7000/9000 SERIES AIR CART

MINIMUM FAN SPEED CHART MANUAL

0252-90-10

Original Instructions

Table of Contents

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1 Fan Speed Charts

Important

The charts listed in the following manual were created using a Bourgault air cart and Bourgault seeding unit/distribution system. The charts listed in this manual are only accurate and valid with a Bourgault seeding system.

Changes to the Bourgault distribution system, installing a Bourgault air kit on a competitor seeding unit, or using a Bourgault tank with a competitive drill will require the end user to calculate their own minimum fan speeds needed for each product. These charts are not applicable for those scenarios.

Bourgault ships all 7000 and 9000 Series carts with ¾" fan circuit hydraulic couplers, and all cross tillage hydraulic hoses with ¾" couplers to supply the fan's hydraulic requirements. For maximum fan efficiency and RPM these couplers should not be downsized for any reason.

The stationary method listed in the *Section 1.2* was used to construct the charts listed in this manual.

Terminology

1. **Cleanout** - This is when the airstream goes from carrying product in the air stream to having only air traveling through the transfer lines.
2. **Loaded Fan Speed** - Stable fan RPM displayed when product is being metered into the distribution system.
3. **Unloaded Fan Speed** - Stable fan RPM displayed when there is no product being metered into the distribution system.
4. **Ports** - Number of manifolds feeding the drill from the Primary Manifold.

Important

Any seeding condition, including product density, product size, relative humidity, and seed treatments, can all have an effect on the Minimum Required Fan speed for any product.

The charts listed herein are a **GUIDE** based on optimum conditions. Operators should calculate the required fan speed using the method listed in the *Section 1.2* for any change to seeding conditions.

Important

When the metering augers are shut off, count the number of seconds that elapse until most of the product has cleared the seed boots. The interval between shutting off the augers and product coming out of the seed boots should be less than 4 seconds at the main frame (expect the odd kernel to come out for 5~10 seconds after the majority of product has cleared). If it is greater, the fan speed must be increased.

Changes in performance may occur over time due to factors including seed treatments and high humidity.

1.1 Reading Fan Charts

The following information will assist in reading the fan charts provided.

1. Verify your model and width.
2. Check your opener spacing. If unsure of the spacing, measure the distance between 2 adjacent openers, this measurement is your unit spacing.
3. Count the number of ports on the primary manifold. This is the manifold being fed by the 6” (152.4 mm) or 7” (177.8 mm) pipe from the air cart, refer to *Figure 1.1*.

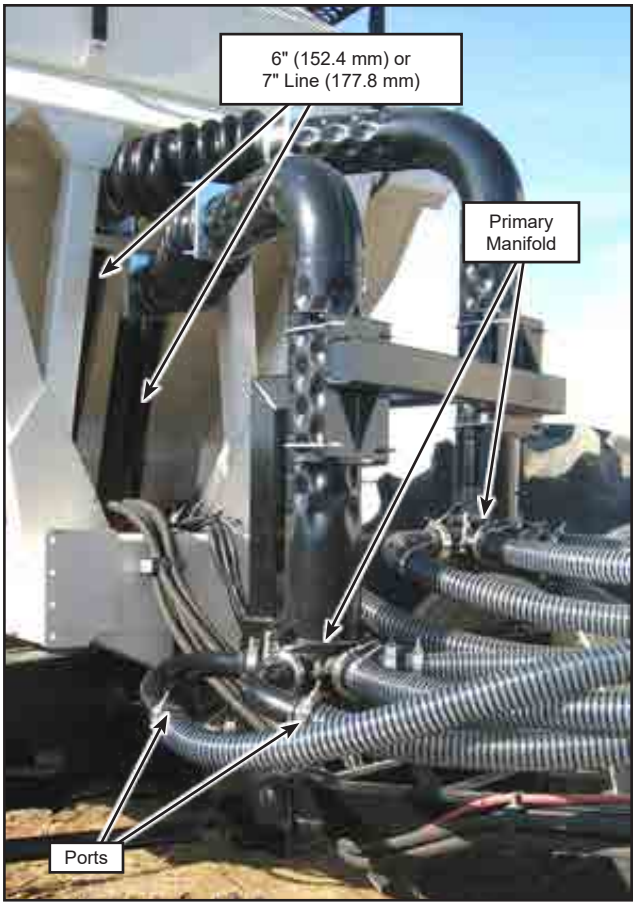


Figure 1.1 - Primary Line, Manifold and Ports

(Double Shoot is shown)

4. Verify the type of fan on your air cart.
5. There are 3 methods to distinguish between the High-Speed, High-Capacity, and High-Pressure fans. Refer to *Figure 1.2*.
   a. The high-speed fan has a plastic molded transition between the fan housing and the 7” (177.8 mm) distribution piping. The high-capacity and high-pressure fans have a steel formed transition between the fan housing and the 7” (177.8 mm) distribution piping.
   b. The high-speed fan has a 3-3/4” (95 mm) wide fan housing. The high-capacity fan has a 4-3/4” (121 mm) wide housing. The high-pressure fan has a 4-1/4” (108 mm) wide housing.
   c. High-speed and high-capacity fans have smaller housing as they use 18" (457 mm)diameter rotor. The high-pressure fan has a much bigger housing, as it accommodates a 24-1/2" (622 mm) rotor.

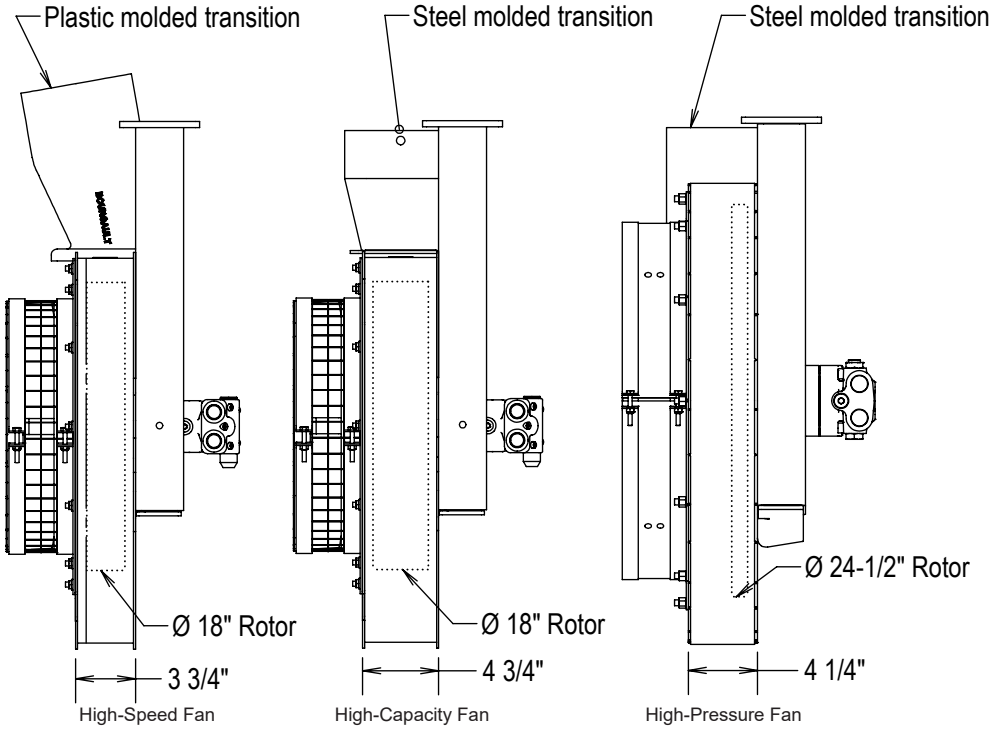


Figure 1.2 - Fan Identification

6. Once you have recorded this information refer to *Figure 1.3* for system with regular air kit or *Figure 1.4* for systems with 3" air kit to find the charts specific to your seeding system and applied product.

Note

If you are applying a blend or there is no chart for your product please follow the instructions in *Section 1.1.2 - Determining Fan Speed For Unlisted Products* to calculate a minimum fan speed required.

Drill Configuration			Chart Required					
			Section A (Trailing Units)			Section B (Leading Units)		
Model	Spacing	Number of Ports	High-Speed Fan	High-Capacity Fan	High-Pressure Fan	High-Speed Fan	High-Capacity Fan	High-Pressure Fan
3320/3330/ 3335 - 50 ft	10	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 60 ft	10	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 66 ft	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 76 ft	10	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F
3320/3330/ 3335 - 80 ft	10	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	N/A
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 86 ft	10	10	4A ~ 4F	6A ~ 6F	12A ~ 12F	N/A	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	N/A	N/A	N/A
	12	10	4A ~ 4F	6A ~ 6F	12A ~ 12F	N/A	34A~34D	32A~32F
3420 - 80 ft	10	8	N/A	5A ~ 5F	15A ~ 15F	N/A	14A ~ 14D	13A ~ 13F
	10	10	N/A	6A ~6F	12A ~ 12F	N/A	14A ~ 14D	N/A
	12	8	N/A	5A ~ 5F	15A ~ 15F	N/A	14A ~ 14D	13A ~ 13F
	12	10	N/A	6A ~6F	12A ~ 12F	N/A	N/A	N/A
3420 - 100 ft	10	10	N/A	11A ~ 11F	12A ~ 12F	N/A	N/A	N/A
	12	10	N/A	11A ~11F	12A ~ 12F	N/A	N/A	N/A
3545-100 ft	10	10	N/A	43A ~ 43F	44A ~ 44F	N/A	N/A	N/A
	12	10	N/A	43A ~ 43F	44A ~ 44F	N/A	N/A	N/A
3720 / 3820 40 ft	7.5	8	N/A	42A ~ 42F	N/A	N/A	N/A	N/A
	10	6	N/A	N/A	N/A	N/A	N/A	N/A
	12	5	N/A	N/A	N/A	N/A	N/A	N/A
	12	6	N/A	N/A	N/A	N/A	N/A	N/A
3720 / 3820 50 ft	7.5	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	10	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3720 / 3820 60 ft	7.5	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	10	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8f	10A ~ 10F	N/A
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8f	10A ~ 10F	N/A
3720 / 3820 70 ft	7.5	10	N/A	41A ~ 41F	N/A	N/A	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F

Drill Configuration			Chart Required			
			Trailing Units		Leading Units	
Model	Spacing	Number of Ports (Primary Manifold)	High-Speed Fan	High-Capacity Fan	High-Speed Fan	High-Capacity Fan
4420-18	250mm	6	1A~1F	N/A	N/A	N/A
	300mm	6	1A~1F	N/A	N/A	N/A
	250mm	8	2A~2F	5A~5F	38A~38F	37A~37F
	300mm	8	2A~2F	5A~5F	38A~38F	37A~37F

Figure 1.3 - Minimum Fan Speed Charts Legend

Drill Configuration			Chart Required			
			Trailing Units		Leading Units	
Model	Spacing	Number of Ports (Primary Manifold)	High-Speed Fan	High-Capacity Fan	High-Speed Fan	High-Capacity Fan
3720/3820-50	10	6	40A~40F	39A~39F	38A~38F	37A~37F
3720/3820-60	10	6	40A~40F	39A~39F	38A~38F	37A~37F
	12	6	38A~38F	40A~40F	38A~38F	37A~37F

Note: The 3 Inch System is only for these select models equiped with Double Row Lockout

Figure 1.4 - Minimum Fan Speed Charts Legend - 3" Air Kit

7. **Example:** For a 3320-76 @ 10" spacing with High-Capacity fan use Chart 5A - 5F, depending on the used product. Refer to *Figure 1.5 - Example* - Finding the Chart Specific to Your Seeding System.

Drill Configuration			Chart Required					
			Section A (Trailing Units)			Section B (Leading Units)		
Model	Spacing	Number of Ports	High-Speed Fan	High-Capacity Fan	High-Pressure Fan	High-Speed Fan	High-Capacity Fan	High-Pressure Fan
3320/3330/ 3335 - 50 ft	10	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 60 ft	10	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 66 ft	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 76 ft	10	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F
3320/3330/ 3335 - 80 ft	10	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	N/A
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	N/A
3320/3330/ 3335 - 86 ft	10	10	4A ~ 4F	6A ~ 6F	12A ~ 12F	N/A	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	N/A	N/A	N/A
	12	10	4A ~ 4F	6A ~ 6F	12A ~ 12F	N/A	34A~34D	32A~32F
3420 - 80 ft	10	8	N/A	5A ~ 5F	15A ~ 15F	N/A	14A ~ 14D	13A ~ 13F
	10	10	N/A	6A ~6F	12A ~ 12F	N/A	14A ~ 14D	N/A
	12	8	N/A	5A ~ 5F	15A ~ 15F	N/A	14A ~ 14D	13A ~ 13F
	12	10	N/A	6A ~6F	12A ~ 12F	N/A	N/A	N/A
3420 - 100 ft	10	10	N/A	11A ~ 11F	12A ~ 12F	N/A	N/A	N/A
	12	10	N/A	11A ~11F	12A ~ 12F	N/A	N/A	N/A
3545-100 ft	10	10	N/A	43A ~ 43F	44A ~ 44F	N/A	N/A	
	12	10	N/A	43A ~ 43F	44A ~ 44F	N/A	N/A	
3720 / 3820 40 ft	7.5	8	N/A	42A ~ 42F	N/A	N/A	N/A	N/A
	10	6	N/A	N/A	N/A	N/A	N/A	N/A
	12	5	N/A	N/A	N/A	N/A	N/A	N/A
	12	6	N/A	N/A	N/A	N/A	N/A	N/A
3720 / 3820 50 ft	7.5	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	10	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	12	6	3A ~ 3F	N/A	N/A	7A ~ 7F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
3720 / 3820 60 ft	7.5	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8F	10A ~ 10F	N/A
	10	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8f	10A ~ 10F	N/A
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	N/A	8A ~ 8f	10A ~ 10F	N/A
3720 / 3820 70 ft	7.5	10	N/A	41A ~ 41F	N/A	N/A	N/A	N/A
	10	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F
	12	6	1A ~ 1F	N/A	N/A	9A ~ 9F	N/A	N/A
	12	8	2A ~ 2F	5A ~ 5F	15A ~ 15F	8A ~ 8F	10A ~ 10F	13A ~ 13F

Figure 1.5 - Example - Finding The Chart Specific to Your Seeding System

8. **Example:** For a 3720-60 @ 10" spacing with Trailing Tank equipped with a High-Speed fan use Chart 40A - 40F, depending on the used product. Refer to *Figure 1.6 - Example* - Finding the Chart Specific to Your Seeding System - Systems with 3" Air Kit.

Drill Configuration			Chart Required			
			Trailing Units		Leading Units	
Model	Spacing	Number of Ports	High-Speed Fan	High-Capacity Fan	High-Speed Fan	High-Capacity Fan
3720/3820-50	10	6	40A~40F	39A~39F	38A~38F	37A~37F
3720/3820-60	10	6	40A~40F	39A~39F	38A~38F	37A~37F
	12	6	38A~38F	40A~40F	38A~38F	37A~37F

Figure 1.6 - Example - Finding The Chart Specific to Your Seeding System - 3" Air Kit

1.1.1 Fan Speed Interpolation for the Unlisted Ground Speeds

For ground speeds not listed on the chart, operators will have to interpolate the fan speed based on the ground speeds listed in the charts. Follow the procedure below for unloaded and loaded minimum fan speeds.

1. From the chart specific to your configuration locate the rate in lb./ac.
2. Follow where the loaded/unloaded speed curve that are above and below your intended speed crosses the rate required and record.
3. Calculate the difference from the speed you wish to travel vs the lower speed curve listed. The difference between chart lines is 1 mph (1.6 kp/h) and your calculated difference is the factor used to calculate the new minimum fan RPM.
4. Subtract the higher ground speed fan RPM from the lower ground speed fan RPM. Multiply this value by the speed difference factor calculated above.
5. Add this value to the lower ground speed fan RPM previously recorded. This is your fan speed.

Example (Imperial):

Minimum unloaded fan speed required to travel 5.7 mph with a 3320-76' unit, 10" spaced, 8 port and tow behind tank that comes with the high-capacity fan applying wheat at 150 lb/ac. (Using *Chart 5*).

1. It is determined that *Chart 5a* is the chart specific for seeding system configuration. On the chart locate the rate - 150 lb.
2. Determine unloaded fan speed:
3. Between 5 mph and 6 mph curves Unloaded Fan speed at 5 mph and 6 mph:
    a. 5 mph 150 lb unloaded minimum fan speed = 4050 RPM
    b. 6 mph 150 lb unloaded minimum fan speed = 4275 RPM
4. Calculate the difference between speeds:
    a. (5.7 mph - 5 mph)/(6 mph - 5 mph) = 0.7 mph (
5. Change in fan RPM required:
    a. (4280-4050) x 0.7 = 161 RPM
6. Calculate your fan speed:
    a. Estimated unloaded fan speed = 4050 RPM + 161 RPM = 4211 RPM minimum no load fan speed for a ground speed of 5.7 mph
    b. Set fan to 4200 RPM in the unloaded state (round RPM to nearest 50 RPM +/- 25 RPM).

Example (Metric):

Minimum unloaded fan speed required to travel 9.2 -km/h with a 3320-76' unit, 10" spaced, 8 port and tow behind tank applying wheat at 168 kg. (Using *Chart 5*).

1. It is determined that *Chart 5a* is the chart specific for seeding system configuration. On the chart locate the rate - 168 kg.
2. Determine unloaded fan speed:
3. Between 8 km/h and 9.7 km/h curves Unloaded Fan speed at 8 km/h and 9.7 km/h:
    a. 8 km/h 168 kg unloaded minimum fan speed = 4050 RPM
    b. 9.7 km/h 168 kg unloaded minimum fan speed = 4275 RPM
4. Calculate the difference between speeds:
    a. (9.2 km/h - 8 km/h)/(9.7 km/h - 8 km/h) = 0.7 km/h
5. Change in fan RPM required:
    a. (4280 - 4050) x 0.7 = 161 RPM
6. Calculate your fan speed:
    a. Estimated unloaded fan speed = 4050 RPM + 161 RPM = 4211 RPM minimum no load fan speed for a ground speed of 9.2 km/h
    b. Set fan to 4200 RPM in the unloaded state (round RPM to nearest 50 RPM +/- 25 RPM).

1.1.2 Determining Fan Speed For Unlisted Products

Listed in *Figure 1.7* are several common products that do not have fan charts, along with the recommended minimum fan chart that can be used as a starting point. If there is no product listed please go to instructions below and follow the procedure to get the minimum fan speed required.

Note

These are recommended charts to follow. Operators should go through the procedure below if there is any concern with the minimum fan speed required.

In order to calculate the minimum fan speed for blended products, or products not listed on the charts please use the following formula:

1. Calculate the total amount of product to be applied, (in lbs/ac).
2. For any product in the blend that has a chart listed in the following pages, look at the chart and find the loaded fan speed required for the **Total Product** to be applied and write it down.
3. For all products that do not have a chart listed in this document select a product that is the closest match to what you wish to apply for your unit and do the same as in *step 2*.
4. Calculate the percentage of each individual product in the blend and multiply that percentage by the fan speed recorded previously for each product.
5. Add the weighted fan speeds together from each product and the result will be your initial loaded fan speed.
6. Repeat *steps 1 - 5*, to calculate the unloaded minimum fan speed required for the same rate required. This will provide the initial starting point.

Product	Recommended Chart to Follow
Canary Seed	Barley
Faba Beans	Chickpea/Pea
Flax	Barley
Lentils	Chickpea/Pea
11-0-0-50	11-51-00
20-00-00-24	46-0-0

Figure 1.7 - Recommended Chart to Follow for Non Listed Products

Example (Imperial):

Applying a blend of 150 lbs. Wheat and 50 lbs. 11-51-0-0 at 5 mph with a 3320-76 unit with 10" spacing, 8 port, and a trailing air cart that comes with a high-speed fan.

Using *Figure 1.3* (if required) and *Chart 2* to calculate fan speed.

1. Total Product:
   a. 150 lbs. + 50 lbs. = 200 lbs.
2. Loaded fan RPM:
   a. Wheat @ 200 lbs.: 4600 RPM
   b. 11-51-00 @ 200 lbs.: 5175 RPM
3. Percentage of each product:
   a. 150 lbs. Wheat / 200 lbs. total = 75%
   b. 50 lbs. 11-51-0-0 / 200 lbs. total = 25%
4. Estimated loaded fan speed
   a. (75% x 4600) + (25% x 5175) = 4744 RPM minimum loaded minimum fan speed for this blend.
   b. Initial loaded fan RPM should be 4750 RPM (round RPM to nearest 50 RPM +/- 25 RPM).

Important

Do not exceed 6000 RPM with either the High Speed or the High Capacity fan.

Example (Metric):

Applying a blend of 168 kg. Wheat and 56 kg. 11-51-0-0 at 8 km/h with a 3320-76 unit with 10" spacing, 8 port, and a trailing air cart that comes with a high-speed fan.

Using *Figure 1.3* (if required) and *Chart 2* to calculate fan speed.

1. Total Product:
   a. 168 kg. + 56 kg. = 224 kg.
2. Loaded fan RPM:
   a. Wheat @ 224 kg.: 4750 RPM
   b. 11-51-00 @ 224 kg.: 5430 RPM
3. Percentage of each product:
   a. 168 kg. Wheat / 224 kg. total = 75%
   b. 56 kg. 11-51-0-0 / 224 kg. total = 24%
4. Estimated loaded fan speed
   a. (75% x 4750) + (24% x 5430) = 4920 RPM minimum loaded minimum fan speed for this blend.
   b. Initial loaded fan RPM should be 4900 RPM (round RPM to nearest 50 RPM +/- 25 RPM).

1.2 Troubleshooting

If you are experience plugging or a fan that cannot achieve the loaded minimum fan RPM required, perform one of the following stationary tests.

1.2.1 Stationary Test if System Plugs

The stationary method should be used any time you experience issues with the air system delivering product.

Note

Each airstream must be checked separately.

1. Verify that augers for the tanks you are testing are charged and full of product.
2. With the unit stationary and the openers out of the ground, set the fan RPM at your anticipated unloaded RPM required.
3. Engage the metering augers from the tanks you are applying product from, (utilizing the control box on the side of the tank), for that airstream.
4. Meter product until the fan RPM stabilizes at the loaded RPM, approximately 5~10 seconds minimum. If after one minute the fan speed has not stabilized and is still increasing, shut off the metering augers, allow the system to clean out and retest with a higher unloaded fan speed.
5. Shut off the metering augers.
6. Count the number of seconds that elapse until product stops coming out of the seed boots at the mainframe. (This is when the majority of product stops – expect the odd kernel to come out for 5~10 seconds beyond the majority of product stopping).
7. If the interval between shutting off the augers vs product coming out of the seed boots is greater than 4 seconds, the unloaded fan speed must be increased.

