

PDR-OPS-008 LUBRICANT SELECTION GUIDE FOR SUB-ZERO ENVIRONMENTS

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Version 3.2 | Effective Date: January 15, 2024

Document Classification: Confidential - Internal Use Only

Polar Dynamics Robotics, Inc.

1. PURPOSE AND SCOPE

1. This document establishes mandatory guidelines for the selection,
2. These requirements apply to all BlueCore(TM)-enabled AMR mode

2. DEFINITIONS

1. "Sub-Zero Environment" refers to any operational environment with
2. "Critical Components" means any mechanical assembly or interface
3. "BlueCore(TM) Compatible" refers to lubricants that have been vali

3. APPROVED LUBRICANT SPECIFICATIONS

1. Primary Drive System Lubricants

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Viscosity Grade: ISO VG 32 or lower

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Pour Point: Below -45 C (-49 F)

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Minimum Viscosity Index: 140

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Synthetic base oil composition required

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Must meet or exceed MIL-PRF-23699G specifications

2. Articulation Joint Lubricants

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NLGI Grade: #1 or #0

-

Operating Temperature Range: -50 C to +80 C

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Must contain anti-wear (AW) additives

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Lithium complex thickener required

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Water washout resistance: <2% loss

3. Bearing Assembly Lubricants

-

Synthetic PAO base oil required

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Temperature range: -40 C to +120 C

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Maximum particle contamination: ISO 16/13

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Minimum base oil viscosity: 14 cSt at 40 C

4. SELECTION CRITERIA

1. Primary Selection Factors

- a) Operating temperature range
- b) Load characteristics
- c) Speed conditions
- d) Environmental exposure
- e) Service interval requirements
- f) Compatibility with seals and materials
- g) BlueCore(TM) technology compatibility

2. Environmental Considerations

-

Moisture exposure levels

-

Contamination risks

- - 5 -

Ventilation conditions

-

Chemical exposure potential

-

Washdown requirements

5. APPLICATION PROCEDURES

1. All lubricant applications must be performed by certified maintenance personnel.

2. Documentation Requirements

-

Lubricant type and batch number

-

Application date and technician ID

-

Component serial numbers

-

Quantity applied

-

Environmental conditions at time of application

3. Safety Protocols

-

Required PPE per SDS specifications

-

Proper ventilation requirements

-

Spill containment procedures

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Disposal protocols

6. MAINTENANCE AND MONITORING

1. Inspection Intervals

-

Daily visual inspections

-

Weekly performance monitoring

-

Monthly sample analysis for critical components

-

Quarterly comprehensive evaluation

2. Sample Analysis Requirements

-

Viscosity testing

-

Particle count analysis

-

Water content measurement

-

Oxidation stability

-

Wear metal content

7. QUALITY CONTROL

1. All lubricants must be sourced from approved vendors listed in PDF

2. Batch testing requirements:

-

Certificate of Analysis required

-

Conformance to ISO 9001:2015

-

Traceability documentation

-

Shelf-life verification

8. DOCUMENTATION AND RECORDS

1. Required Records

-

Lubricant inventory logs

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Application records

-

Maintenance reports

-

Analysis results

-

Non-conformance reports

2. Retention Requirements

-

All records maintained for minimum 3 years

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Electronic backup required

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Accessible through PDR-DOCS system

9. LEGAL DISCLAIMER

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10. REVISION HISTORY

Version 3.2 - January 15, 2024

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Updated temperature specifications

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Added BlueCore(TM) compatibility requirements

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Revised maintenance intervals

Version 3.1 - July 1, 2023

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Updated vendor requirements

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Added new safety protocols

Version 3.0 - January 1, 2023

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Complete document revision

- - 13 -

Incorporated new ISO standards

Document Control

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Approved by:

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Dr. James Barrett, Chief Robotics Officer

-

Sarah Nordstrom, Chief Operating Officer

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Marcus Chen, Chief Technology Officer

