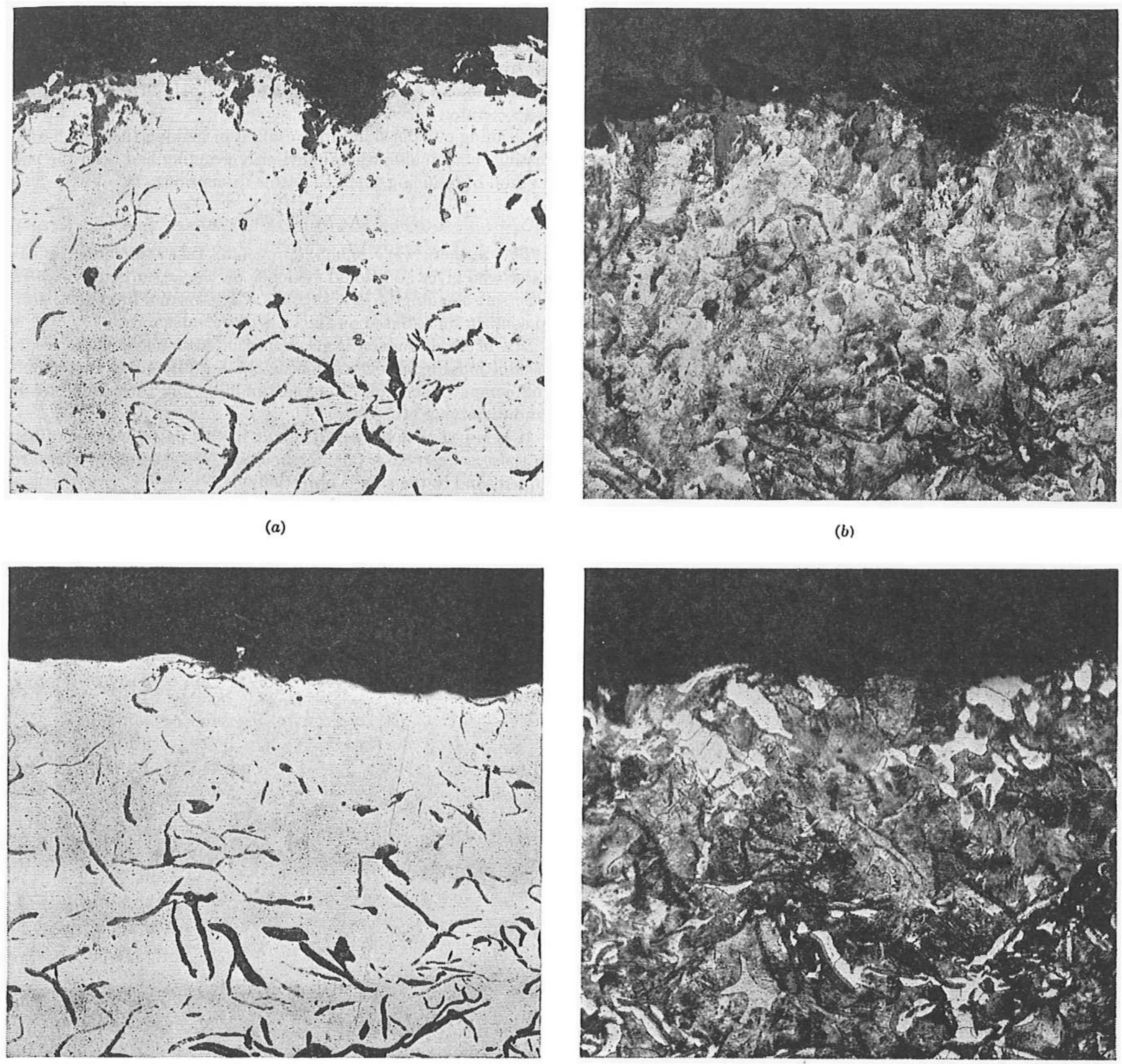

(*a*) (*b*) (*c*) (*d*)

Fig. 9 Photomicrographs of Cast Surfaces; ×100

(*a*, Unetched tumbled surface reveals rough decarburized surface. *b*, Etched tumbled surface reveals pearlitic structure. *c*, Unetched shot-blasted surface. Shot-blasting produces a smoother surface than tumbling. *d*, Etched shot-blasted surface shows pearlite and ferrite.)

Discussion

J. A. Faler.[6] We wish to commend the authors of this paper for their excellent observation of a subject generally ignored by metallurgists. Since a large percentage of production machining is the removal of the cast surface, an evaluation of the machinability of these surfaces is of genuine interest to production engineers.

Our personal interest in this information is a result of the observation of the operation of electroytic salt-bath processes installed for the removal of burned-in sand, scale, and so forth, from castings used in hydraulic and lubrication systems.

[6] Chief Engineer, Kolene Corporation, Detroit, Mich. Mem. ASME.

It was observed at one plant, on an operation involving facing, boring, and chamfering stress-relieved gray-iron housings with single-point carbide tools, that there was approximately a 100 per cent increase in tool life, with electrolytic salt cleaning of the surfaces over sandblasting.

With brass and bronze, the removal of sand inclusions much more noticeably affects tool life. In one case an improvement of several hundred per cent was noted.

It is apparent that much faster cutting speeds and longer tool life can be obtained by the removal of scale, burned-in sand, and sand inclusions. This is especially noticeable in making forming cuts. On an experimental setup it was determined that a gray-iron cast surface that had been prepared in an electrolytic salt bath had only slightly more abrasiveness than the base metal (as determined by tool wear). At the same time, the tool wear was less than one tenth that experienced with the same type of casting prepared by tumbling only. An even more pronounced difference has been shown to exist in a spot-facing operation.

Preliminary estimates of one company show a possible tool saving of over $350,000.00 per year on machining three parts for one engine alone if the abrasiveness of the "as-cast" surfaces could be made to approach that of the base metal.

D. H. Mills.[7] In reply to this excellent paper the writer concurs heartily with the authors. His research experience is limited, however, to the heated sodium-hydroxide process of dissolving the sand from the surface of castings. Further experience with tool life in machining high-alloy cast valves shows a parallel condition after making proper allowance for the more-difficult-to-machine alloy.

Microscopic examination of castings showed that a minimum of shot blasting and tumbling prior to the sand-dissolving process is desirable because the tumbling and blasting can and do peen the metal right over some of the sand particles. This prevents the solution from contacting the impacted sand particles and they constitute an abrasive trapped in a softer matrix and are therefore capable of making score lines on the tool bit which, in effect, is accelerated wear.

Cleaning out the skin sand resulted in making these high-alloy castings machinable where previously grinding had been the only method of reducing them to usable dimensions.

[7] Ford Motor Company, Manufacturing Research, Dearborn, Mich.

Authors' Closure

The authors very much appreciate the comments of Mr. Faler who gives additional evidence on the advantage of electrolytic salt cleaning of cast surfaces. The results in general seem to confirm those based on the tests of the authors.

Mr. Mills' discussion is also appreciated as he gives the results of additional experience when machining high-alloy cast metals and compares shot blasting and tumbling and their value to the sand-dissolving processes.

It is hoped that the results given in this paper may be of help to those concerned with the machining of cast metals where retained sand in the skin is objectionable.