ASSOCIATION OF PLASTIC RECYCLERS

SORTING POTENTIAL TEST METHOD:

A Practice for Compressing Plastic Articles for Laboratory Evaluation

DOCUMENT NUMBER: SORT-P-00

Revision Date: March 6, 2025

Introduction

Scope, Significance, and Use

This practice presents the steps used in the laboratory to simulate the compression that occurs in a garbage truck when articles are transported from the curb to a material recovery facility (MRF). This is an important step when evaluating sortation performance since articles processed at the MRF and plastic reclaimer have undergone this potentially shape changing process prior to sortation.

Reference Documents

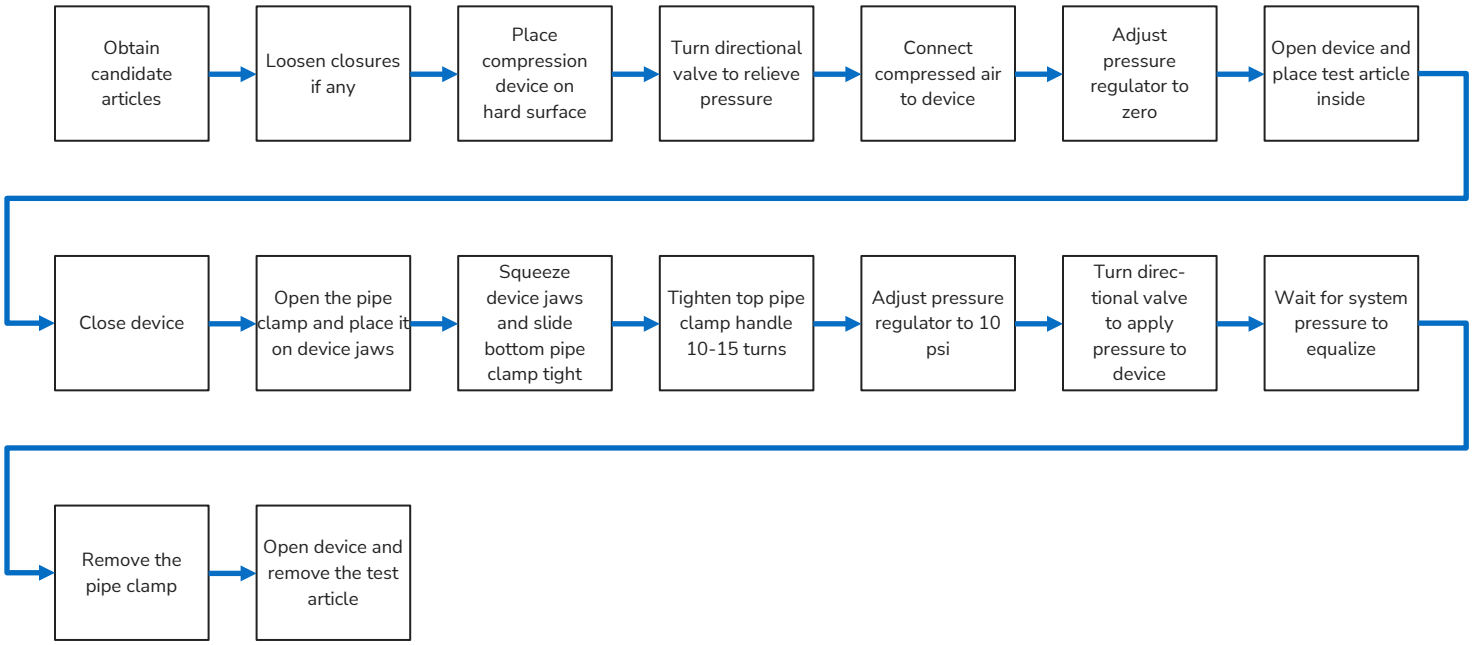
None

Hazards and Safety Statemen

This practice involves handling plastic items, lifting hinged equipment and using compressed air. The operator should have a working knowledge of the operation of pneumatic valves and regulators and the dangers that can be created by pressure. It is extremely important to follow all safety precautions.

Practice Summary and Flow Diagram

The flow diagram below outlines the compression practice.



Equipment Required

- Compression device and pipe clamp constructed per annex 1 to this document
- Air compressor or centralized compressed air system

Materials Required

- Test Articles – quantity according to the test method to be performed after compression.

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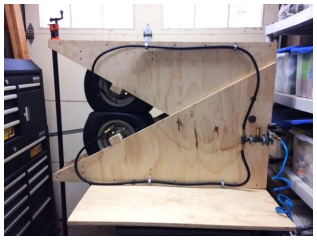
Practice Steps

1. Obtain candidate articles of sufficient quantity to satisfy the test method(s) to be performed after the compression practice. Note: all closures, attachments and labels should be included since the goal of tests requiring compression is to simulate articles as they are presented to the sorting system in real life.

