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MECHANICAL SENSITIVITY OF PBX 9501

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DEVELOPMENT DIVISION

OCTOBER - DECEMBER 1976

Normal Process Development
Endeavor No. 105

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ABSTRACT

Skid tests, vertical drop tests and drop hammer tests were done on PBX 9501 (nominal composition 95.0/2.5/2.5 HMX/Estane 5703-F1/DNPAF) to determine its sensitivity to mechanical stimuli. The sensitivity of PBX 9501 is considered to be very low.

DISCUSSION

Skid testing was performed on PBX 9501 (Lot 622-7) to determine if any handling hazards exist. The average billet density for the skid and vertical drop tests was 1.836 Mg/m^3 or approximately 99% TMD. Drop heights and impact angles are tabulated in Table I. No reactions were observed up to the highest height at which testing was done. Higher heights were not done due to the difficulty in consistently impacting the target properly. These tests indicate a low sensitivity to skid test stimuli.

Table I. PBX 9501, Lot 622-7

Skid Test Results

14°		45°	
Height (m)	Reaction	Height (m)	Reaction
0.76	0,0,0	2.16	0,0,0
1.07	0,0,0	3.05	0,0,0

A series of vertical drop tests was also done. Results are tabulated in Table II. Fig. 1 gives a plot of the maximum contact spot diameter for PBX 9501, LX-04-1, PBX 9404 and PBX 9011 as a function of the billet impact velocity. As can be seen PBX 9501 is less stiff (more compliant) than either PBX 9011 or LX-04-1 and is considerably less stiff than PBX 9404. The fact that the stiffness of PBX 9501 is rather low partially explains its low sensitivity in the skid test.

The drop hammer sensitivity (H_{50}) of the material was found to be 40 ± 1 cm on type 12A tooling. This represents only moderate sensitivity in the drop hammer test. In comparison, LX-04-1, PBX 9404 and PBX 9011 have a H_{50} of 41, 34 and 44 cm, respectively.

COMMENTS, CONCLUSIONS

PBX 9501 (Lot 622-7) exhibits a relatively low sensitivity in the skid test. Vertical drop tests indicate this material is fairly compliant. Drop hammer tests show only a moderate sensitivity.

Table II. Vertical Drop Test Summary

Drop No.	Drop Height (mm)	Billet Weight (kg)	Contact Spot Diameter (mm)	COR	κ	RMS (MPa)	γ (ms)	Zm (mm)	E (MPa)	I	ε (m/m)	$\dot{\varepsilon}$ (m/m/s)	θ	NRMS (kN)
221	19.57	10.478	16.51	0.520	1.373	35.12	1.282	0.558	1478	1.422	0.00391	3.115	0.103	6.326
222	37.58	10.471	19.56	0.532	1.383	35.42	1.259	0.778	1349	1.389	0.00557	4.420	0.127	9.258
223	76.44	10.481	23.37	0.482	1.536	38.24	1.147	0.999	1397	1.404	0.00715	6.239	0.171	14.034
224	305	10.475	30.99	0.397	1.626	50.20	0.982	1.660	1384	1.445	0.01188	12.099	0.134	31.633
225	610	10.478	36.58	0.385	1.733	54.77	0.916	2.170	1395	1.459	0.01553	16.954	0.127	47.619

COR = Coefficient of Restitution
κ = Area-Approach Constant
RMS = RMS Flow Stress
γ = Compression Time to Maximum Billet Approach
Zm = Maximum Billet Approach
E = Elastic Parameter
I = Impact Number
ε = Apparent Contact Strain
$\dot{\varepsilon}$ = Apparent Contact Strain Rate
θ = Relative Time Delay
NRMS = RMS Normal Force

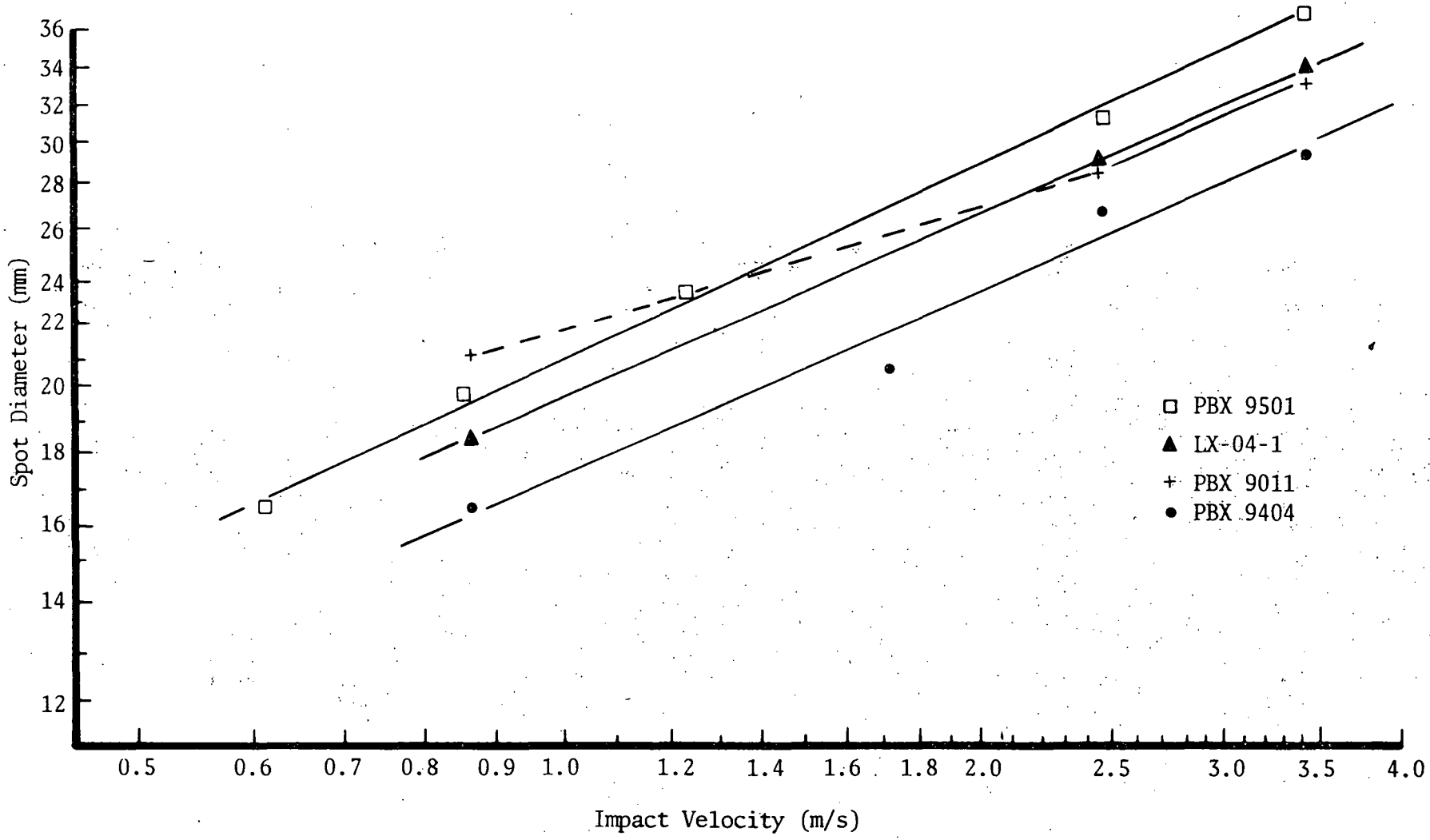

Fig. 1. Maximum Contact Spot Diameter as a Function of Impact Velocity