8. Repeat the above process until the interval is below 4 seconds. The RPM that has a clean out of less than 4 seconds is your required minimum fan RPM for this product.

Note

Measure fan speed against your acceptable seed bounce. Be sure to use enough fan RPM to meet the 4 second minimum cleanout.

Important

Excessive fan speed can result in premature hose wear, seed damage, and the potential for abnormally higher percentage of seed bounce.

1.2.2 Stationary Test if Minimum Loaded Fan Speed is Unachievable

Note

Each airstream must be checked separately.

1. Verify that augers for the tanks you are testing are charged and full of product.
2. With the unit stationary and the openers out of the ground, set the fan RPM at the maximum unloaded fan speed available.
3. Engage the metering augers from the tanks you are applying product from, (utilizing the control box on the side of the tank), for that airstream.
4. Meter product until the fan RPM stabilizes at the loaded RPM, (5~10 seconds minimum). If after 1 minute the fan speed has not stabilized and is still increasing, shut off the metering augers, allow the system to clean out and retest with a lower ground speed or with less total product. Continue to the next step if the fan speed is stable.
5. Shut off the metering augers.
6. Count the number of seconds that elapse until product stops coming out of the seed boots at the mainframe. (This is when the majority of product stops - expect the odd kernel to come out for 5~10 seconds beyond the majority of product stopping).
7. If the interval between shutting off the augers vs product coming out of the seed boots is greater than 4 seconds, the seeding speed will need to be decreased or the total amount of product being applied will need to be lowered.
8. Repeat the above process until the interval is below 4 seconds. The RPM that has a clean out of less than 4 seconds is your required minimum loaded fan RPM for this product.
9. The stationary method should be used any time you experience issues with the air system delivering product.

1.3 EvenStream Primary Inspection

1.3.1 Inspection

Information in this section will assist you in the inspection of the EvenStream primary and inserts. The instructions below are for both the line 1 (single shoot) and line 2 (double shoot) side primary's and for ASC and NON-ASC models as noted.

For terminology and location of components used in the content please refer to *Figure 1.8*.

Important

A trailing unit is shown in *Figure 1.8*.

Leading units are similar, but use a Urethane coupler instead of the bellows shown.

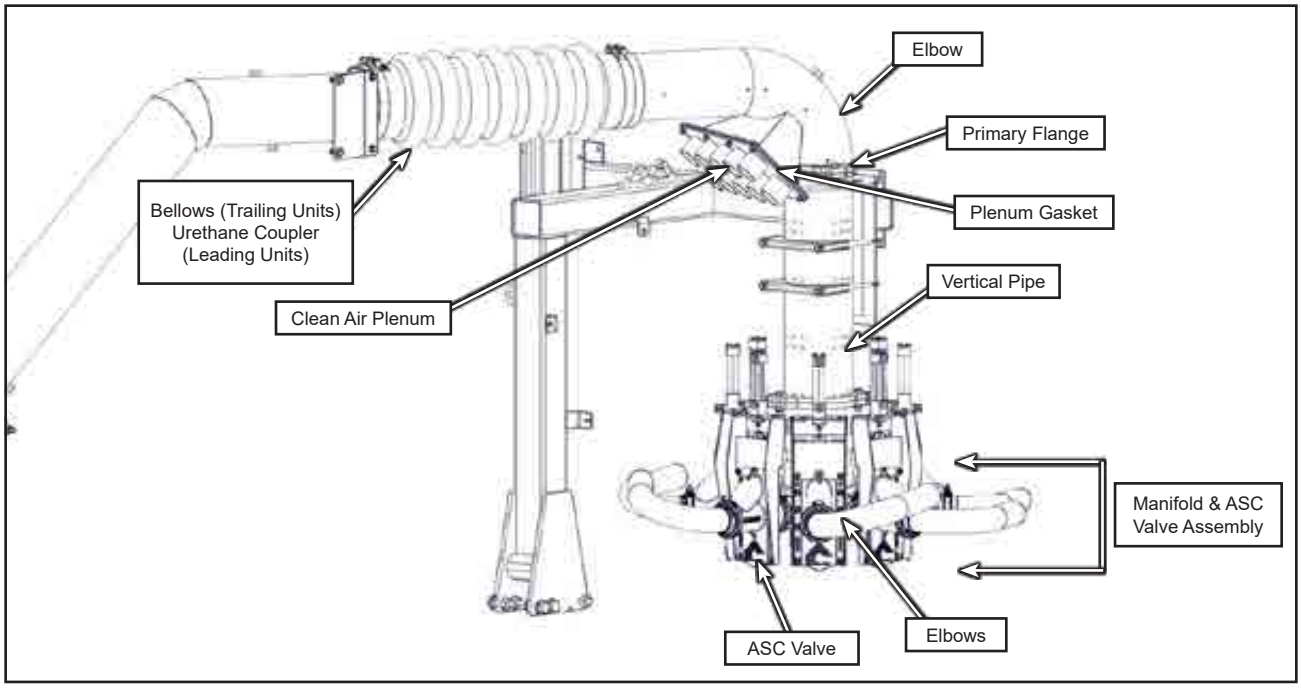


Figure 1.8 - EvenStream Primary Components

1.3.1.1 Check Primary Alignment - Trailing Units ONLY

There are 2 methods to get the unit prepared for primary alignment, either method will work to provide good results.

Method 1:

1. Verify that the front hitch is centered. Check that measurements labelled "X" in *Figure 1.9* are equal.
2. Check that the front axle is level (unit is parked on level ground).
3. This was how the unit was aligned at the factory and will allow for the primary to be aligned successfully.

Method 2:

1. Select units will “dog track” slightly when being pulled straight down the field.
   a. In this case the hitch will not be square to the frame.
2. For optimal alignment of the primary in operation, it is recommended to pull the unit ~100 feet (30 m) in a straight line and park on level ground prior to inspecting the primary.

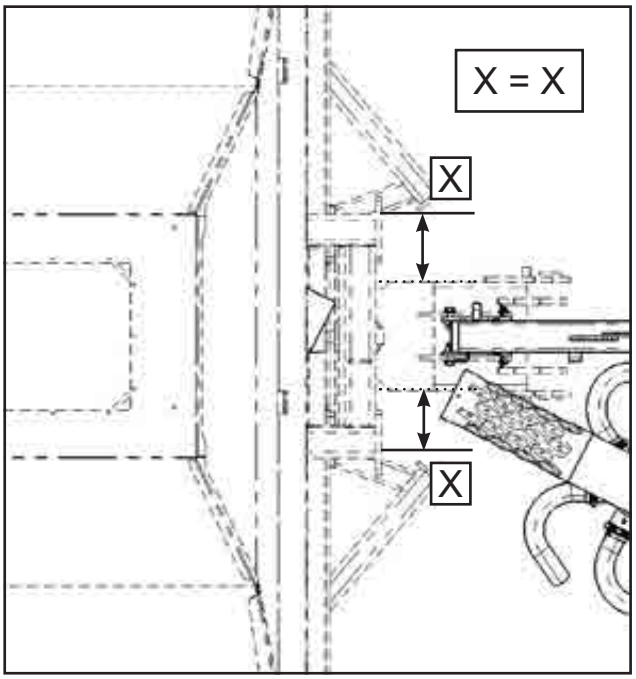


Figure 1.9 - Front Hitch - Centered

1.3.1.2 Dis-Assembly

1. Remove clean air plenum bolts and plenum cover from the primary and rest the assembly off to the side.
   a. Be careful not to tear the gasket while removing, (ASC units only).
   b. Refer to *Figure 1.10*.

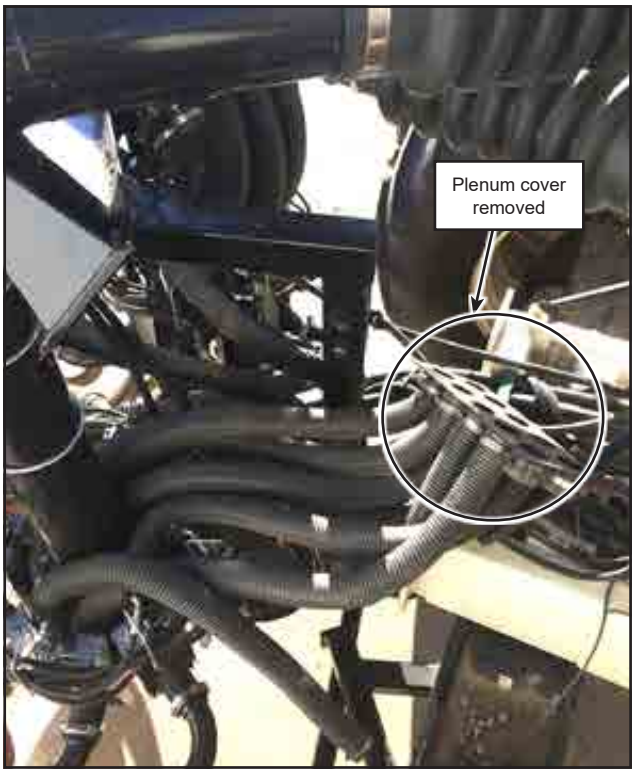


Figure 1.10 - Clean Air Plenum Removed

2. Mark the primary flange in two locations, 90° apart, one on the front of the primary flange and the other on the bolted side of the flange. Refer to *Figure 1.11*.

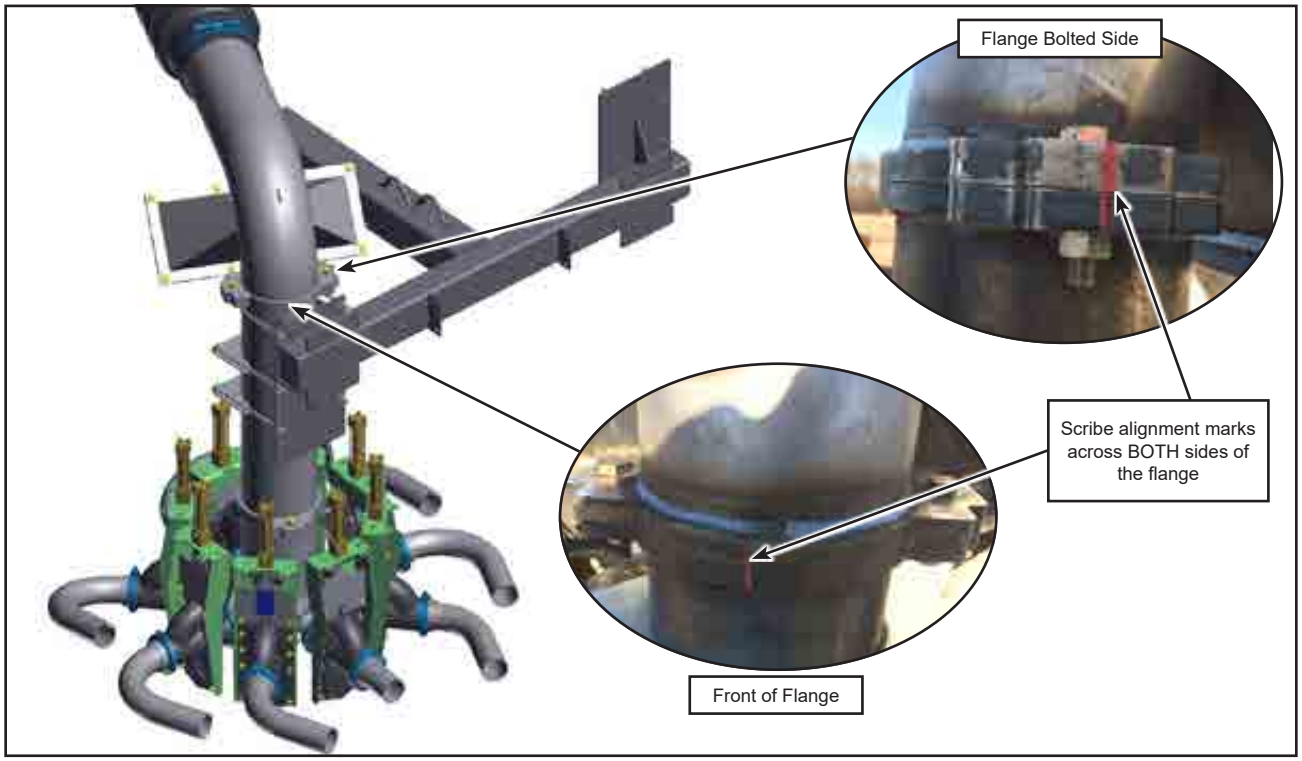


Figure 1.11 - Primary Flange - Marking

3. Loosen the two bolts securing the elbow to the vertical pipe. Leading primary air kits only:
    i. Loosen the clamps holding the urethane coupler and slide the coupler back onto the s-pipe.
    ii. Loosen the 2 bolts securing the elbow to the vertical pipe.

Note

For trailing units only, use caution as the bellows has some preload and may pop off when the bolts are removed.

4. There is a spigot inside the pipe that will assist in holding the elbow in place. Refer to *Figure 1.12*. Not applicable for leading units.

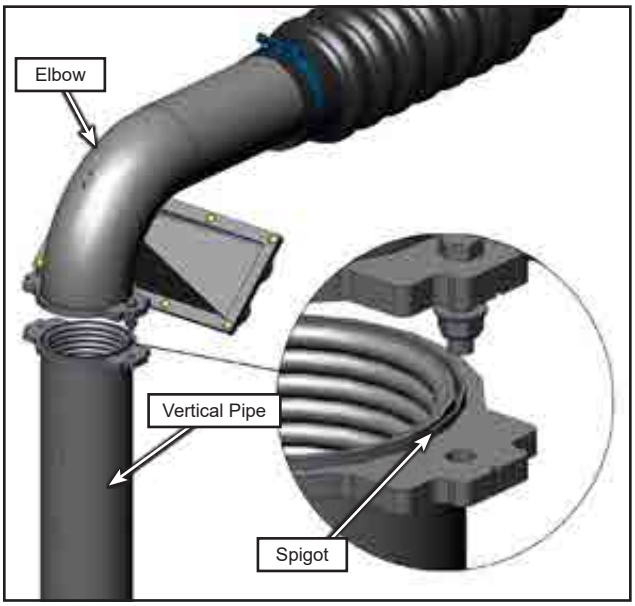


Figure 1.12 - Spigot Location

5. Lift the elbow off of the vertical pipe and allow it to hang on the bellows. Refer to *Figure 1.13*.
    a. Leading primary air kits only:
        i. Lift the elbow off of the vertical pipe and set down, be careful not to damage the elbow.

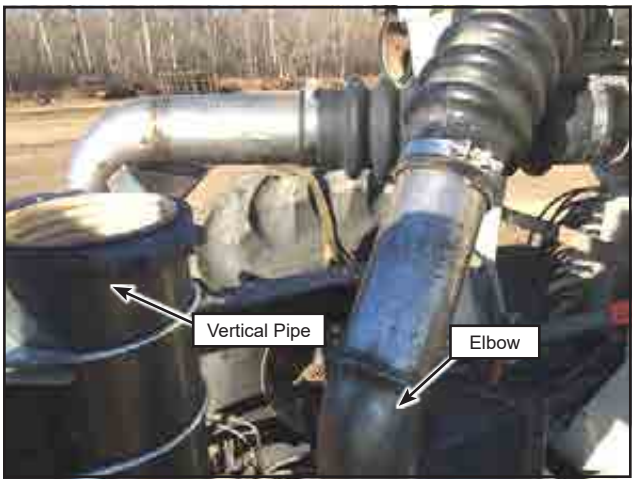


Figure 1.13 - Elbow Removed from Vertical Pipe

1.3.1.3 Inspection

1. Inspect the inserts from the top of the pipe for any for buildup of product between the ribs and clean as required. Refer to *Figure 1.14.*
2. Inspect the inside of the insert and determine if the wear is normal or excessive. Refer to *Figure 1.16*.
3. To confirm that the insert needs to be replaced, measure the diameter of the ribs.
4. This ID should not exceed Ø 5-31/32” (152 mm). Refer to *Figure 1.15*.
   a. If it measures below 5-31/32” (152 mm) the inserts are acceptable for use.
   b. If the measurement is larger than specification the inserts must be replaced for optimum performance of the distribution system.

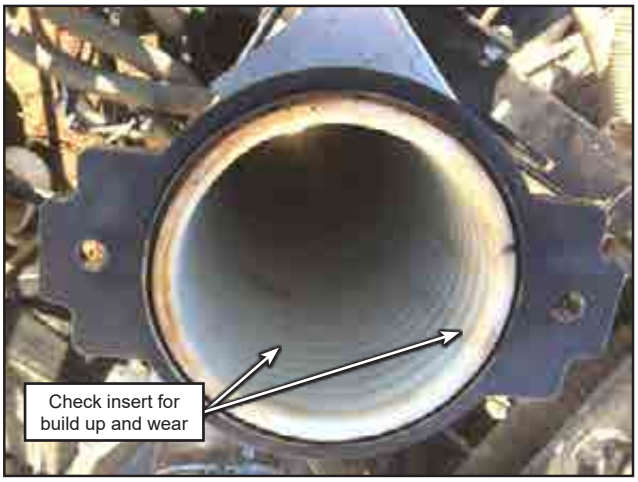


Figure 1.14 - EvenStream Insert Inspection

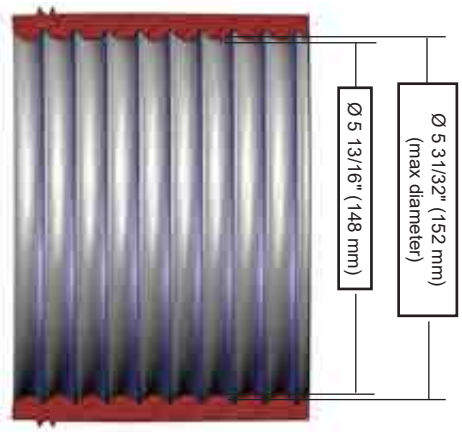


Figure 1.15 - Rib Diameter

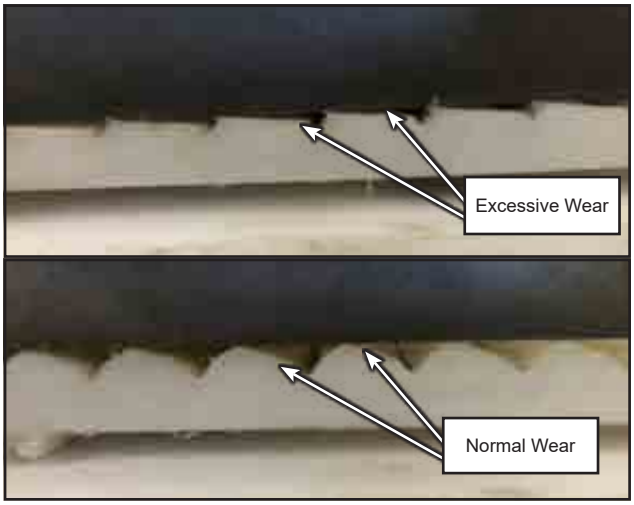


Figure 1.16 - Wear Patterns

5. To replace the inserts, the primary manifold will have to be unbolted from the bottom of the vertical pipe. Refer to *Figure 1.17.*

   a. Place supports under the manifold.

   b. Use sawhorses/or suitable blocking.

   c. Loosen and remove the bolts shown in *Figure 1.17*.

Note

On ASC units the manifold/ASC valve assembly is heavy. Use proper care when removing.

6. If the ASC valves are removed be sure they are marked for correct reassembly.

   a. On both ASC and NON ASC units, if removing the elbows, be sure they are properly marked for proper reassembly.

7. Once the manifold is removed, the inserts can be driven out of the vertical pipe, from the top down with a block and hammer.

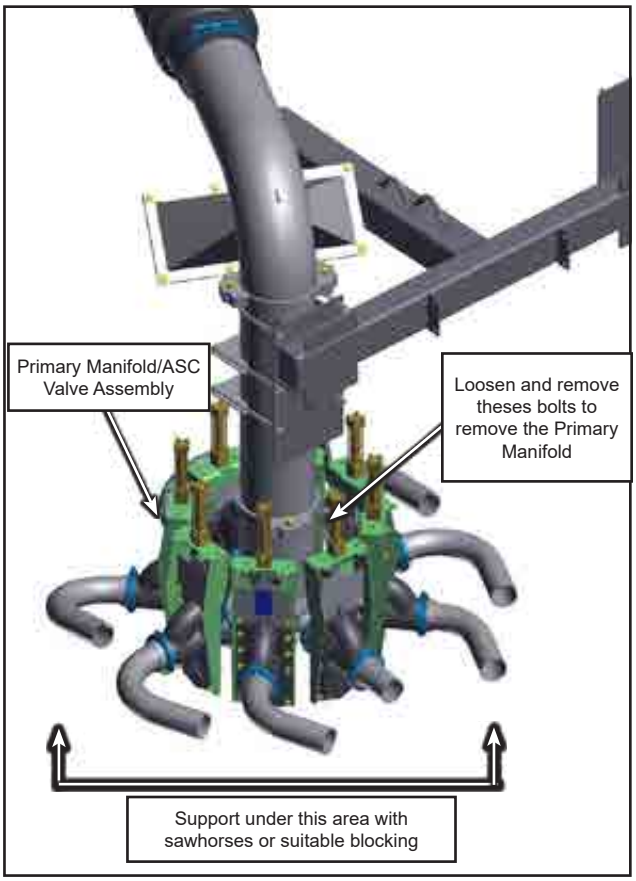


Figure 1.17 - Primary Manifold - Removal

1.3.1.4 Re-Installation of Components

1. Refer to *Section 1.3.1.1 to 1.3.1.3* for correct orientation of the manifold/elbows before starting re-assembly.
2. Re-connect the primary manifold/ASC Valve assembly that was removed.
   a. Ensure the bolts are tightened and that the alignment is correct.
3. Install the elbow following the instructions below:
   a. Lift the elbow/bellows assembly back onto the vertical pipe.
   b. Trailing units only:
      i. Apply force to the assembly, towards the bellows, to get the elbow back onto the vertical pipe.
   c. Apply force to the assembly, towards the bellows, to get the elbow back onto the vertical pipe.
   d. There is a 1/8” (3 mm) spigot on the vertical pipe that the elbow will lock over top of. Refer to *Figure 1.18*.
   e. Install the two mounting bolts and snug up so the elbow will still move by hand.
   f. Check the alignment marks made in step 3 and adjust the elbow as needed to get the orientation correct. Refer to *Figures 1.19 & 1.20*.