2. Loosen but don't remove closures. Insure the closure is loose enough that air escapes easily when the container is squeezed by hand.

3. Place the compression device on a hard, sturdy, flat surface with 4 – 6 inches hanging off the edge.



4. Turn directional valve handle to release pressure from device.

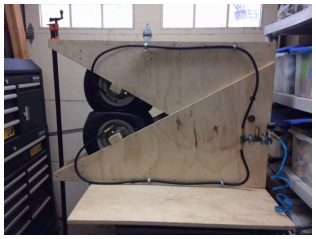
5. Connect the compressed air system to the compression device.

6. Adjust the pressure regulator to " 0" in order to stop all air from flowing downstream.

7. Open the compression device and place one test article between the tires with the cap facing away from any people.

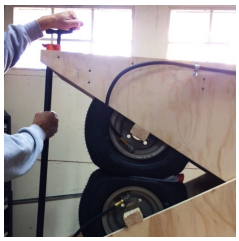
8. Close the compression device.

9. Open the pipe clamp jaws and place the pipe clamp on the compression device as shown.



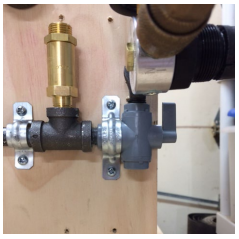
10. While pulling down on the compression device and top of pipe clamp, slip the bottom moving jaw of the pipe clamp as close to the other jaw as possible.

11. Turn the top pipe clamp adjustment handle 10-15 full turns to apply mechanical pressure to the test article.



12. Adjust the pressure regulator so that the downstream pressure is 10 psi.

13. Turn the directional valve handle so the air pressure is applied to the device.



14. Wait for the system to equalize (typically 15-20 seconds). During this time it is common to hear creaking from both the package and the device.

15. Turn the directional valve handle to relieve the downstream pressure.

16. Remove the pipe clamp.

17. Open the compression device and remove the test article.

18. Repeat for the remaining articles.

19. Allow test articles to sit 30 minutes before testing to simulate the time the article sits on the MRF tip floor. All following tests should be completed within 16 hours of the compression of the first article.

Measurements

None

Table and Figures

None

Annex 1: Compression Device Construction

Materials Required		
Reference	**Quantity**	**Description**
1	2	18 x 850 – 8, 4-hole golf cart tire and wheel (Home Depot part #205719722)
2	1	4’ x 8’ x ¾” (23/32) B-C or better plywood
3	1	2” x 4” x 8’ framing grade lumber
4	1	2” x 10” x 8’ framing grade lumber
5	1	2" x 3" x 8' framing grade lumber
6	1 lb	2” exterior grade flat head screws
7	16	2 ½” exterior grade flat head screws
8	2	¾” steel threaded pipe caps
9	1	12“ long, ¾” steel pipe nipple, threaded both ends
10	2	Air Chuck, ¼ NPT female air inlet with valve stem clip (McMaster-Carr #6140A62)
11	1	PVC On-Off Valve, directional control, ¼ NPT female (McMaster-Carr #4757K52)
12	2	Air hose, ¼ x ¼ brass NPTF male, 200 psi, black, 5’ long (McMaster-Carr #1593N1)
13	2	Low pressure pipe fitting, iron, tee, ¼ NPT female (McMaster-Carr #44605K152)
14	1	Standard wall steel pipe nipple threaded both ends, ¼ pipe size, 2” long (McMaster-Carr #44615K432)
15	2	Standard wall steel pipe nipple threaded both ends, ¼ pipe size, close (McMaster-Carr #44615K412)
16	1	Standard wall steel pipe street elbow, ¼ pipe size (McMaster-Carr #44605K132)
17	1	Compact compressed air regulator, relieving, Al housing, ¼ NPT, 0-25 psi (McMaster-Carr #6763K82)
18	1	Fast-acting pressure relief valve for air, ¼ NPT male, 15 psi set pressure (McMaster-Carr #4772K4)
19	1	¼” compressed air quick connection to match existing compressed air hose
20	5	2 hole strap for ½” conduit
21	1	2 hole strap for ¾” conduit
22	1	Any length bar clamp for ¾” pipe size (McMaster-Carr #5063A11)
23	1	Standard wall steel pipe, ¾” diameter, 5’ long, threaded both ends
24	12	#8 x ¾” pan head wood screws

