

Determination of isocyanate exposure resulting from the application of polyurethane adhesives

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In the summer of 2003, isocyanate exposure in ambient air was measured at four companies that use PUR adhesives made by Purbond. All adhesives investigated were moisture-curing one-component PUR adhesives (1C-PUR) on the basis of diphenylmethane-diisocyanate (MDI). Six different sites were investigated in order to cover a variety of different exposure scenarios. Table 1 shows the measuring sites, the number of filters per site, and the PUR products used.

Table 1: Measuring sites, number of filters, and Purbond products used by the investigated companies

Company	Measuring site	No of filters	PUR product
CH1	Finger-jointing machine	3	PURBOND® HB 440
	Extruder head cleaning (personal sampling)	2	
	Face gluing station 1 (face gluing and pressing)	4	
CH2	Face gluing station 2 (face gluing only)	4	PURWELD 663
AUT1	Pressing station	2	PURBOND® HB 440
AUT2	Curing facility	2	PURBOND® HB 530

Adhesive application was performed via bead applicator heads (face gluing station) or via finger-type extruder heads (finger-jointing machine). Application, curing, and pressing were performed at room temperature.

Fig. 1 shows the MDI concentrations at the six measuring sites in comparison with the TLV (Threshold Limits Value) for MDI (50 µg/m³). All measured MDI concentrations are at least 120 times lower than the TLV.

Fig. 1: MDI concentrations at the six measuring sites in comparison with the TLV for MDI (50 µg/m³)

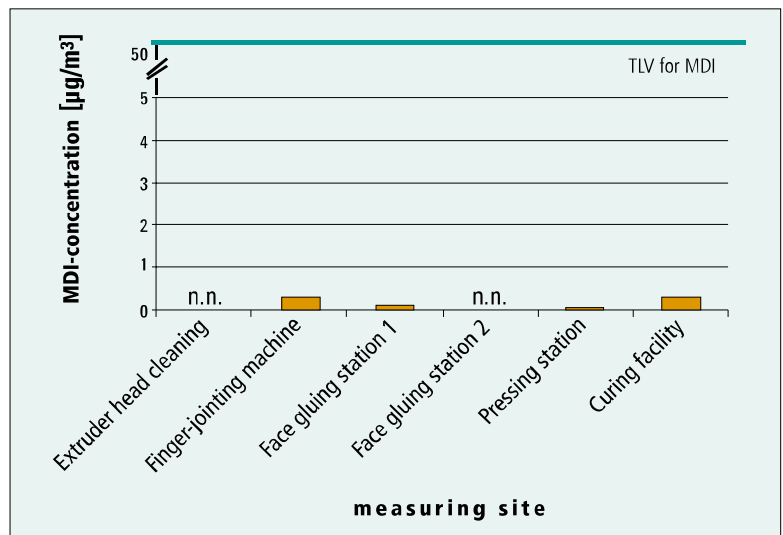
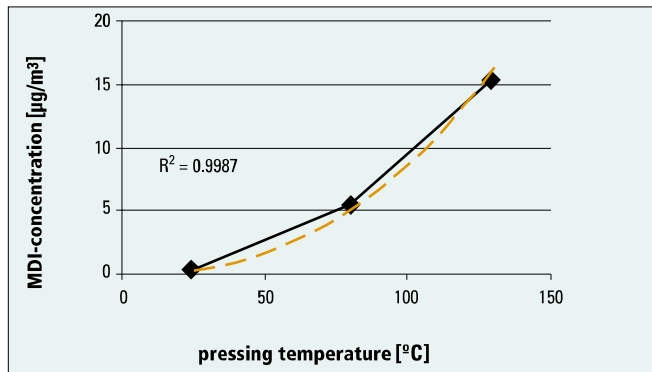


Fig. 2: Influence of pressing temperature on MDI emissions



A laboratory trial was performed in order to determine the effect of temperature on MDI emission. MDI emission was measured during pressing at three different pressing temperatures. An adhesive quantity of 250 g/m² was applied at each temperature. All measured MDI concentrations are at least three times lower than the TLV (Fig. 2). Higher pressing temperatures correlate with higher MDI concentrations in the air.

Conclusions:

At all six measuring sites, MDI concentrations were at least 120 times lower than the TLV for MDI (50 µg/m³). On the basis of the defined TLV, these concentrations do therefore not affect occupational health at the examined workplaces. Especially susceptible persons and pregnant women may nevertheless incur a residual risk of developing an isocyanate allergy. Every effort should therefore be made to minimize MDI exposure at any time. This is accomplished with effective ventilation systems and optimal hygienic precautions (changing contaminated clothes, wearing gloves).

A summary of this thesis can be ordered at Purbond.