

**UNITED NATIONS
DEVELOPMENT PROGRAMME
*MONTREAL PROTOCOL UNIT***



**METHYLAL
AS BLOWING AGENT IN THE
MANUFACTURE OF
POLYURETHANE FOAM SYSTEMS**

AN ASSESSMENT FOR THE APPLICATION IN MLF PROJECTS

December 2011

PURPOSE

- **DETERMINE THE EXTENT TO WHICH ML CAN BE USED IN MLF PROJECTS**
- **NOT AN EXHAUSTIVE STUDY IN HOW THE TECHNOLOGY WORKS AND HOW IT CAN BE OPTIMIZED**

ASSESSED

SUBJECT

- **HSE, CURRENT USE**
- **SYSTEM/FOAM DETAILS**
- **COSTS, CONCLUSIONS**

COVERED BY

LAMBIOTTE

ARINOS

UNDP

SUMMARY OF PREVIOUS **ML PRESENTATIONS**

HSE

Health **No adverse health effects**

Safety **Safe for system users but flammability to be addressed**

Env't **No known adverse effects**

PROPERTIES

ISF/MF **Capable to replace HCFC-141b yielding the same or better properties**

FPF **Capable to replace HCFC-141b yielding the same or better properties.)**

SRF **Capable to replace HCFC-141b yielding the same or similar properties**

RPF **Capable to replace HCFC-141b but with insulation values 5-15% less.
No liner attack observed. Other properties the same or similar**

MARKET ACCEPTANCE

General acceptance from downstream users that tested ML

MLF CONVERSION COSTS

SYSTEM HOUSES

ACTION	CALCULATION
MF vapor monitor	2,000
Explosion Proofing of Blenders	AA x 30,000
Nitrogen Dispenser for Inertion	BB x 8,000
Spray/PIP Retrofit Packages	CC x 5,000
LPD/HDP Retrofit Packages	DD x 10,000
Pycnometer (closed cell tester)	5,000
(Portable) K-Factor Tester	10,000
Rent-out Dispenser(s)	EE x 10,000
Project Management	FF @ 1,000
Monitoring/TTT	30,000-50,000
Contingencies	10%

MLF CONVERSION COSTS

DOWNSTREAM USERS

ACTION	CALCULATION	
Spray/PIP Retrofit Packages	US\$	5,000
LPD/HPD Retrofit Packages	US\$	10,000
New Dispensers	US\$	15,000
Trials, Testing, Training	US\$	3,000
Contingencies		10%
Incremental Operating Costs/kg system	US\$	0.07

ML DETECTOR 0-2,000 ppm



CONCLUSIONS

- **ML IS A VALID ALTERNATIVE FOR HCFC-141b**
- **CONVERSIONS PREFERRABLY THROUGH LOCAL SYSTEM HOUSES**
- **FOLLOW LOCAL IH/FIRE REGULATIONS**
- **PROJECT DESIGNERS TO ASSURE THAT**
 - **CHEMICAL COMPATIBILITY IS CHECKED**
 - **MINIMUM DENSITY OBSERVED, AND**
 - **HSE RECOMMENDATIONS ARE INCORPORATED**

RECOMMENDATIONS (1)

UNDP recommends that the use of ML to replace HCFC-141b in PU foams be subject to the following conditions:

- Projects preferably implemented through local system houses;**
- Project designers to ensure that:**
 - Chemical compatibility is verified**

RECOMMENDATIONS (2)

- Implications related to flammability are addressed as follows:**

SYSTEM HOUSES

- Proper personal protective equipment**
- Closed blending containers, with (dry) nitrogen blanket**
- Explosion proof equipment**
- Electrically grounded equipment and drums**
- Methylal vapor sensor with alarm set on 20% (= ~TLV)**
- Adequate ventilation**
- Methylal metered under in the tank**
- Adherence to GHS, MSDS and local guidelines**

RECOMMENDATIONS (3)

DOWNSTREAM USERS

- **Proper personal protective equipment**
- **Electrically grounded equipment and drums (grounding clip)**
- **A methylal vapor sensor with alarm function set on 20% LFL (= ~TLV) LFL or an industrial hygiene survey by supplier or certified third party**
- **Adequate ventilation**
- **Adherence to international and local guidelines**