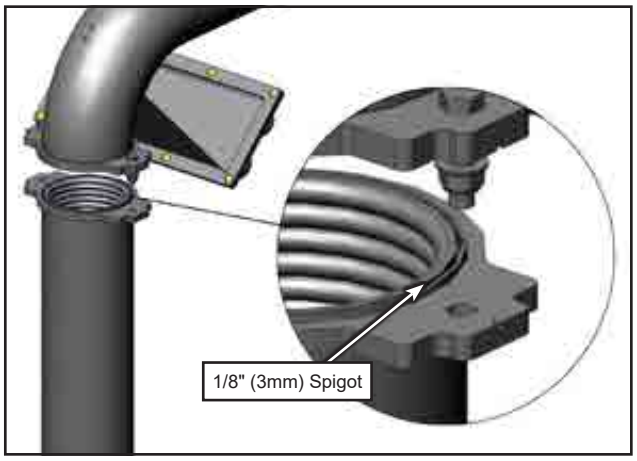


Figure 1.18 - Spigot Location

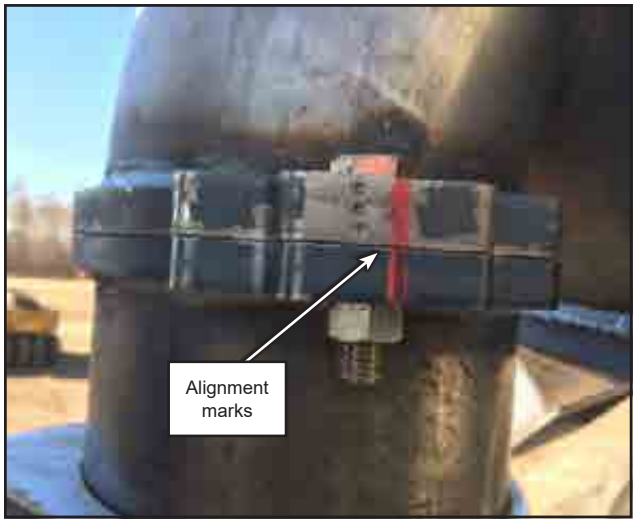


Figure 1.19 - Bolted Side Flange Scribe Marks

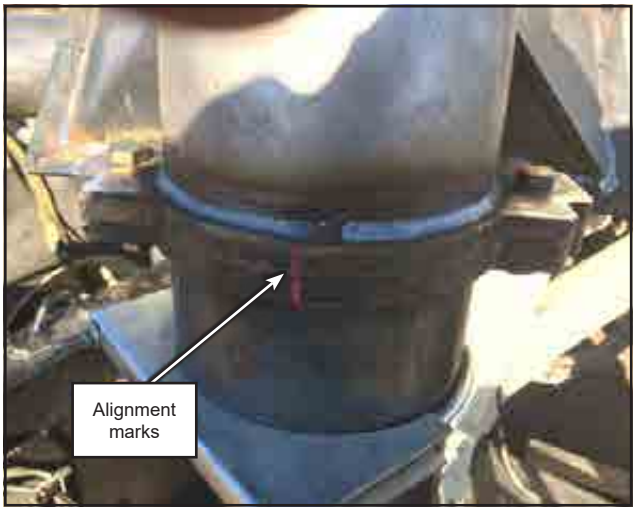


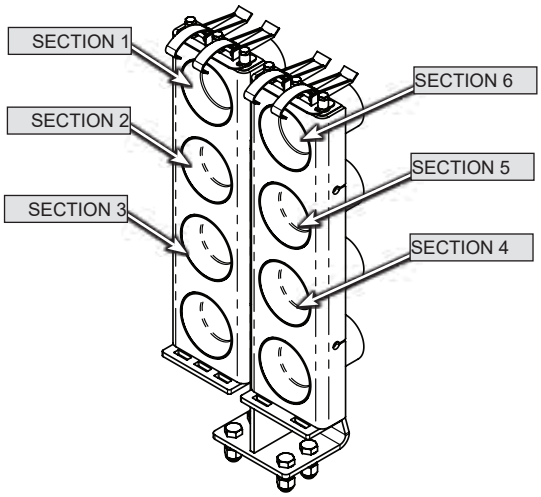
Figure 1.20 - Front of Flange Scribe Marks

4. Tighten all mount bolts to 50 FTLB (68 N-m).
5. Leading primary air kits only:
    a. Slide urethane coupler back onto the elbow.
    b. Be sure to center the coupler between the s-pipe and elbow.
    c. Tighten the 2 clamps
6. For ASC units inspect the clean air plenum gasket to be sure it is still fit for use, (no rips or tears).
    a. Reinstall gasket and plenum cover.
    b. Tighten all hardware.

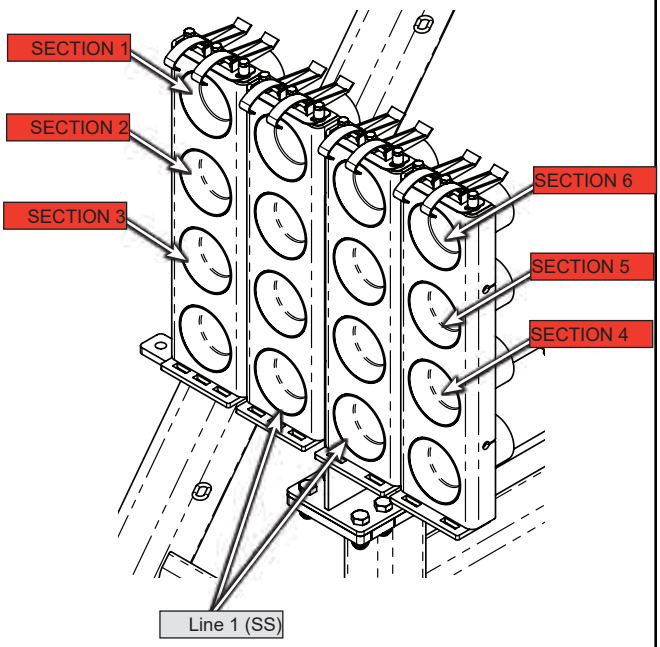
1.3.2 Primary Manifolds & Elbows, Clean Air Layout, Secondary Hose Connection

1.3.2.1 6 Port Configuration

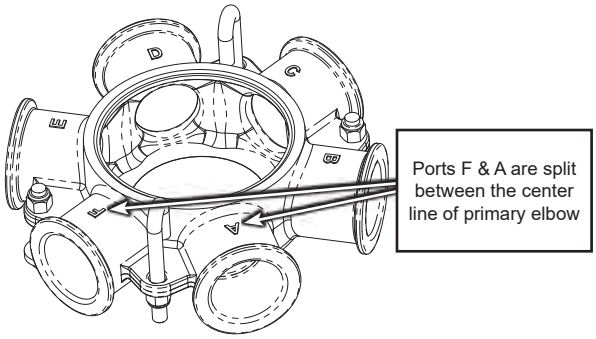
LINE 1 (Single Shoot)



LINE 2 (Double Shoot)

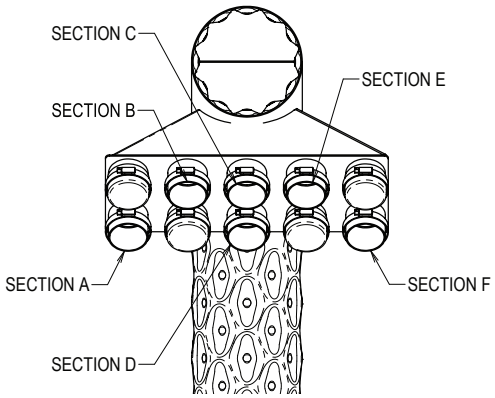


Primary Manifold Head & Elbows - 6 Port



Trailing A/C: Port A for FAN 1 (Right hand side primary elbow)
Port F for FAN 2 (Left hand side primary elbow)
Leading A/C: Port D for FAN 1 (Left hand side primary elbow)
Port C for FAN 2 (Right hand side primary elbow)

Clean Air Connections - 6 Port



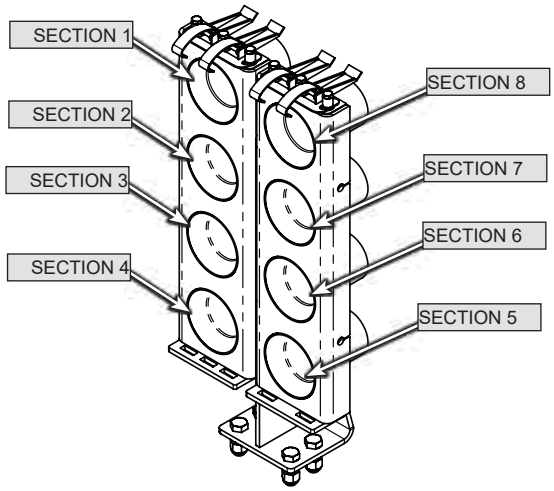
Section On Drill	Port On Primary Manifold
1	A
2	D
3	B
4	E
5	C
6	F

Note

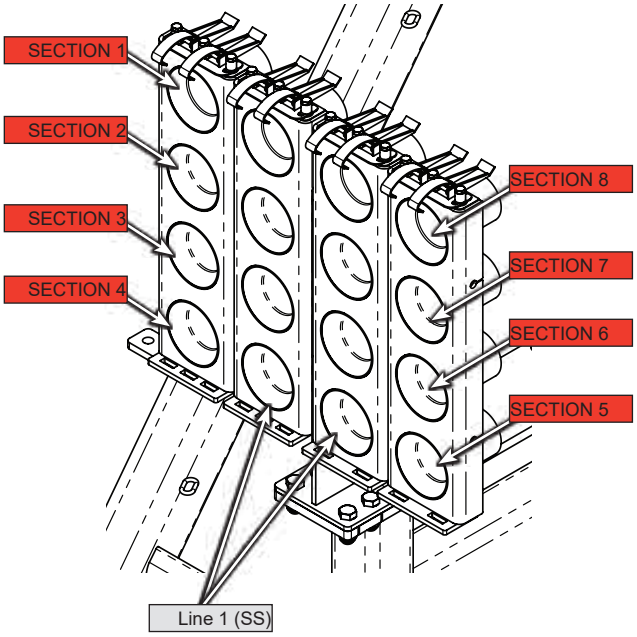
The air drill sections are numbered from left to right. Left and right are determined by standing “behind” the unit and facing in the direction of travel.

1.3.2.2 8 Port Configuration

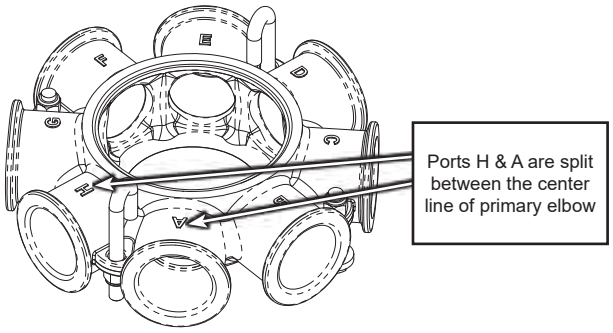
LINE 1 (Single Shoot)

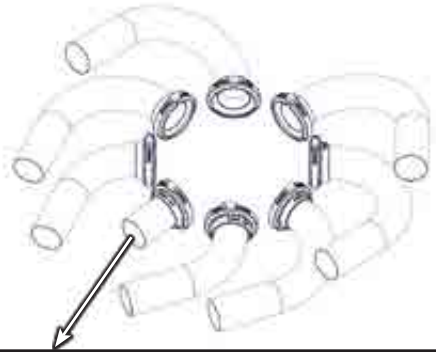


LINE 2 (Double Shoot)



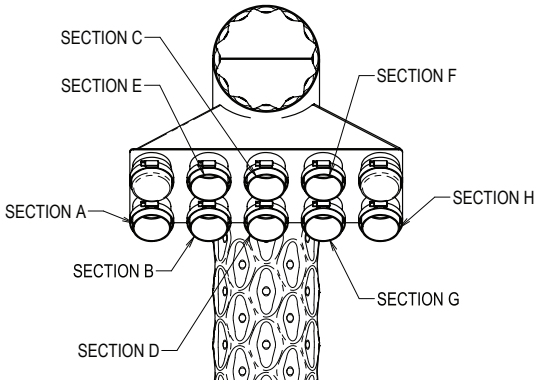
Primary Manifold Head & Elbows - 8 Port





Trailing A/C: Port A for FAN 1 (Right hand side primary elbow)
Port H for FAN 2 (Left hand side primary elbow)
Leading A/C: Port E for FAN 1 (Left hand side primary elbow)
Port D for FAN 2 (Right hand side primary elbow)

Clean Air Connections - 8 Port



Section On Drill	Port On Primary Manifold
1	A
2	E
3	C
4	G
5	B
6	F
7	D
8	H

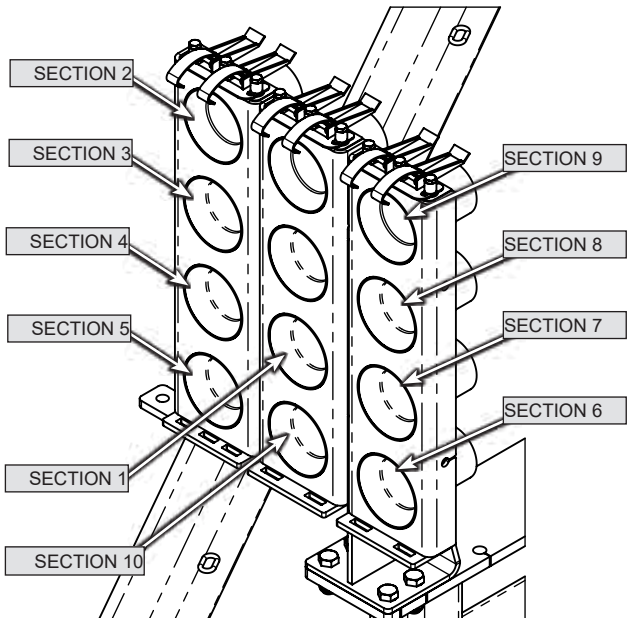
Note

The air drill sections are numbered from left to right. Left and right are determined by standing “behind” the unit and facing in the direction of travel.

1.3.2.3 10 Port Configuration

4 Port Coupler Plates

LINE 1 (Single Shoot)

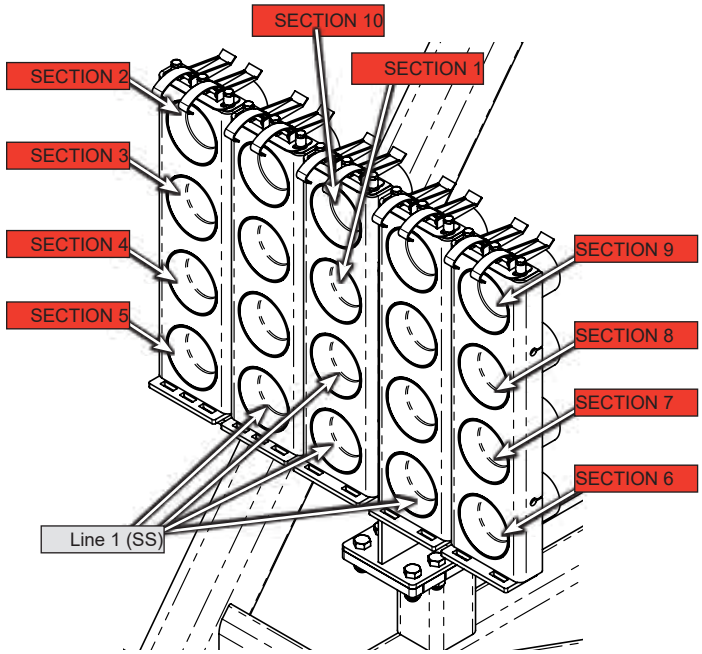


Section On Drill	Port On Primary Manifold
1	A
2	F
3	C
4	H
5	D
6	I
7	B
8	G
9	E
10	J

Note

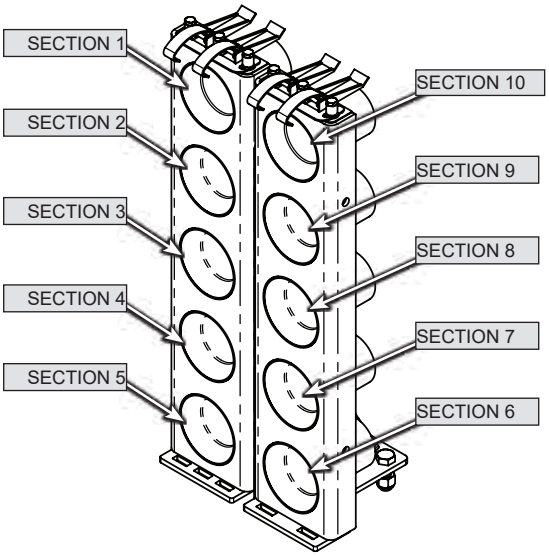
The air drill sections are numbered from left to right. Left and right are determined by standing “behind” the unit and facing in the direction of travel.

LINE 2 (Double Shoot)

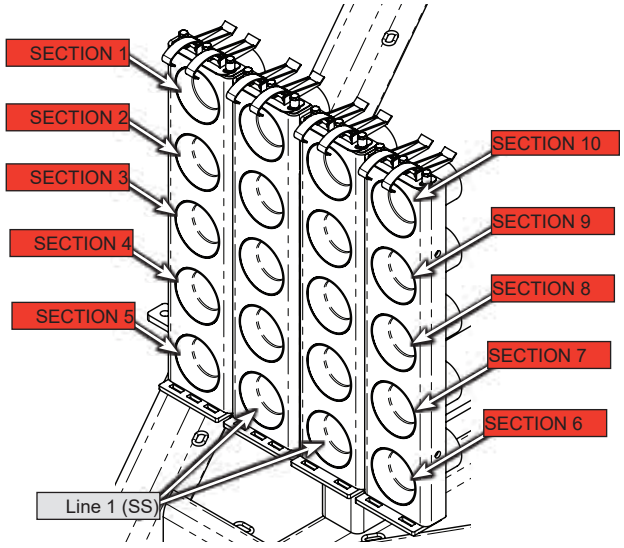


5 Port Coupler Plates

LINE 1 (Single Shoot)



LINE 2 (Double Shoot)

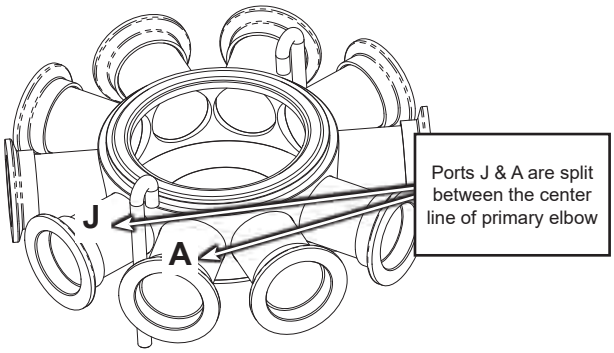


Section On Drill	Port On Primary Manifold
1	A
2	F
3	C
4	H
5	D
6	I
7	B
8	G
9	E
10	J

Note

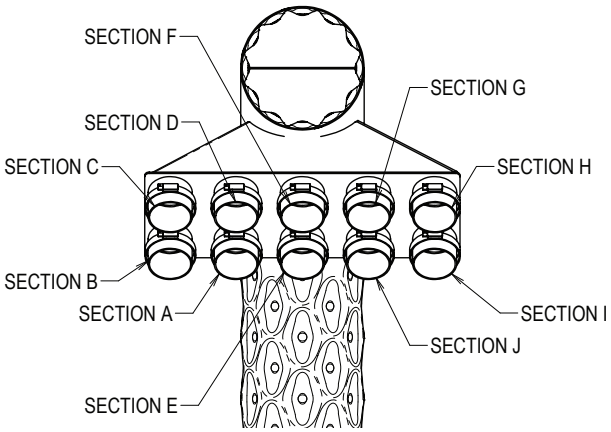
The air drill sections are numbered from left to right. Left and right are determined by standing “behind” the unit and facing in the direction of travel.