TOOLS REQUIRED

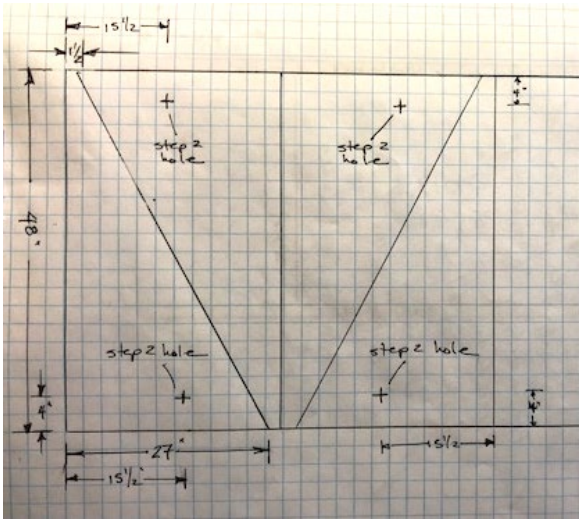
- Circular saw
- Hand held drill
- Miter or hand saw
- 1-1/8” hole saw or forstner bit
- Tape measure
- Chalk line or straight edge
- Liquid pipe sealant suitable for pneumatics
- 2 Channel-lock pliers

Annex 1: Compression Device Construction (continued)

INSTRUCTIONS

Fabricate the Jaws:

1. Lay the plywood (#2) flat and cut 4 pieces as shown.

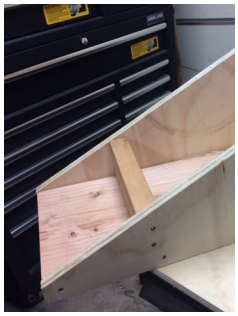


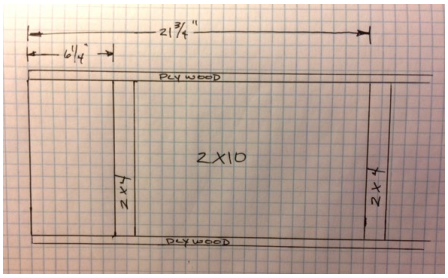
2. Drill a 1-1/8" hole through each plywood piece as shown at the points previously marked.

3. Cut the 2x10 (#4) into 2, 4' long sections

4. Align two of the cut plywood sections as shown with one of the cut 2 x 10's and fasten using the 2" screws (#6) on 8" centers. Repeat with the remaining pieces.

5. Cut the 2x4 (#3) into 4 pieces 9 ¼" long, position and fasten these pieces to the plywood as shown using 2" screws (#6).





6. Deflate the tires and set them between the plywood pieces and the 2 x 4's as shown with valve stems accessible, the valve stem of the two sets opposite each other.


7. Cut the 2 x 3 (#5) into 2 pieces 10 ¾" long and drill 2, 1/8" diameter holes 3/8" from either end as shown.

8. Place the 2 x 3's through the center holes of the tires, square the pieces to the plywood and fasten to the plywood through the predrilled holes using the 2-1/2" screws (#7).

9. Thread one ¾" pipe cap (#8) onto the 12", ¾" pipe nipple (#9).

10. Using 2 people, align the two device jaws so that the holes are aligned. Insert the pipe nipple through the entire assembly and thread the final ¾" pipe cap onto the exposed end.


Fabricate and Attach the Pneumatic Assembly:

1. Using a limited amount of pipe liquid pipe sealant connect the following as shown:
    a. a ¼" pipe tee (# 13)
    b. the 2", ¼" dia pipe nipple (#14)
    c. a ¼ " pipe tee (#13)
    d. the pressure relief valve (#18)
    e. a ¼" close nipple (#15)
    f. the directional valve (#11) (insuring it is oriented as so that the compression device side of the valve is switched between the atmosphere and the compressed air supply)
    g. the ¼" street elbow (#16)
    h. the regulator (#17) (insuring the gage is threaded into the upward gage port, a plug ins inserted into the bottom gage port and the port marked "IN" is positioned correctly)
    i. the quick connector

2. Thread one air hose (#12) into each end of the pipe tee.

3. Thread one air chuck (#10) onto the exposed end of each air hose.

4. Using the ½" and ¾" 2-hole straps (#20 and 21) and the ¾" screws (#24) attach the pneumatic assembly to the jaws as shown. Connect the air chucks to the valve stems.

Assemble the Pipe Clamp:

1. Thread the side of the clamp (#22) onto one end of the 5' long ¾" pipe.

2. Slide the traveling end of the clamp up the pipe from the other end.

3. Attach the stop to the free end of the pipe clamp.

Disclaimer

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Document Version History

Version	*Publication Date*	*Changes Made*
1	January 8, 2018	Original
2	August 30, 2024	Revised naming convention of testing protocol from SORT-PR-01 to SORT-P-00
3	March 6, 2025	Added additional timing to practice step #19 for compression testing