Primary Manifold Head & Elbows - 10 Port



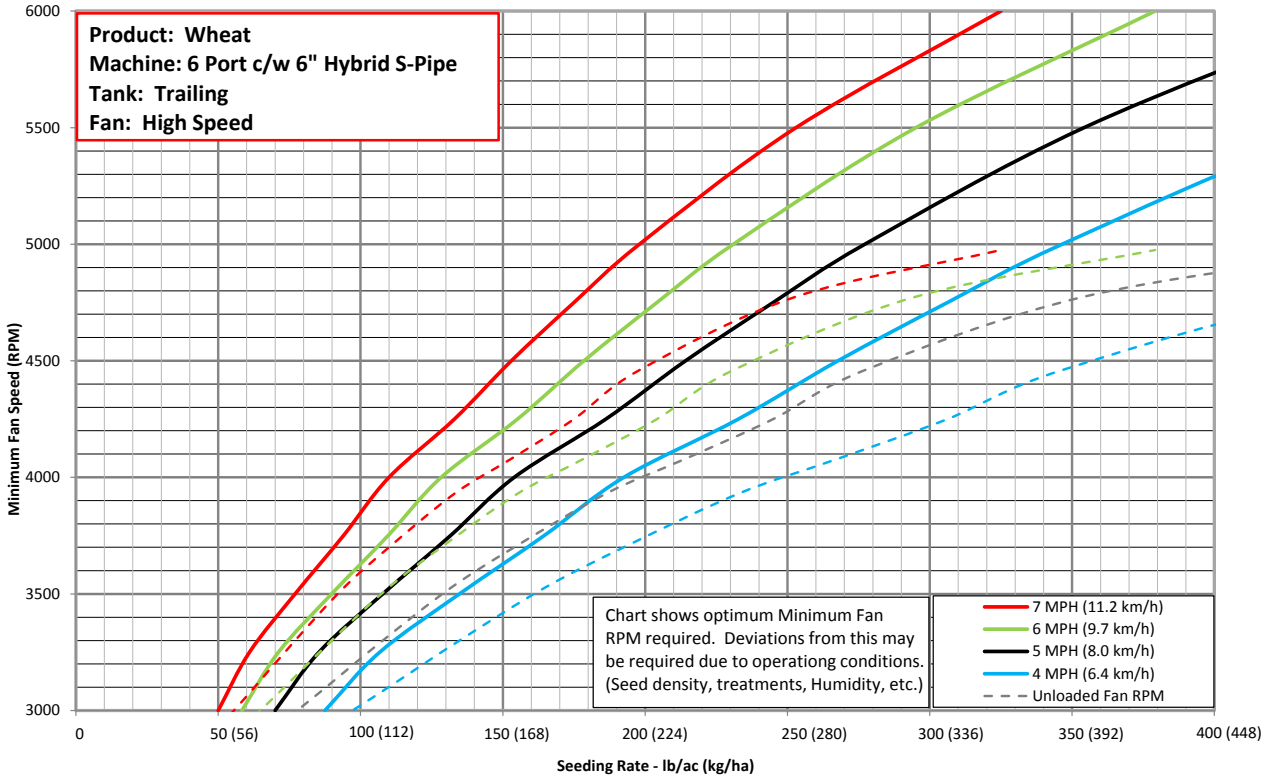
Trailing A/C: Ports A & B for FAN 1 (Right hand side primary elbow)
Ports I & J for FAN 2 (Left hand side primary elbow)
Leading A/C: Ports D & E for FAN 1 (Left hand side primary elbow)
Ports F & G for FAN 2 (Right hand side primary elbow)

Clean Air Connections - 10 Port



2 Trailing Air Cart Charts

Chart 1A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 1B

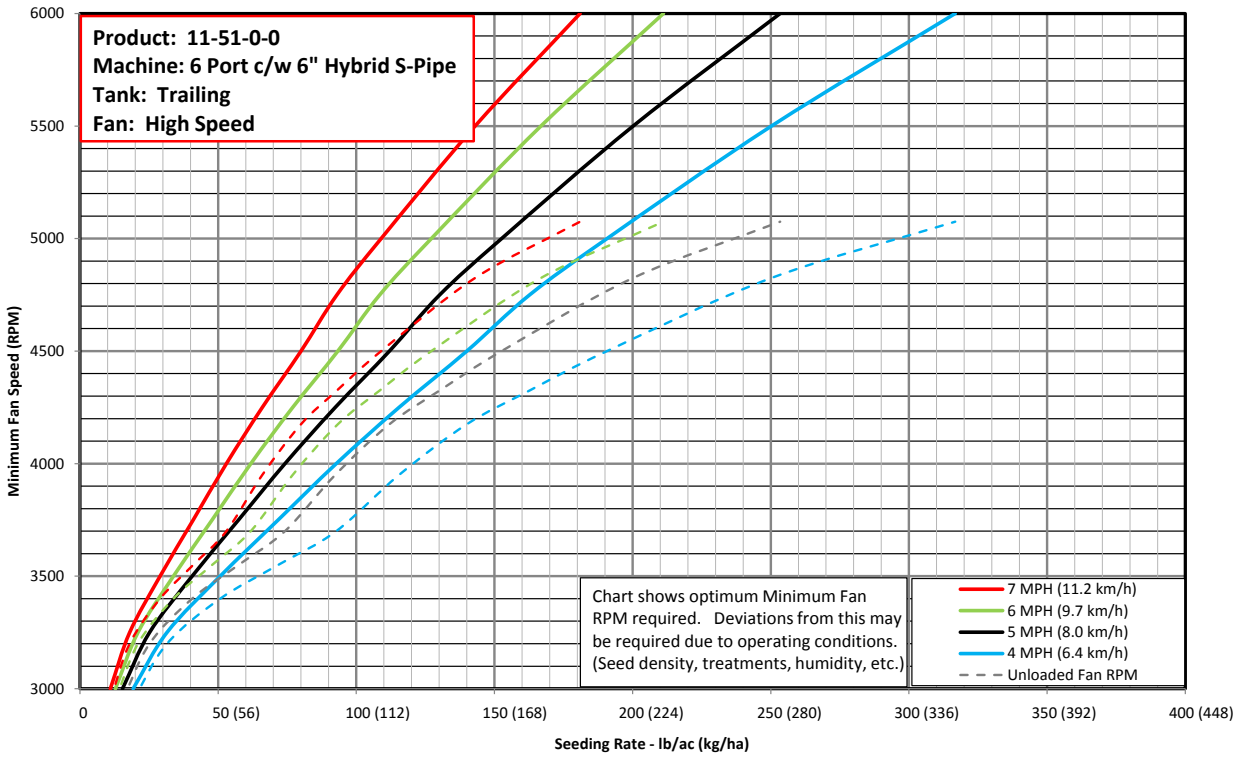
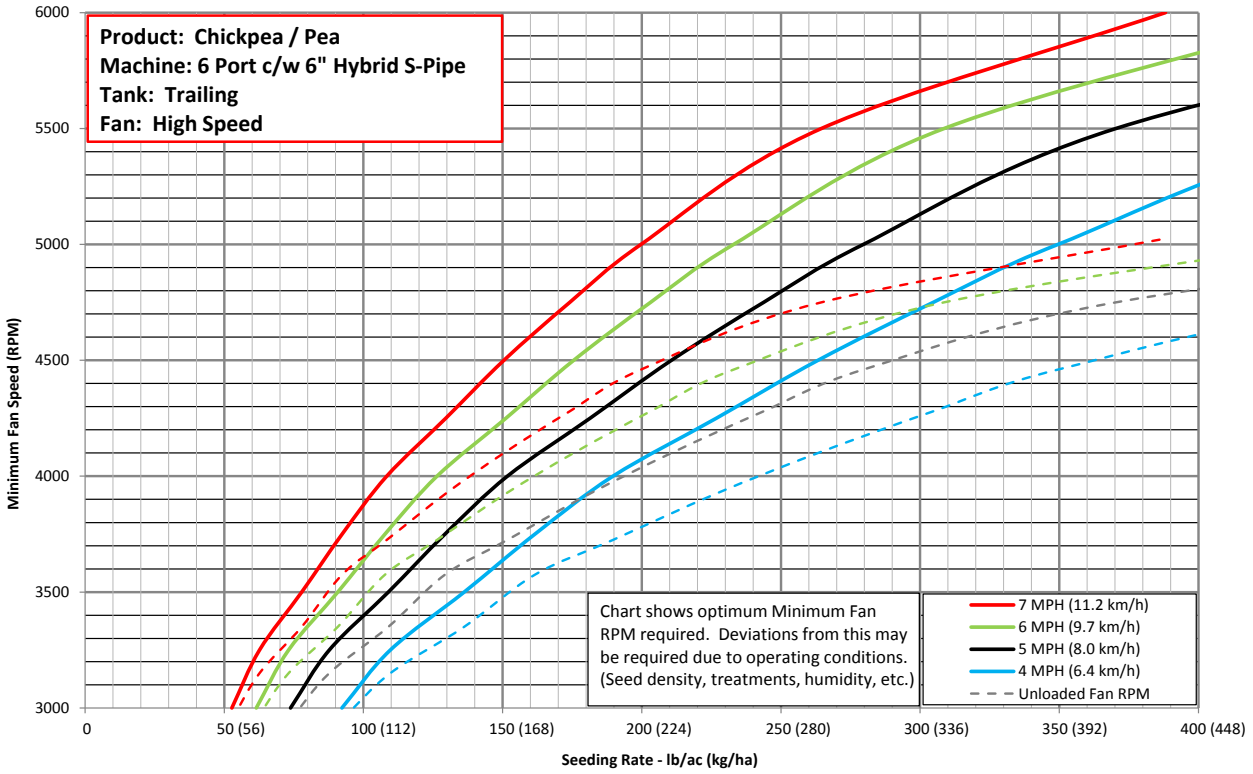


Chart 1C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 1D

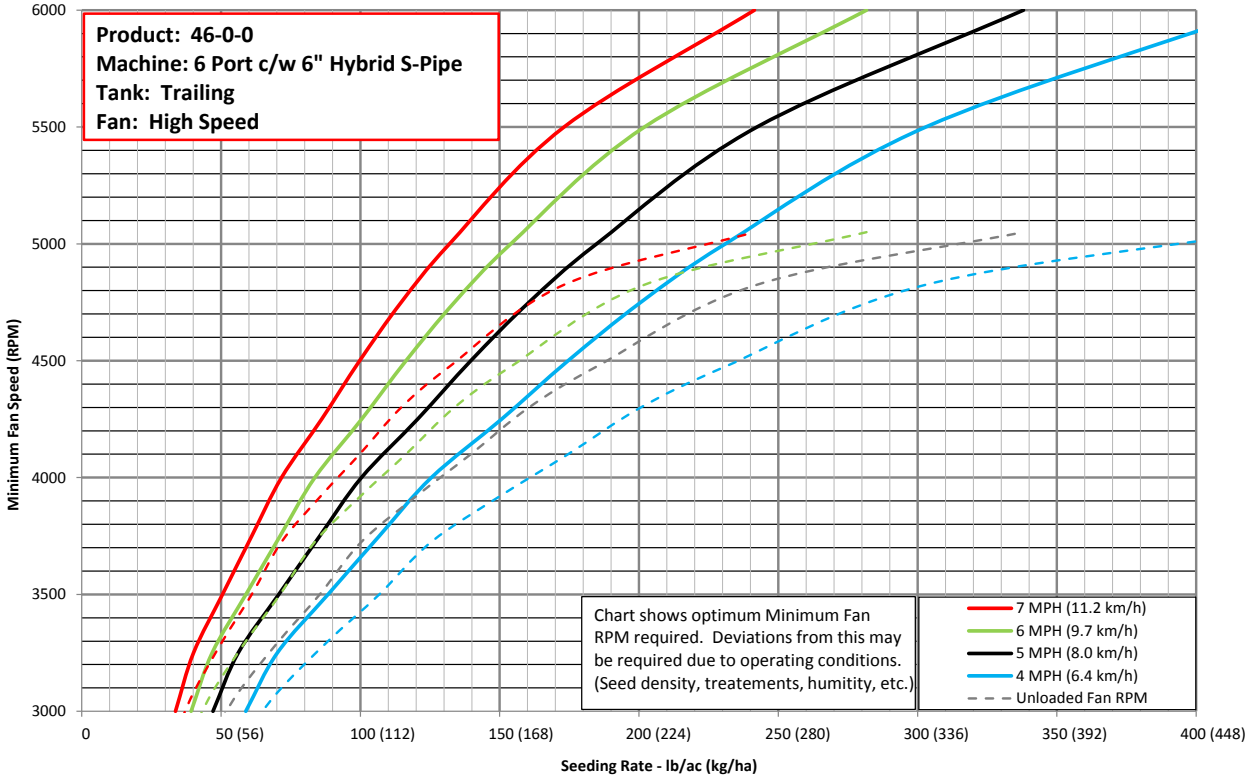
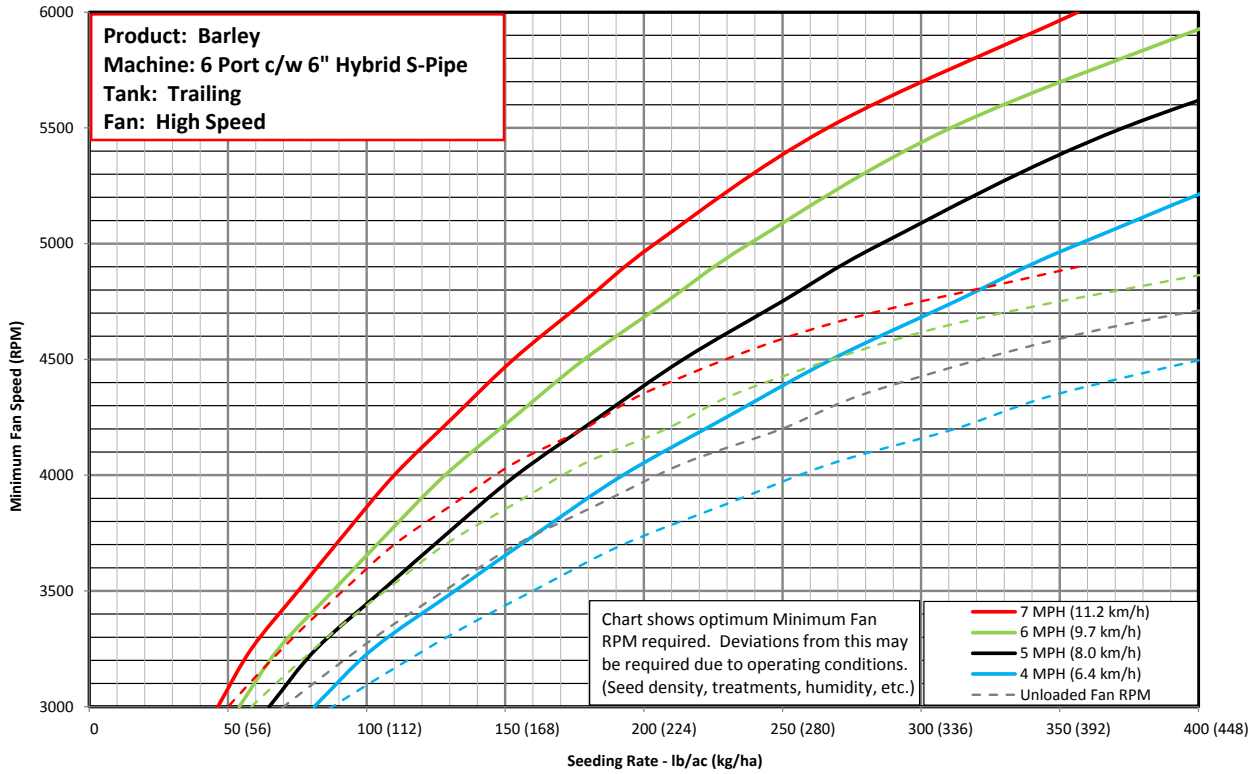


Chart 1E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 1F

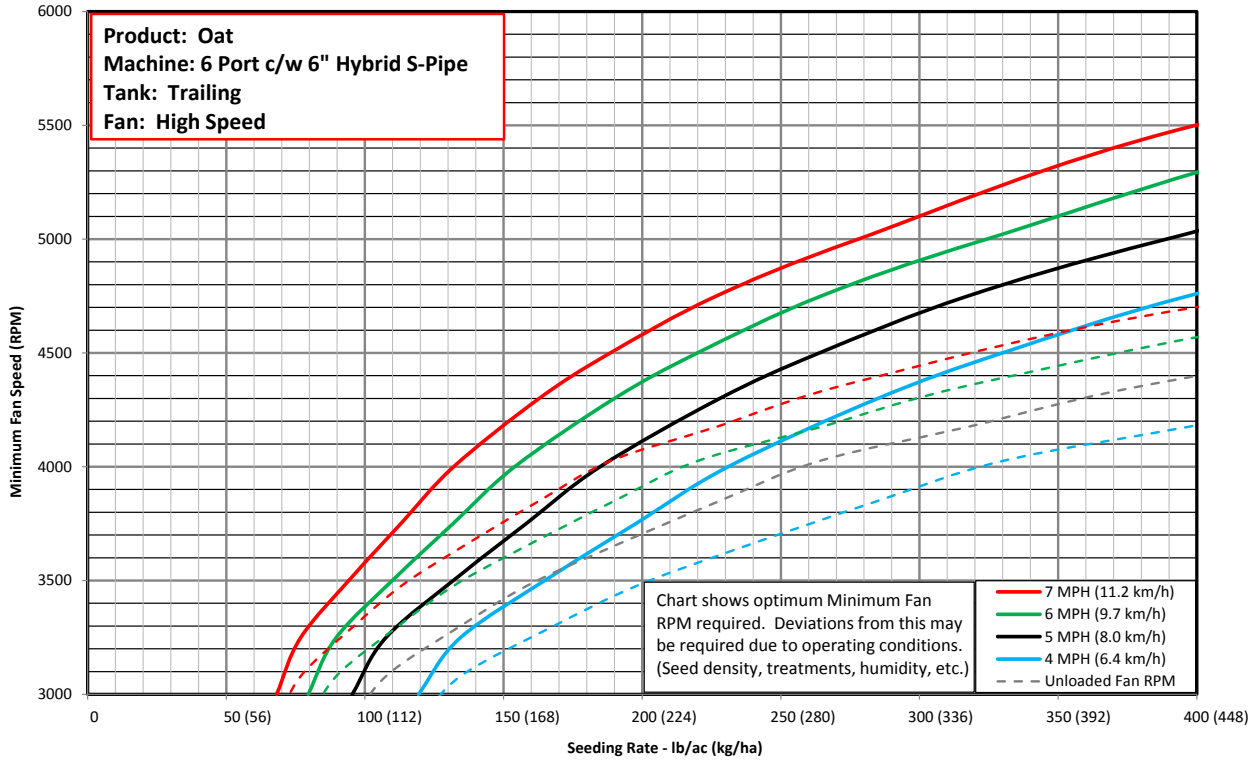
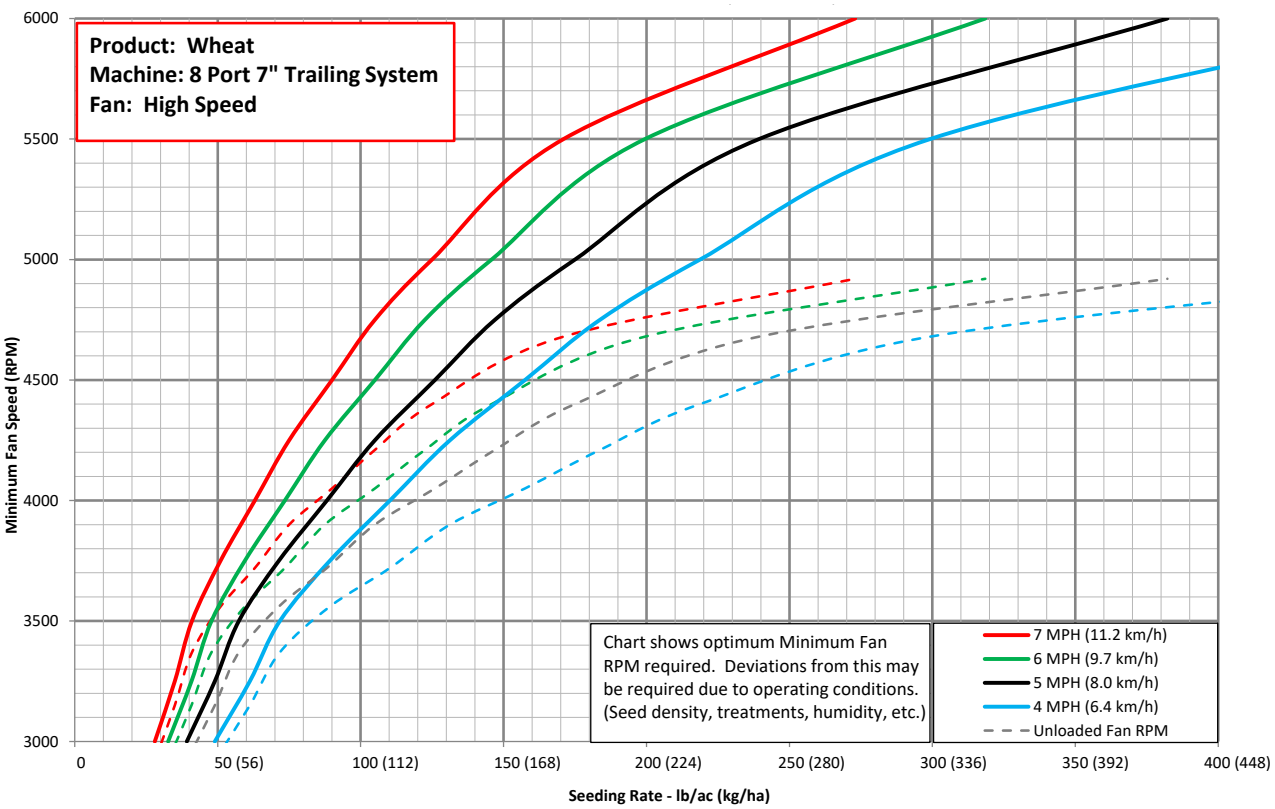


Chart 2A



Note: For rates below 50 lb/ac use a minimum fan speed of 3000 RPM.

Chart 2B

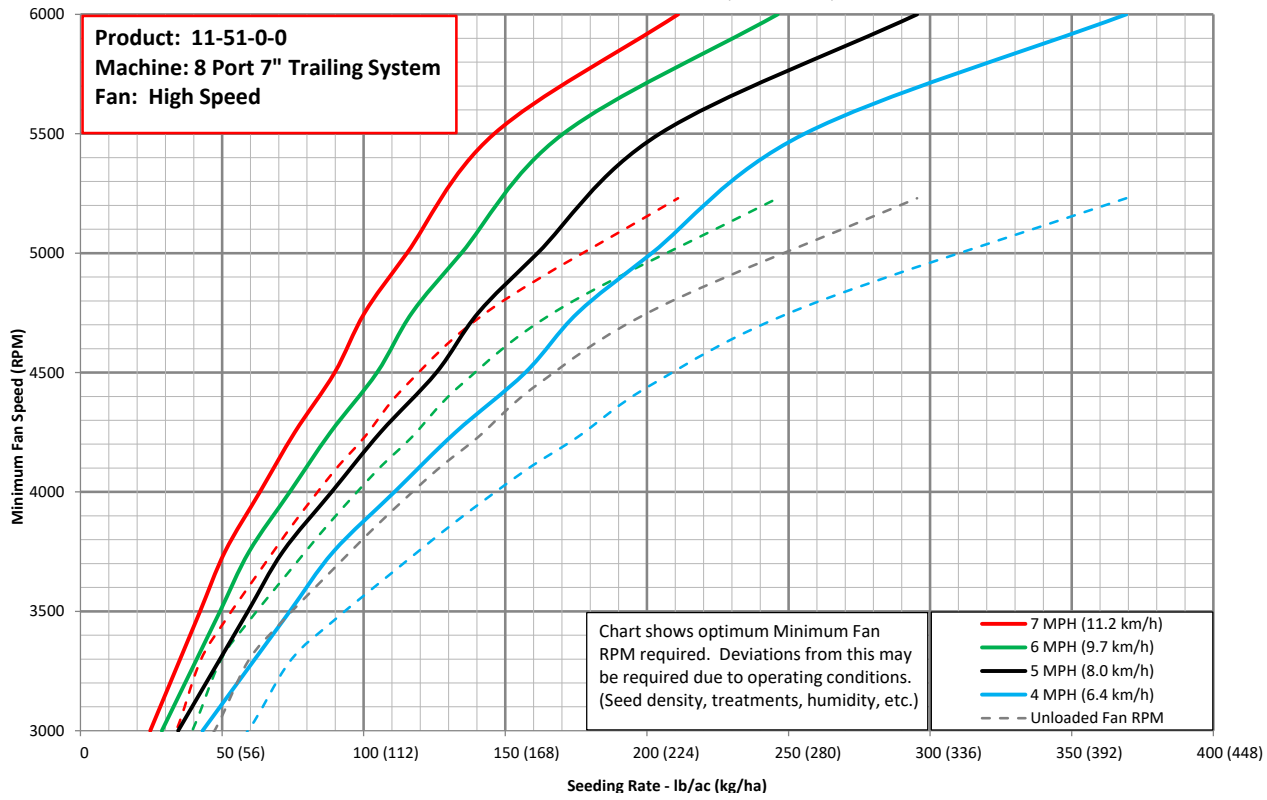
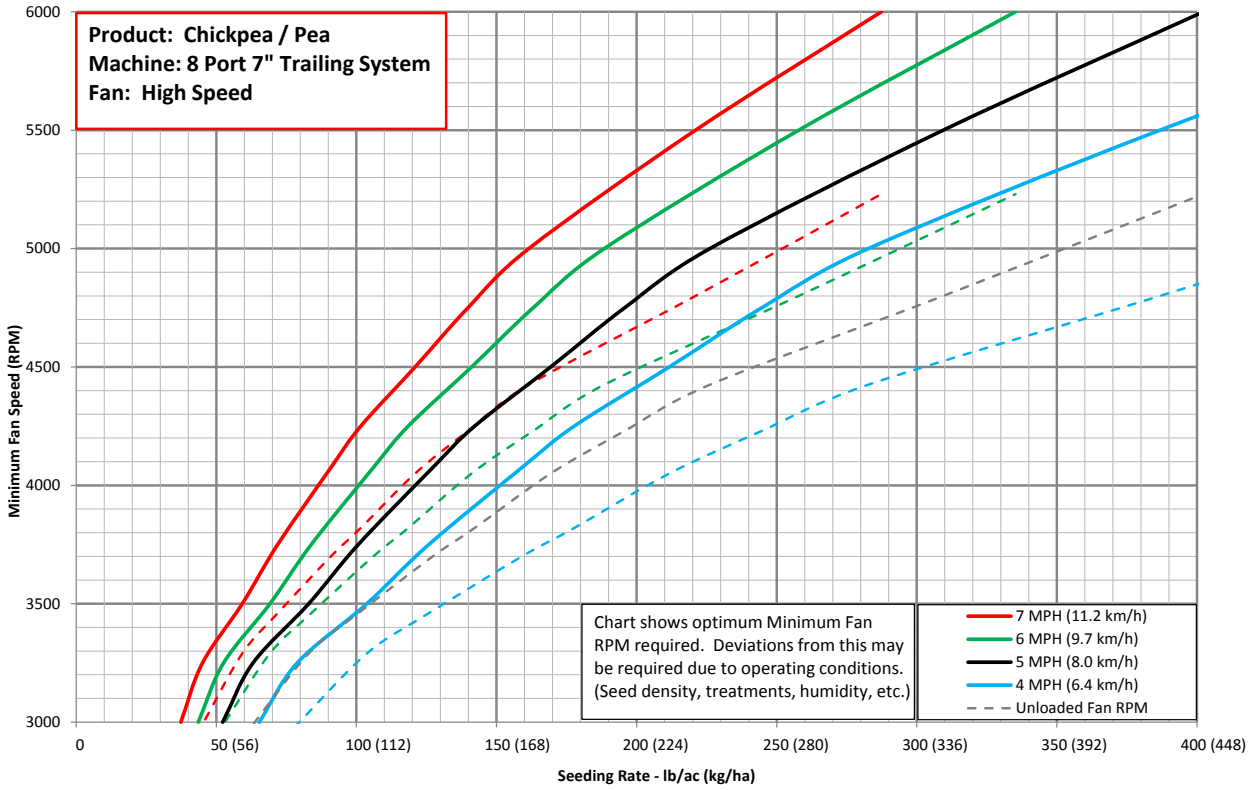


Chart 2C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 2D

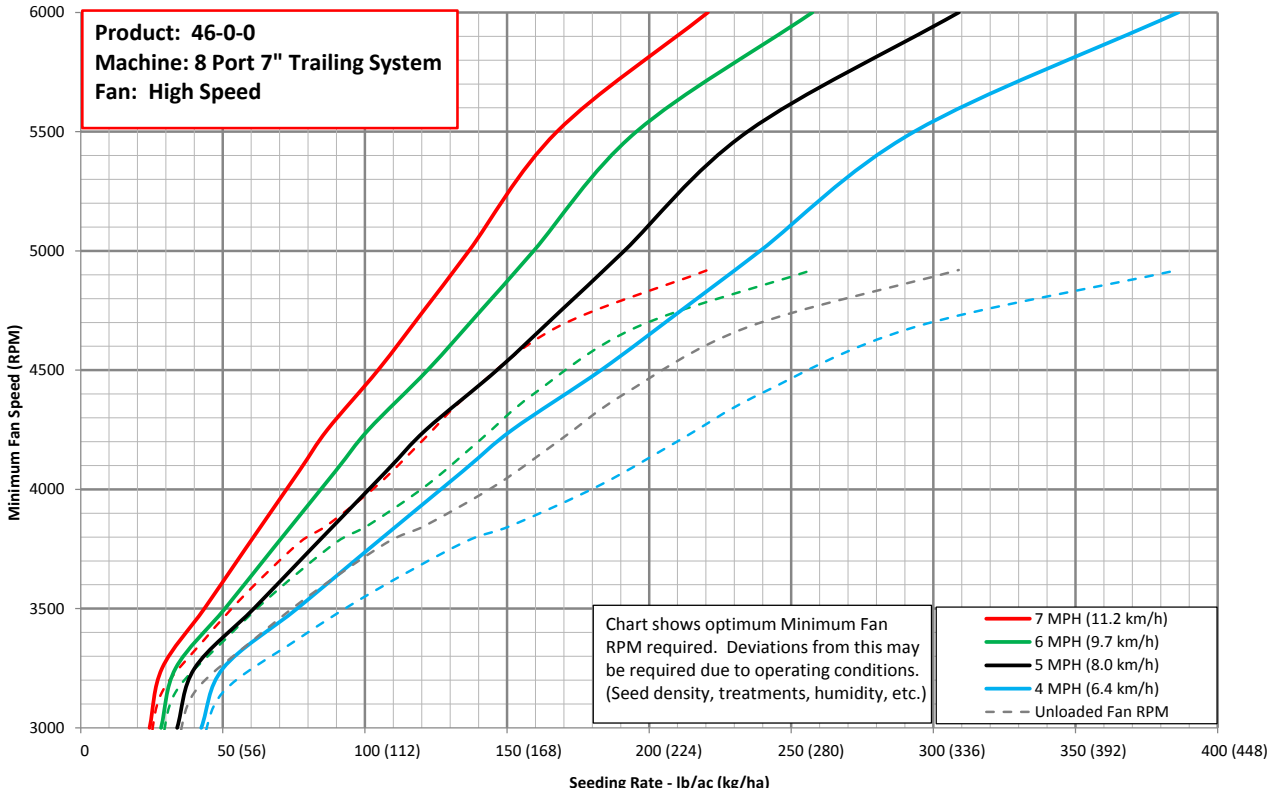
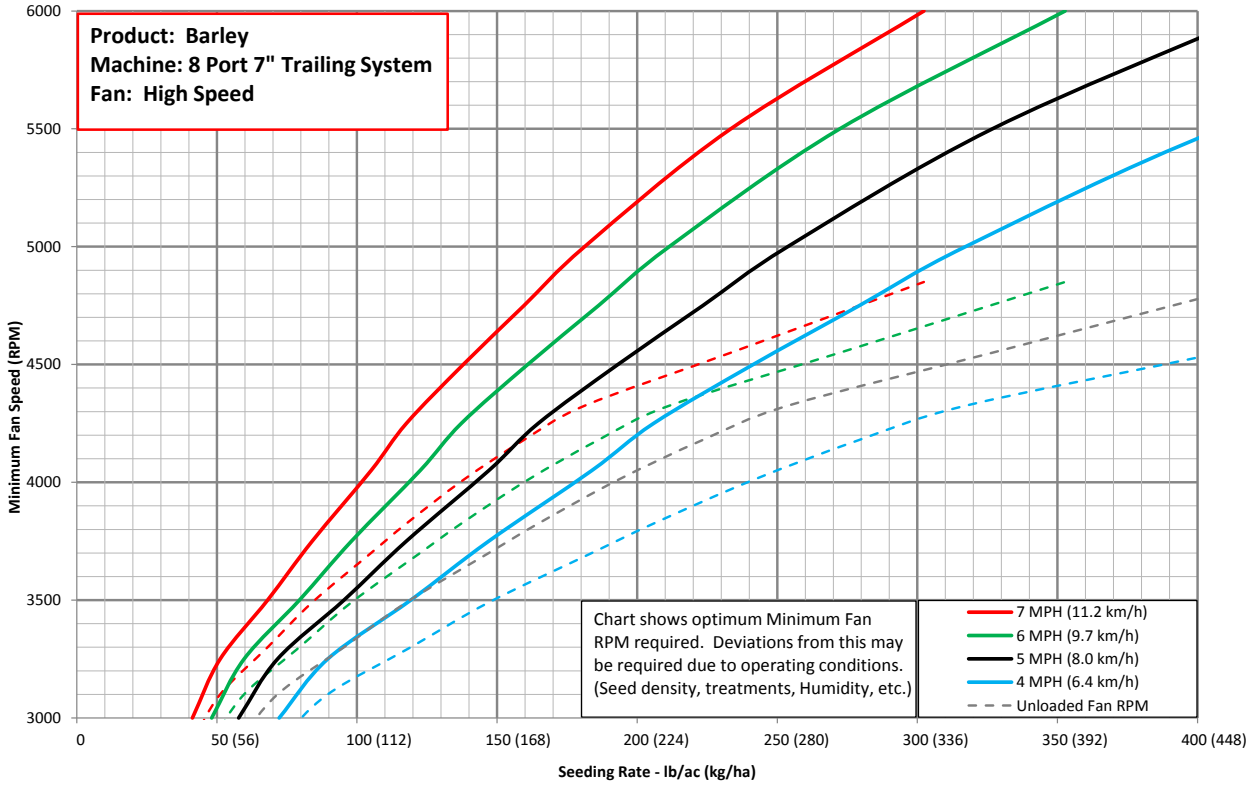


Chart 2E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 2F

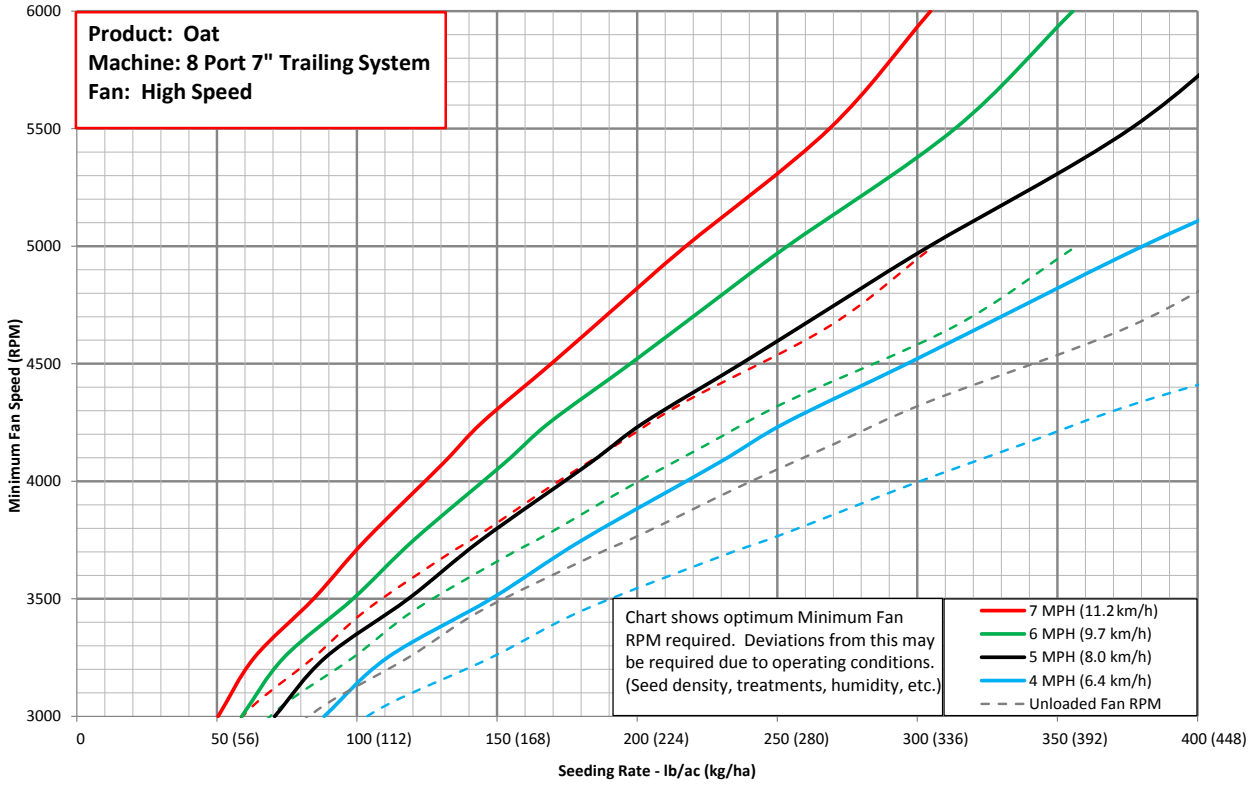
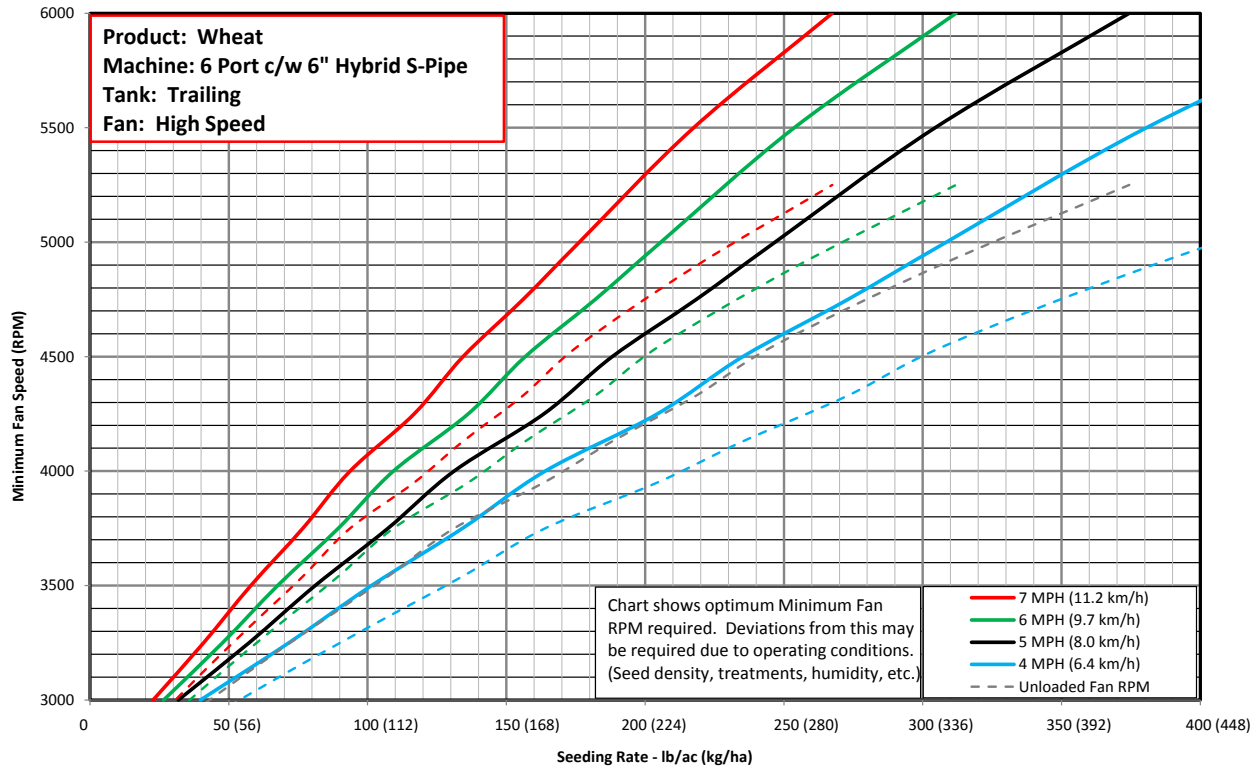


Chart 3A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 3B

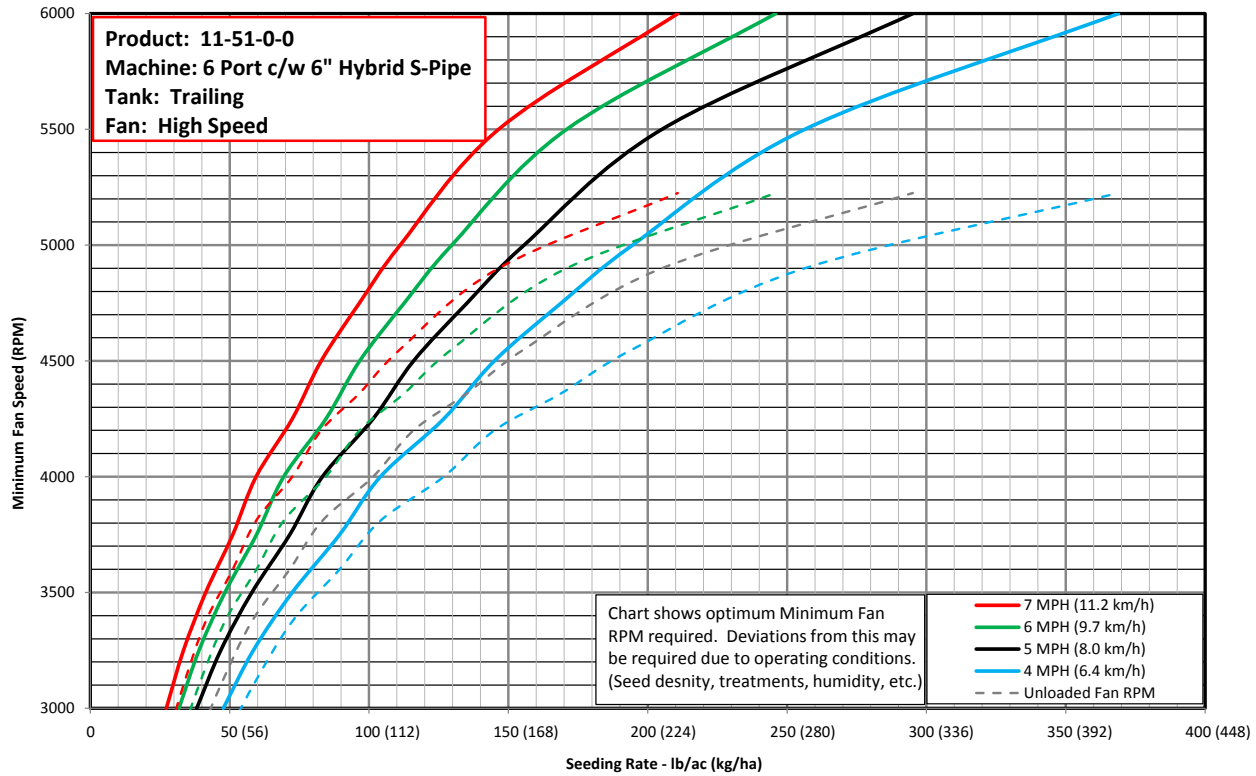
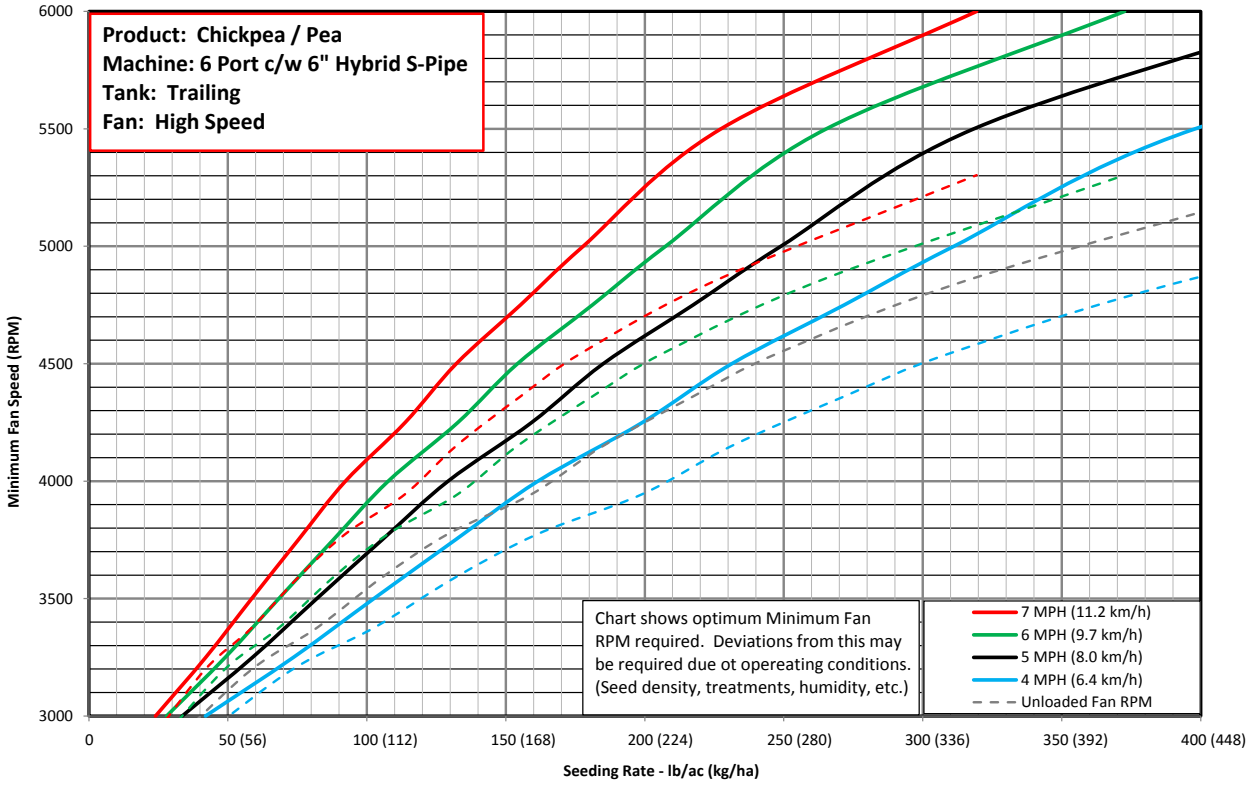


Chart 3C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 3D

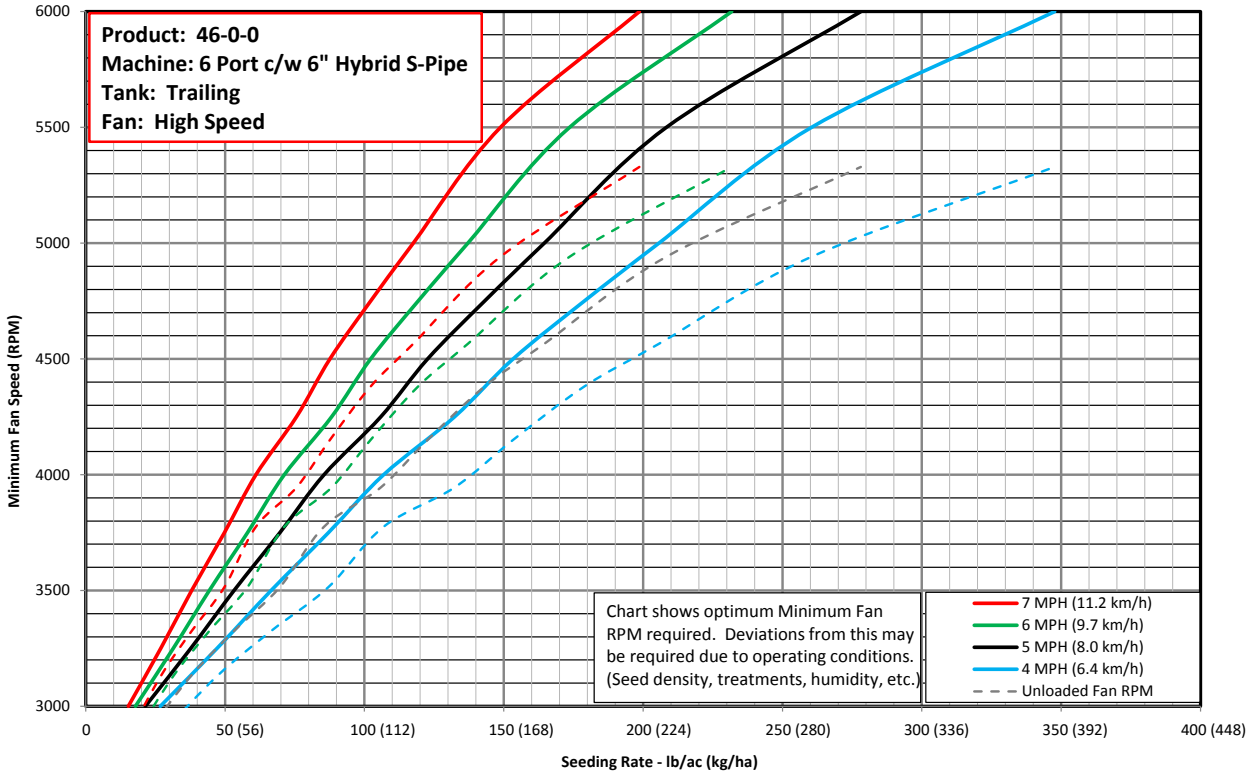
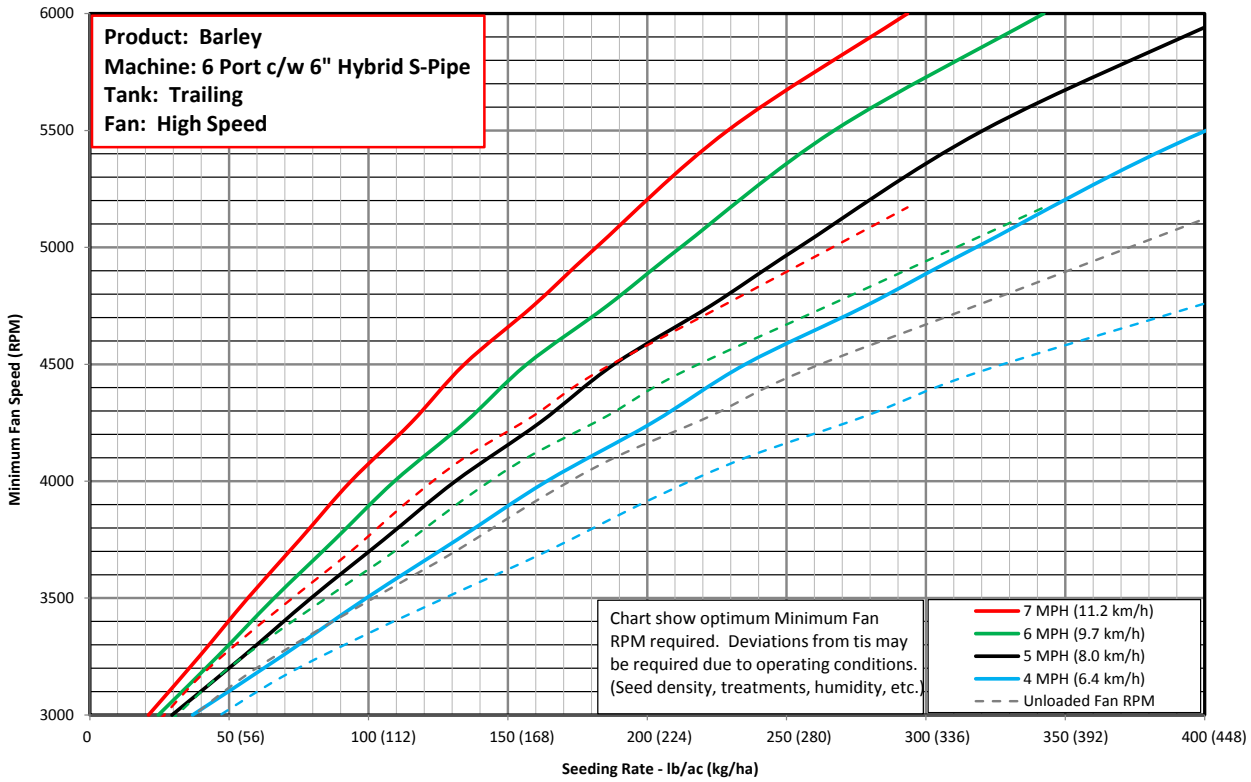


Chart 3E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 3F

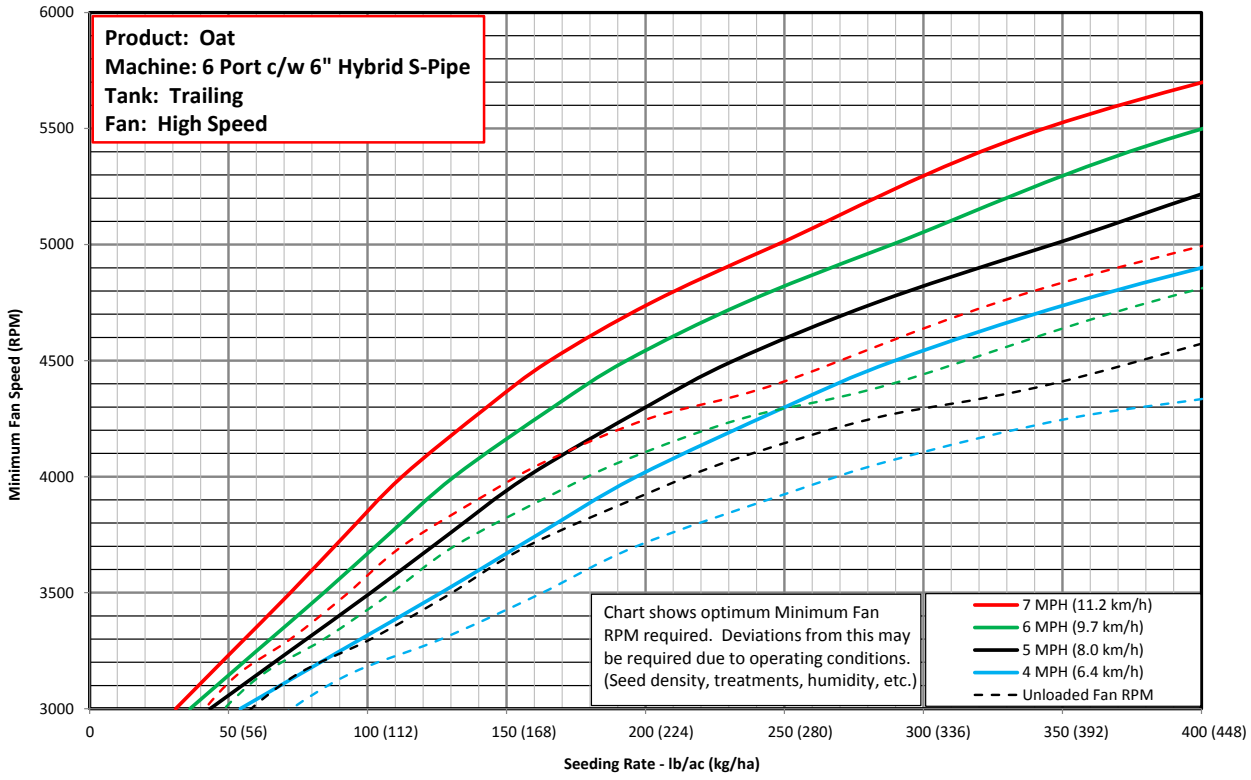
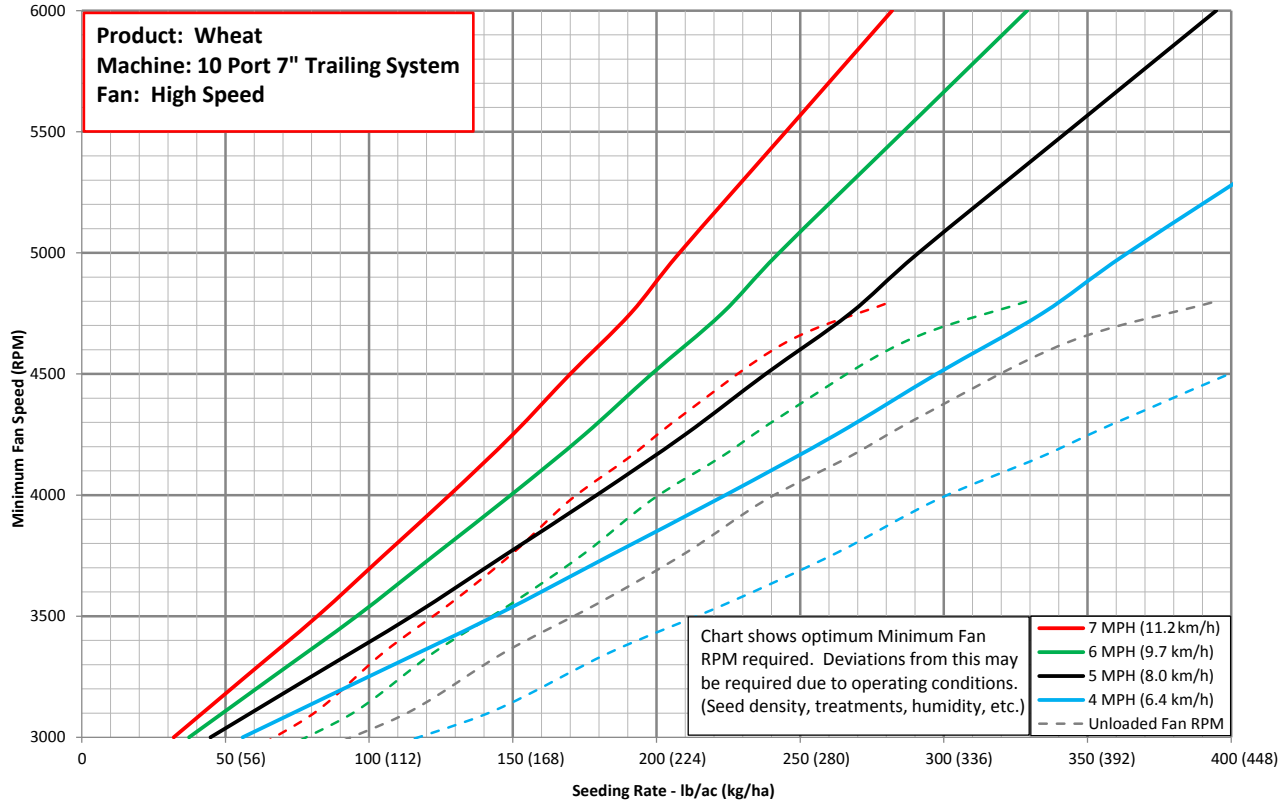


Chart 4A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 4B

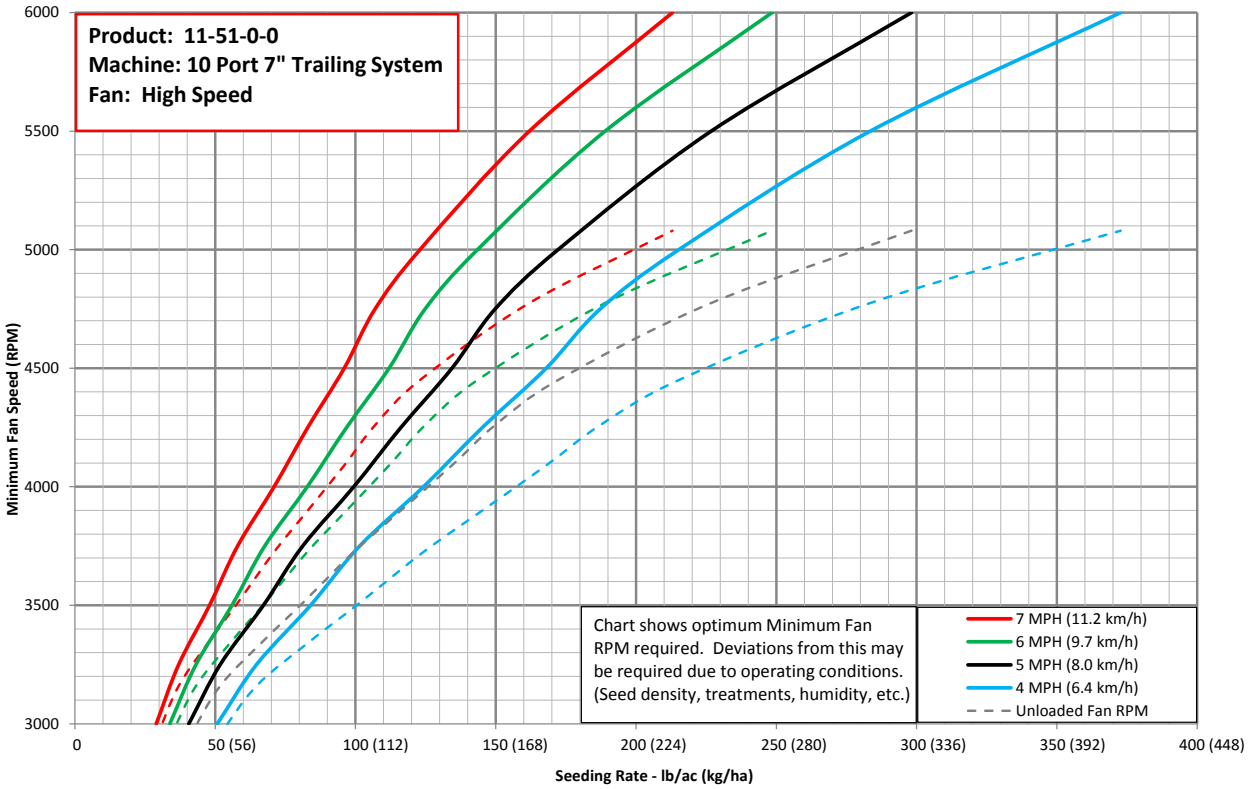
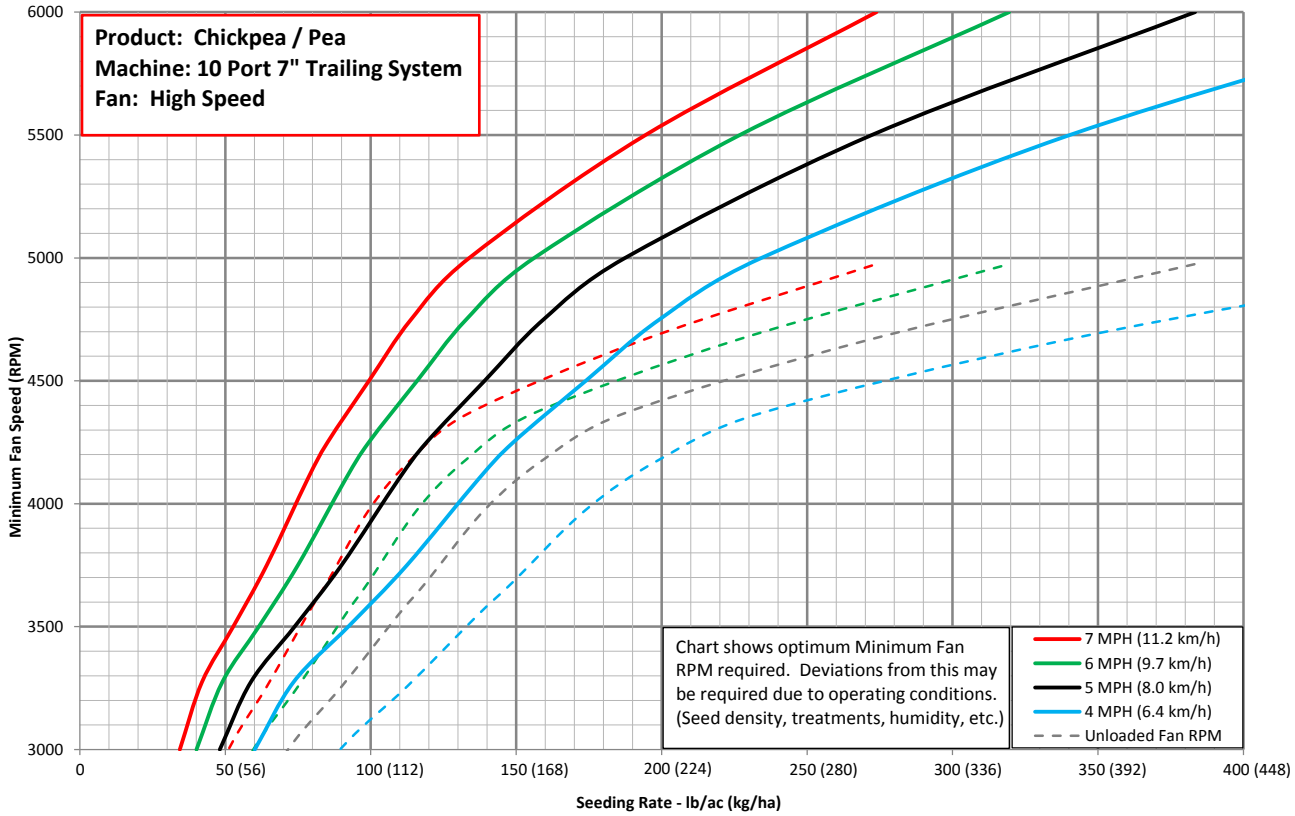


Chart 4C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 4D

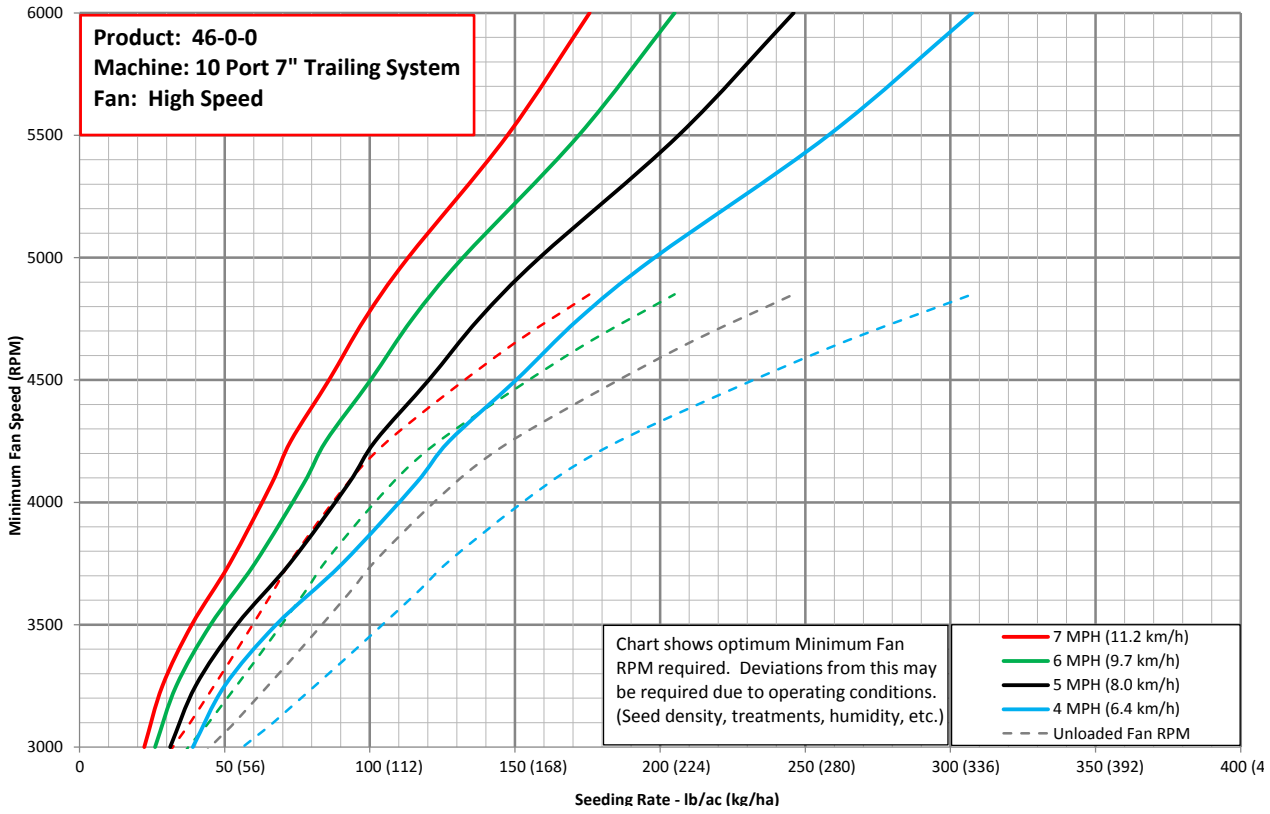
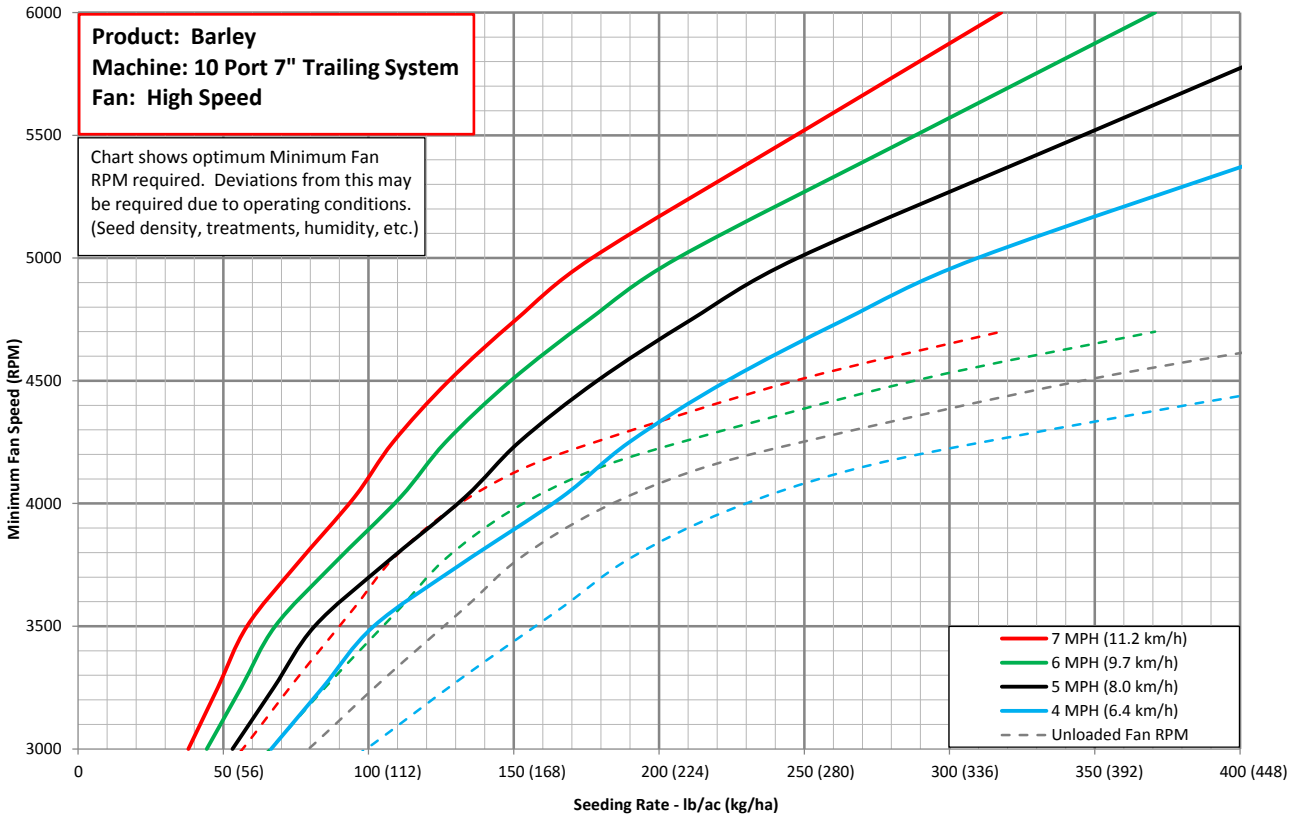


Chart 4E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 4F

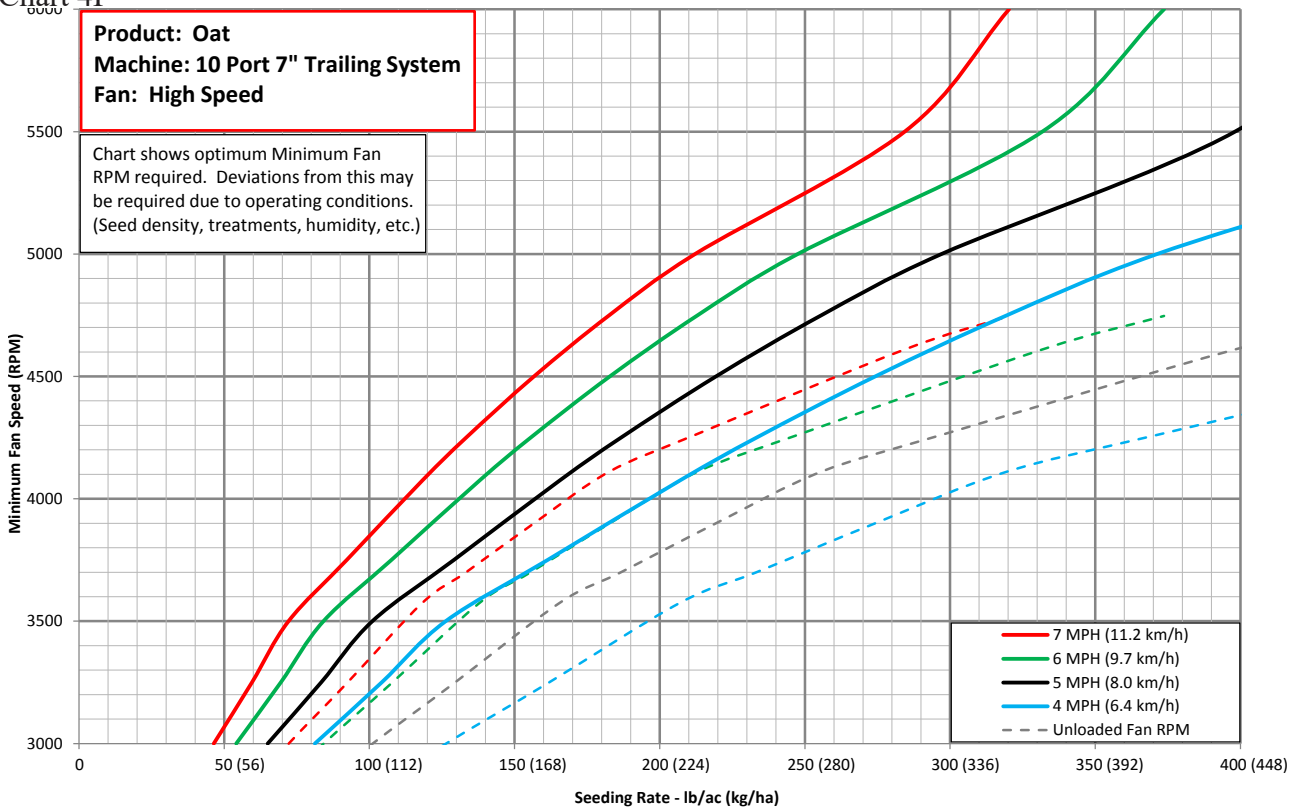
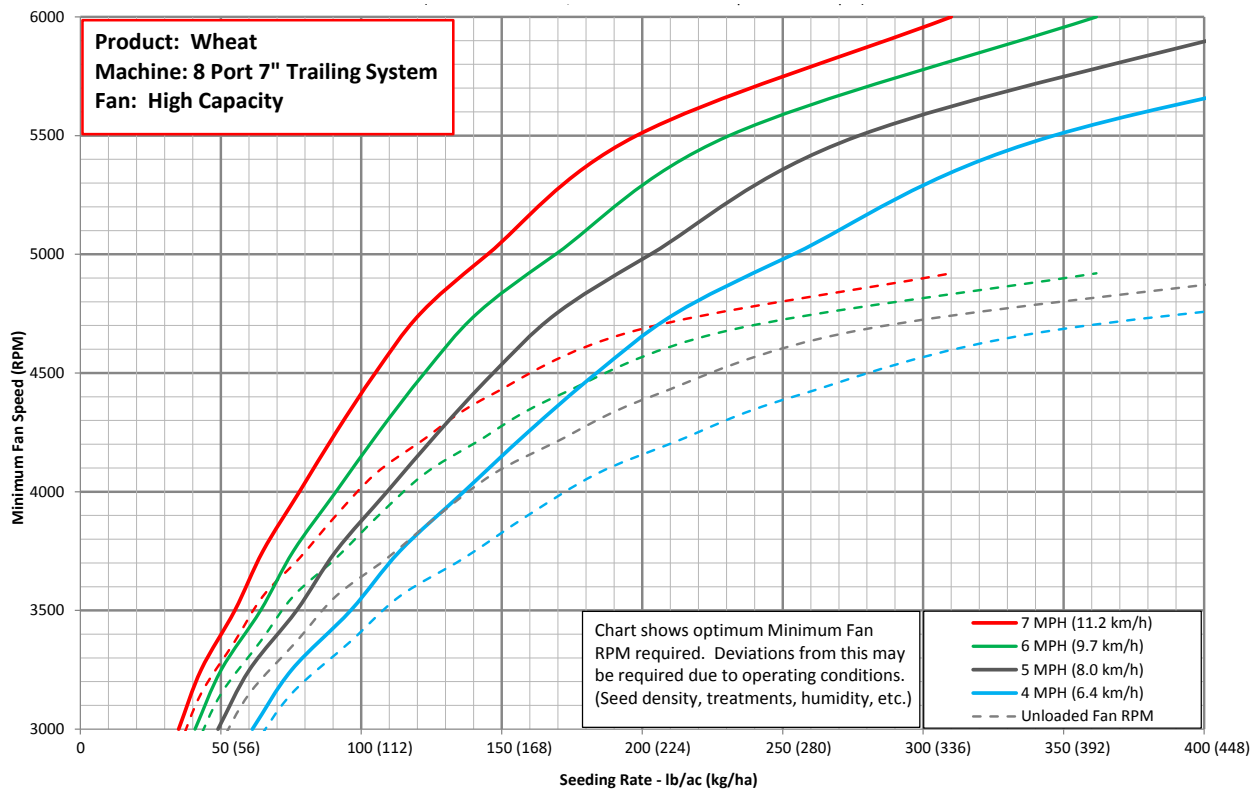


Chart 5A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 5B

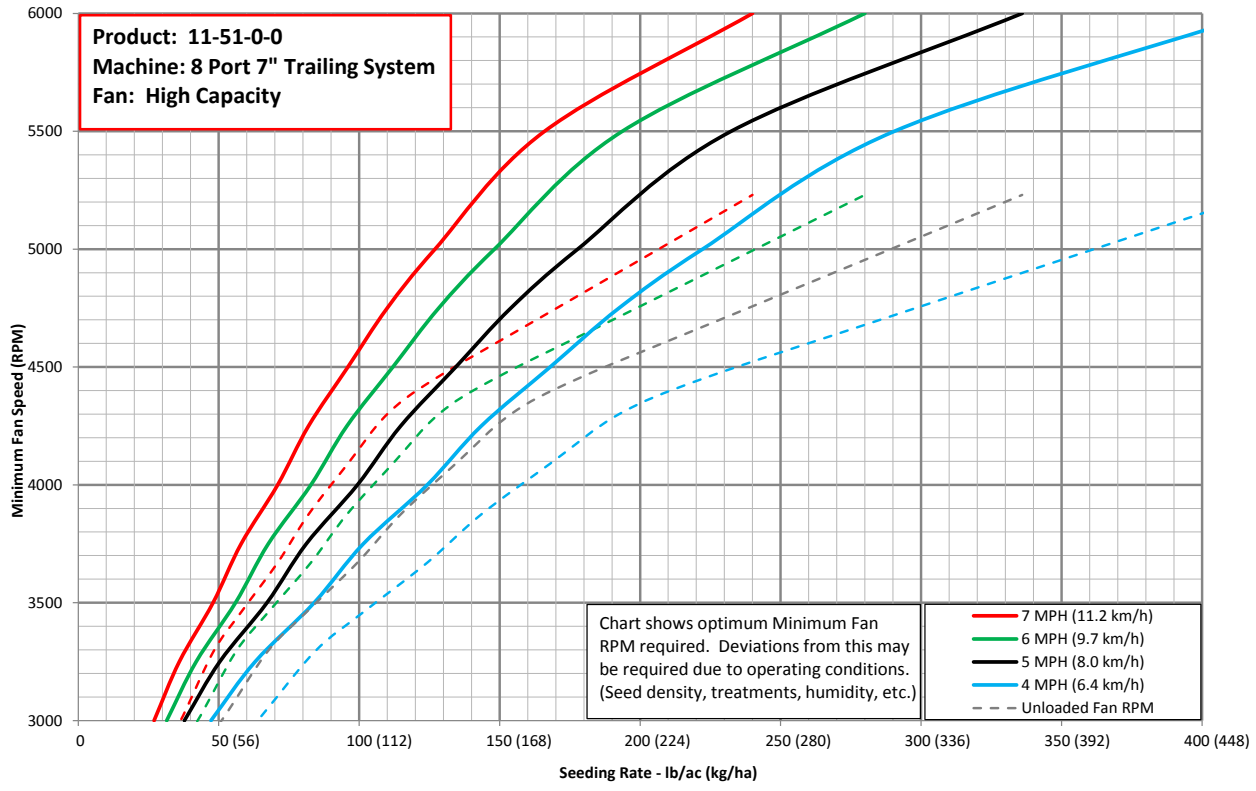
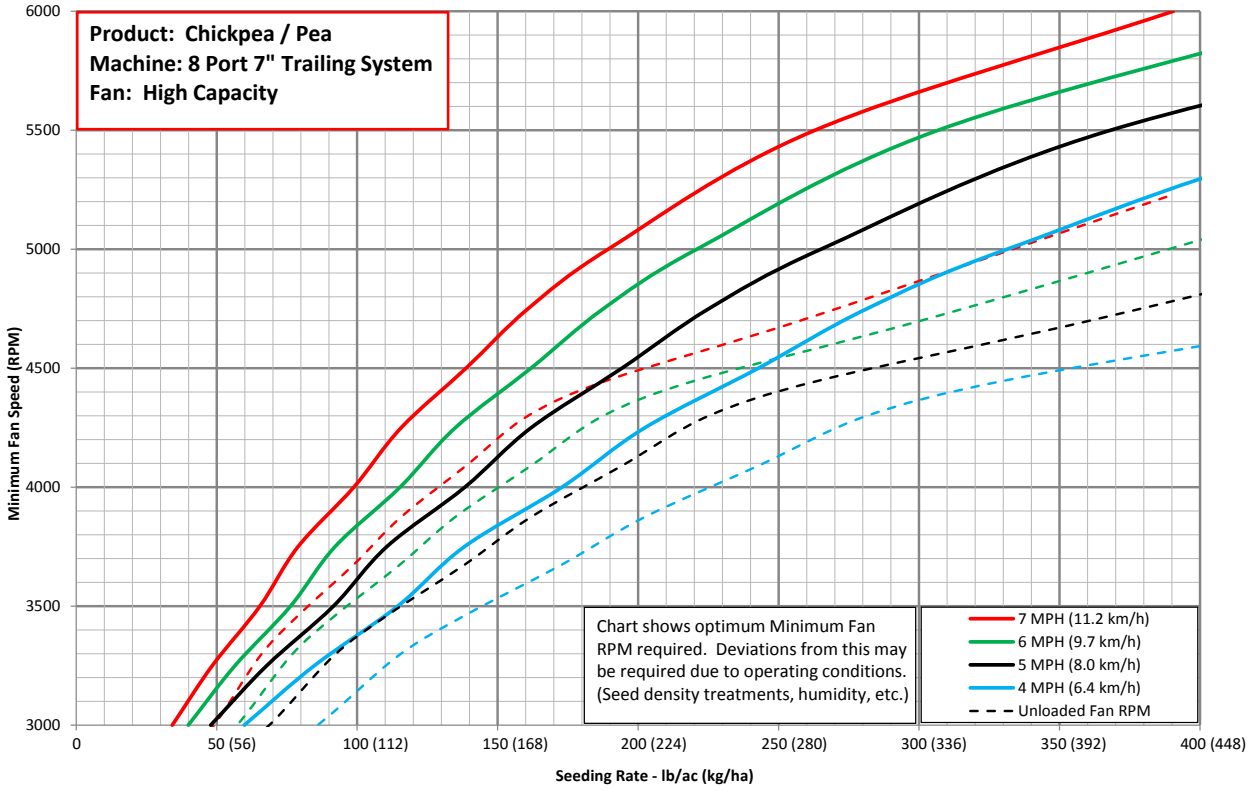


Chart 5C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 5D

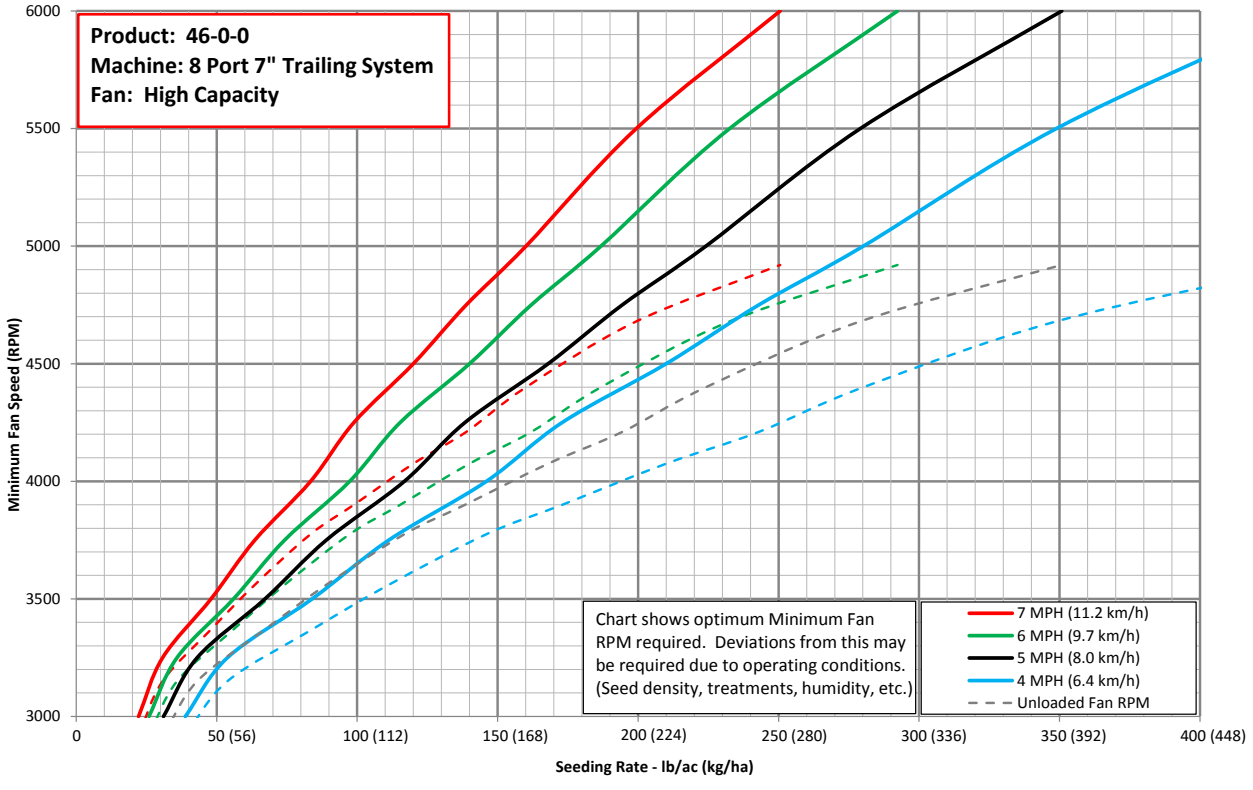
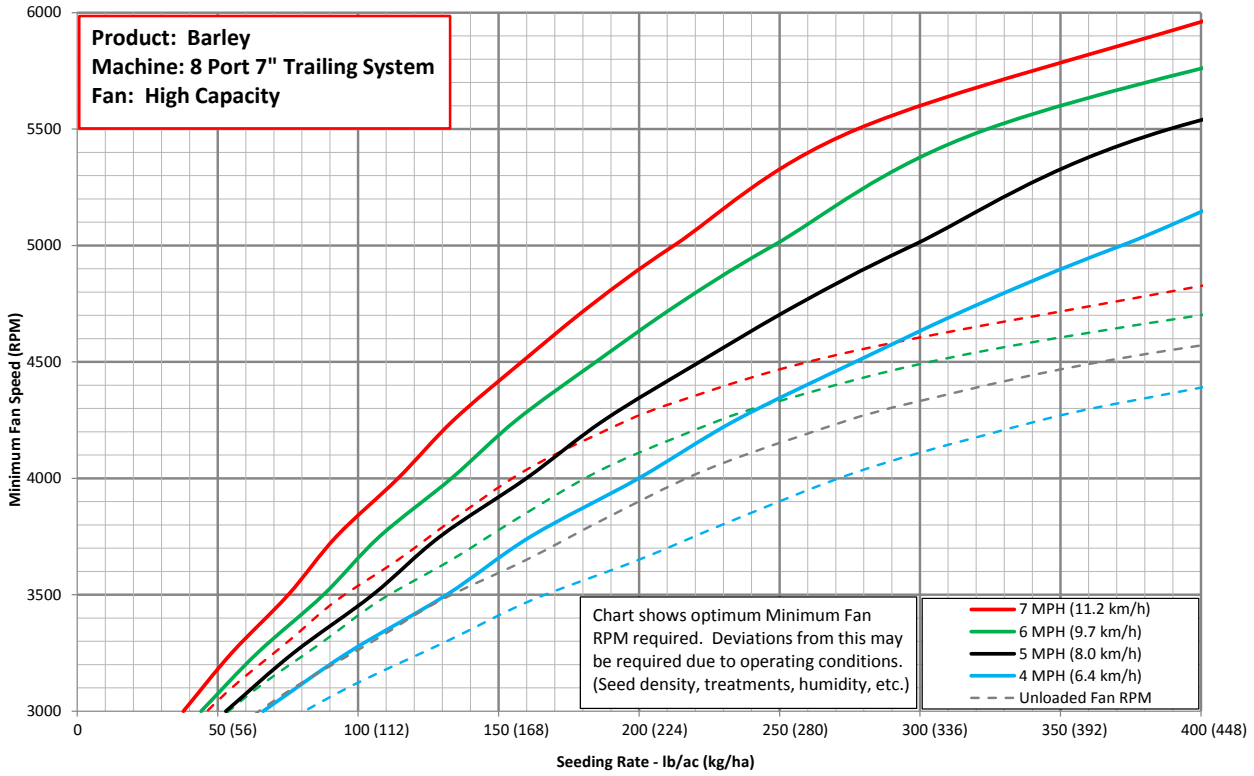


Chart 5E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 5F

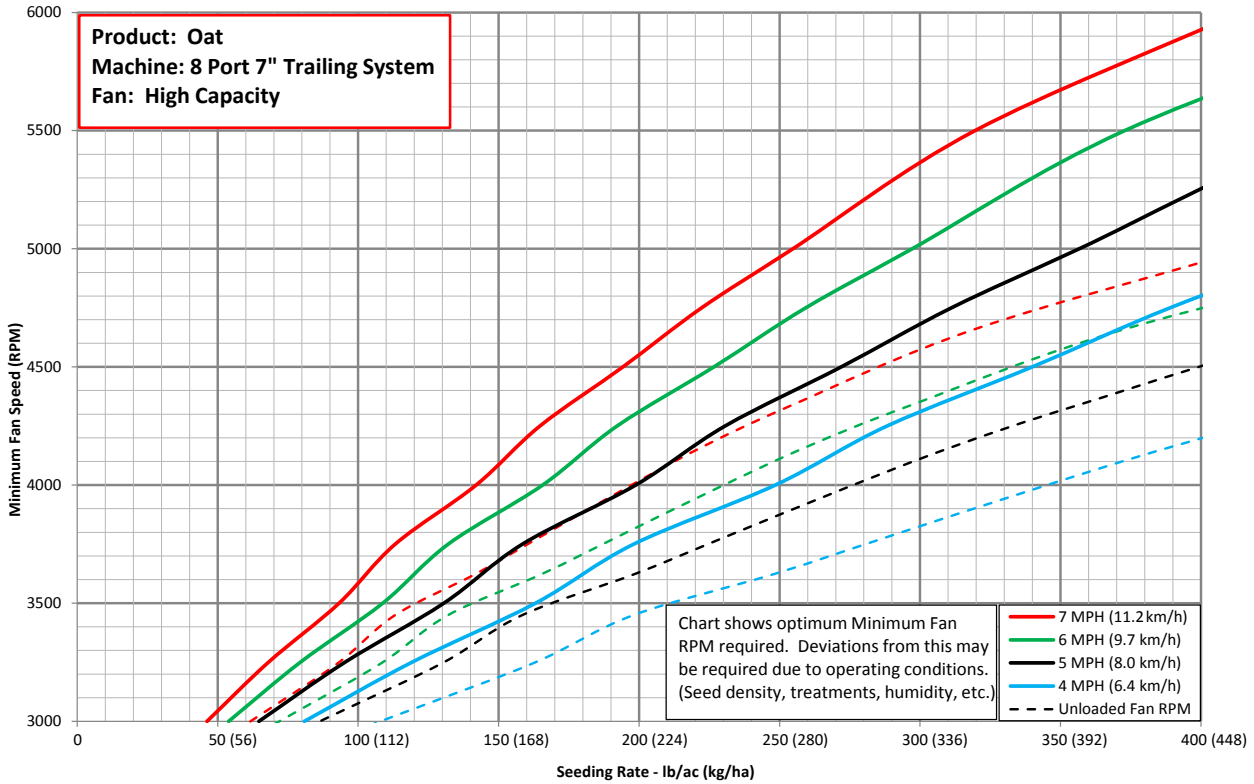
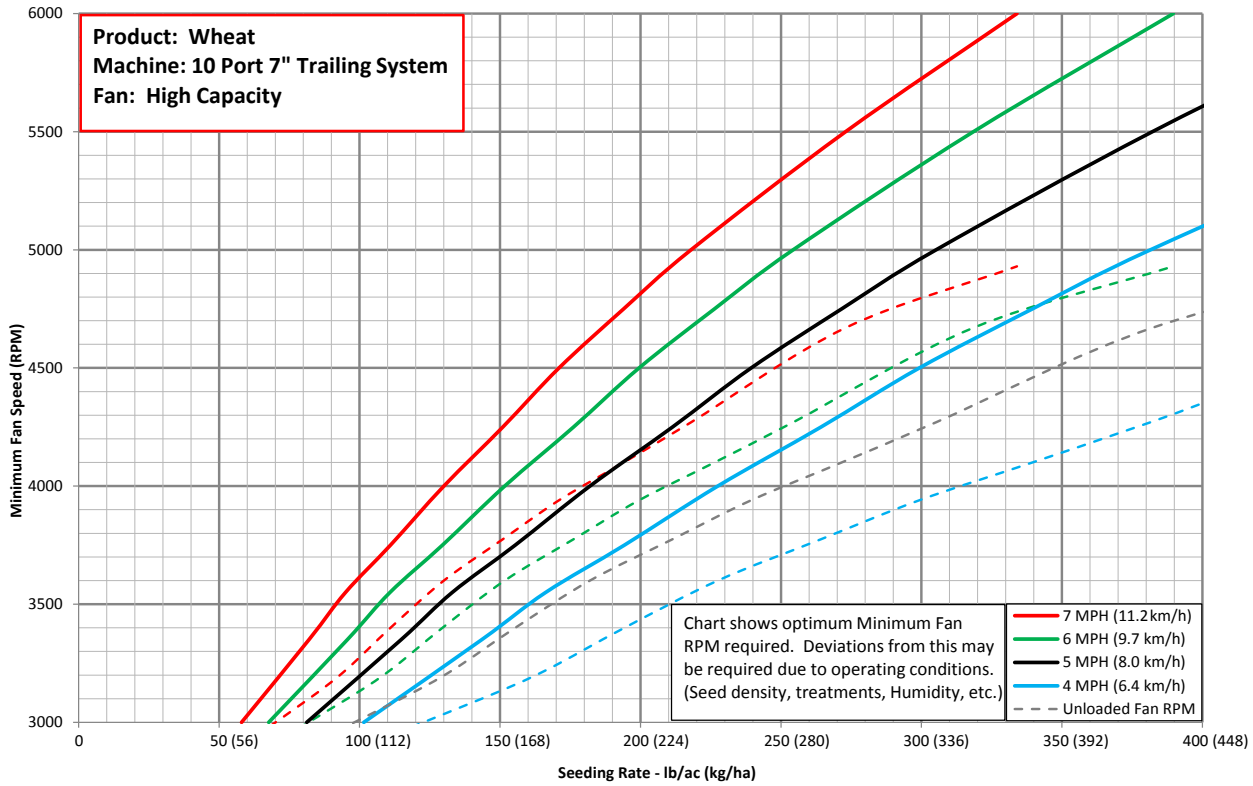


Chart 6A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 6B

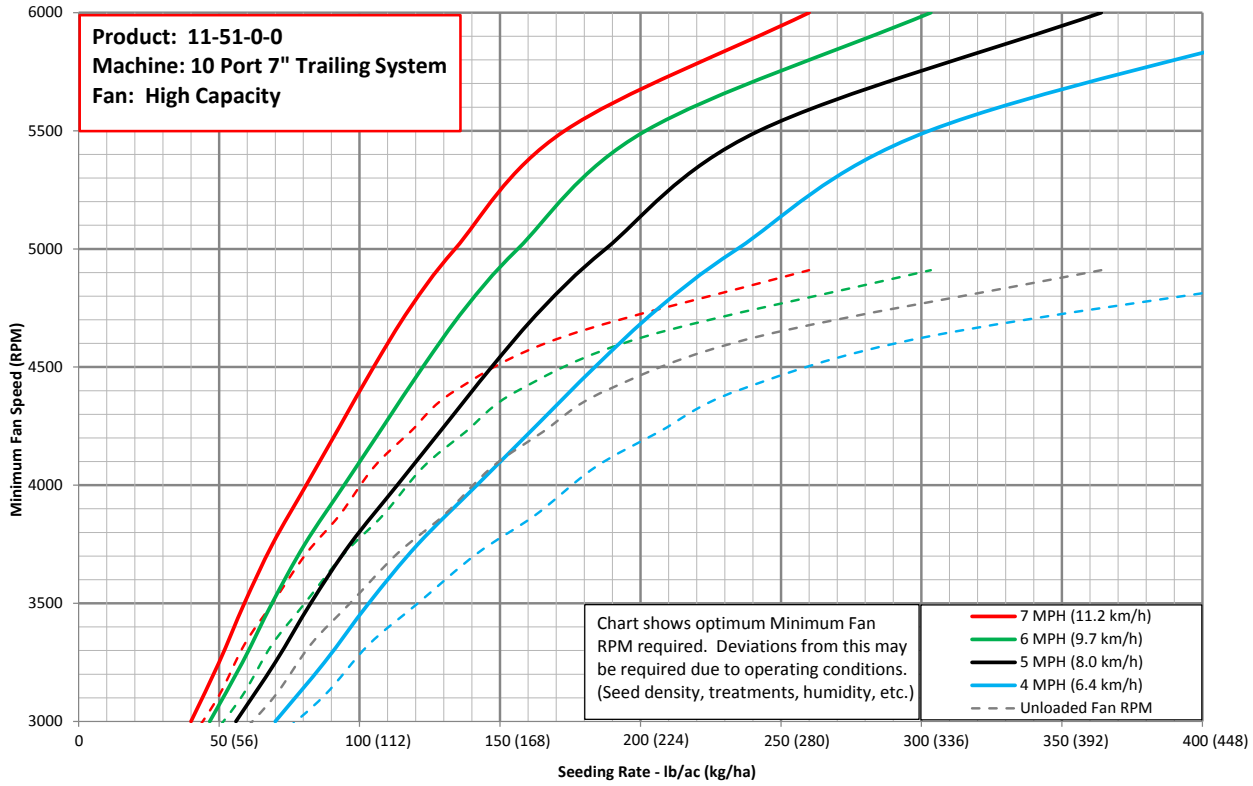
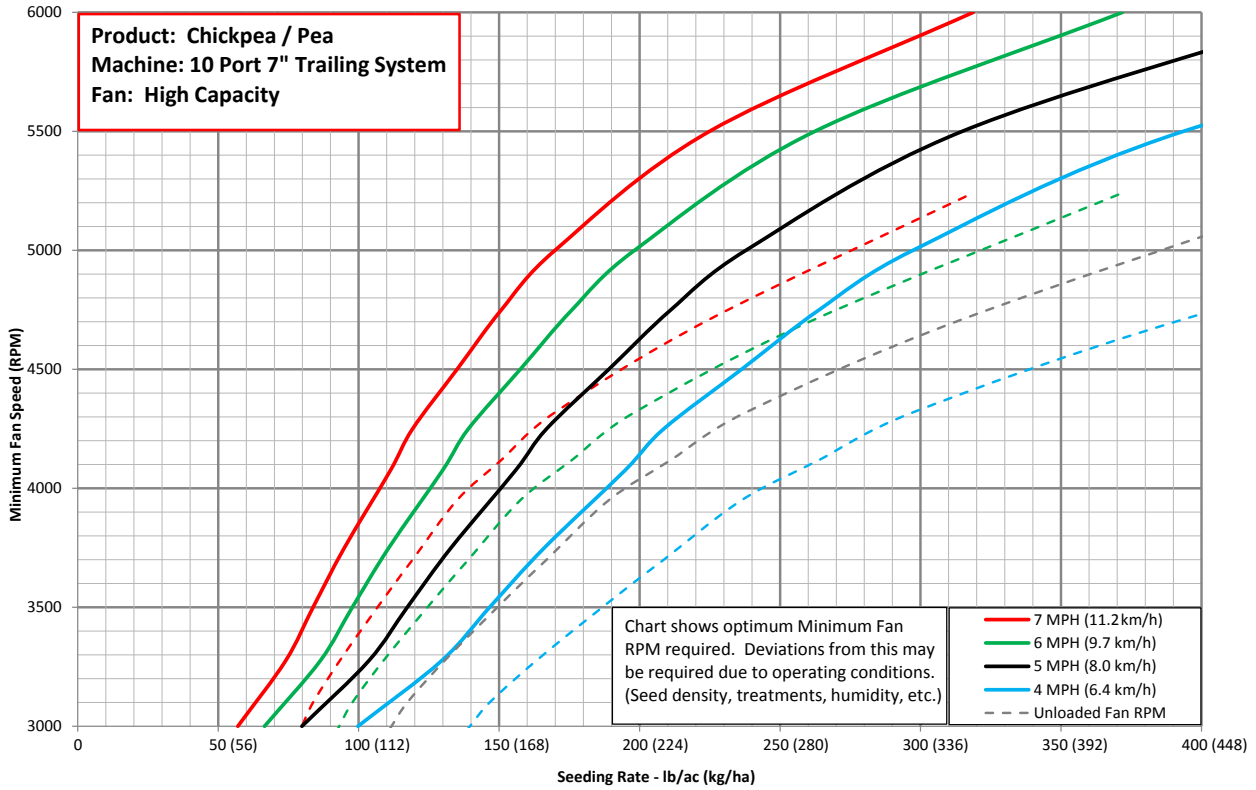


Chart 6C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 6D

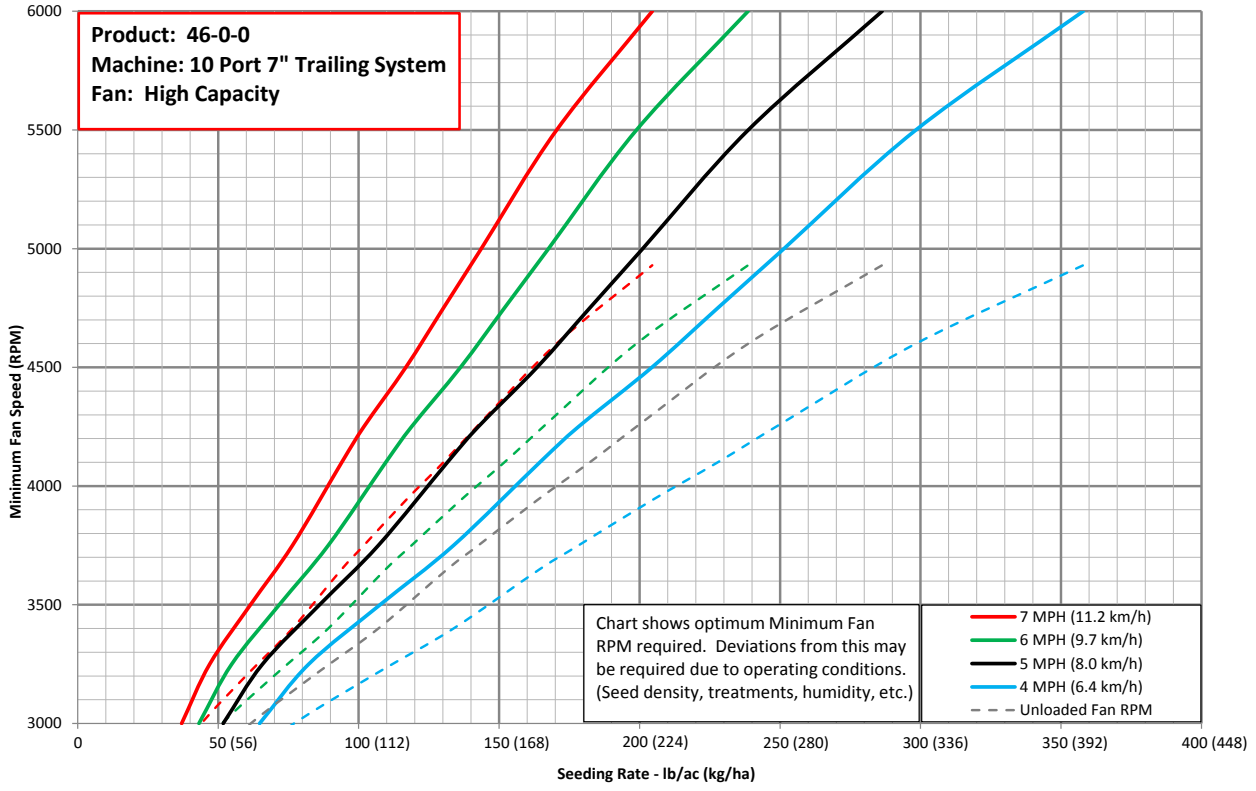
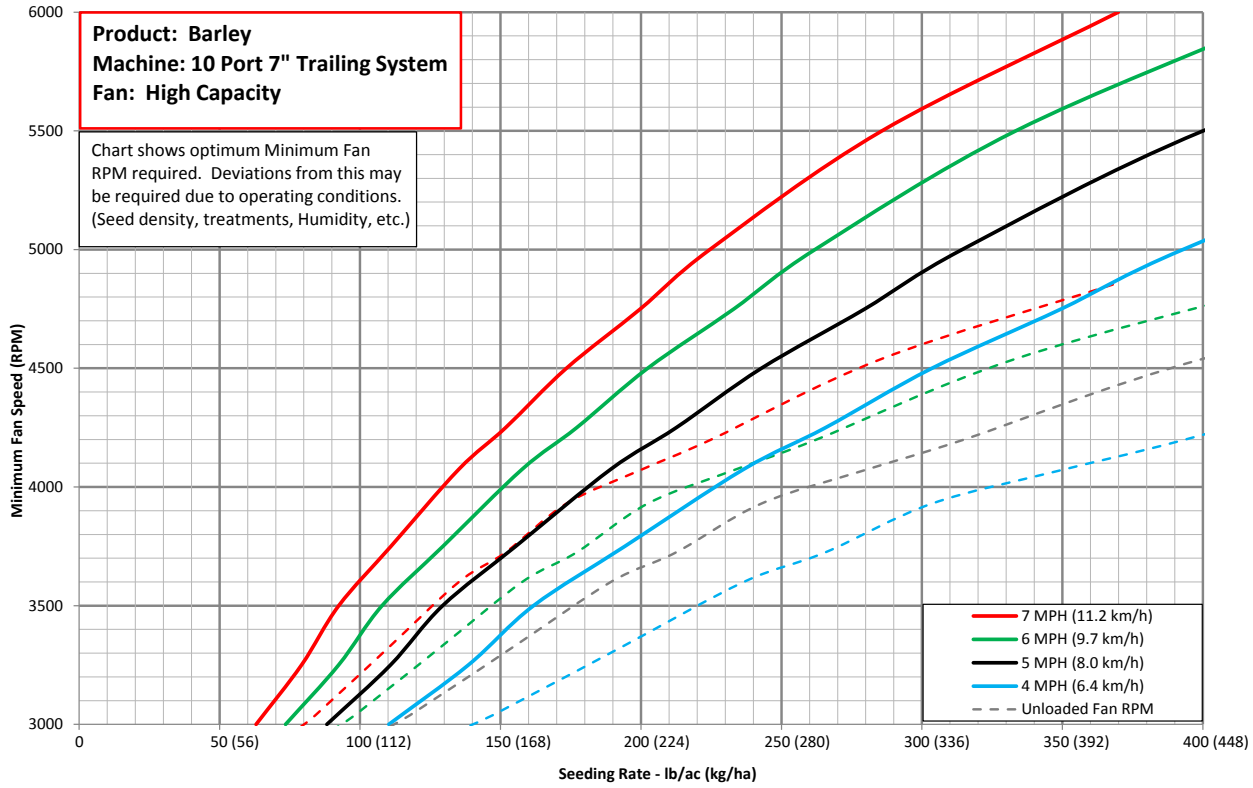


Chart 6E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 6F

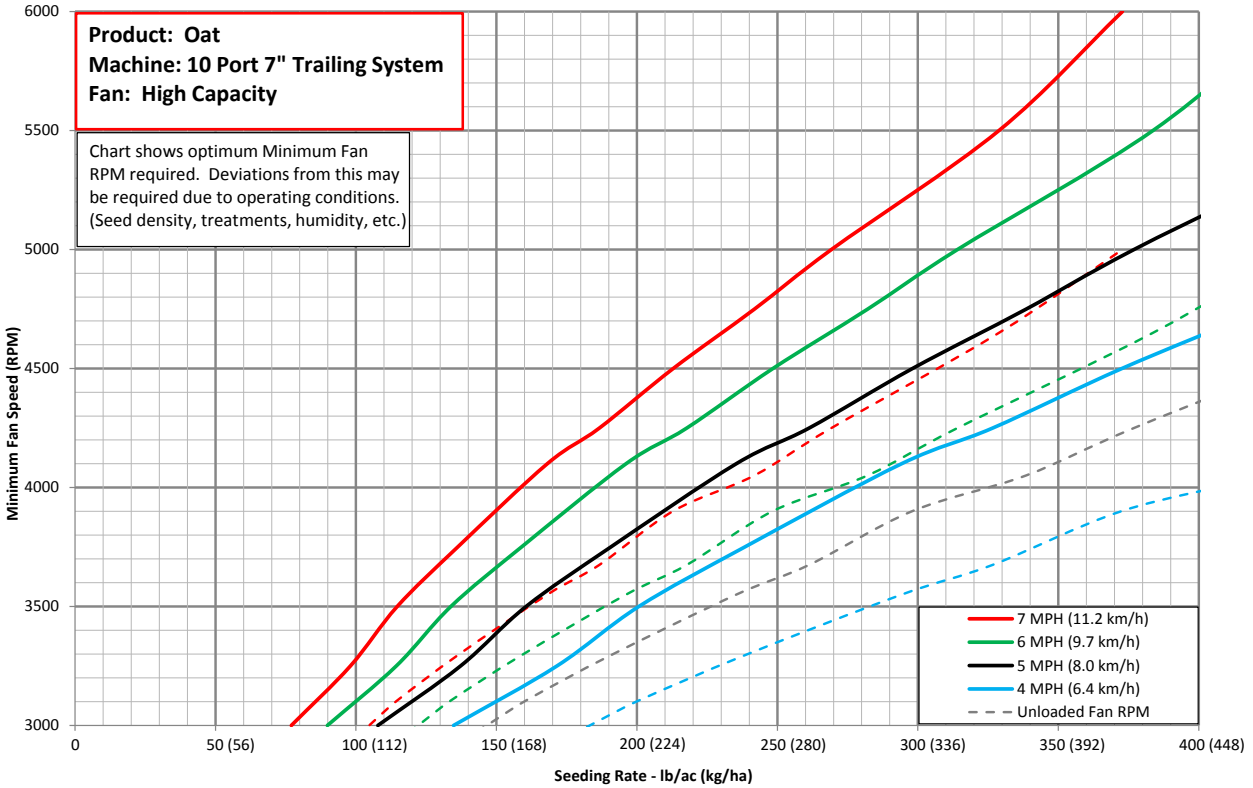
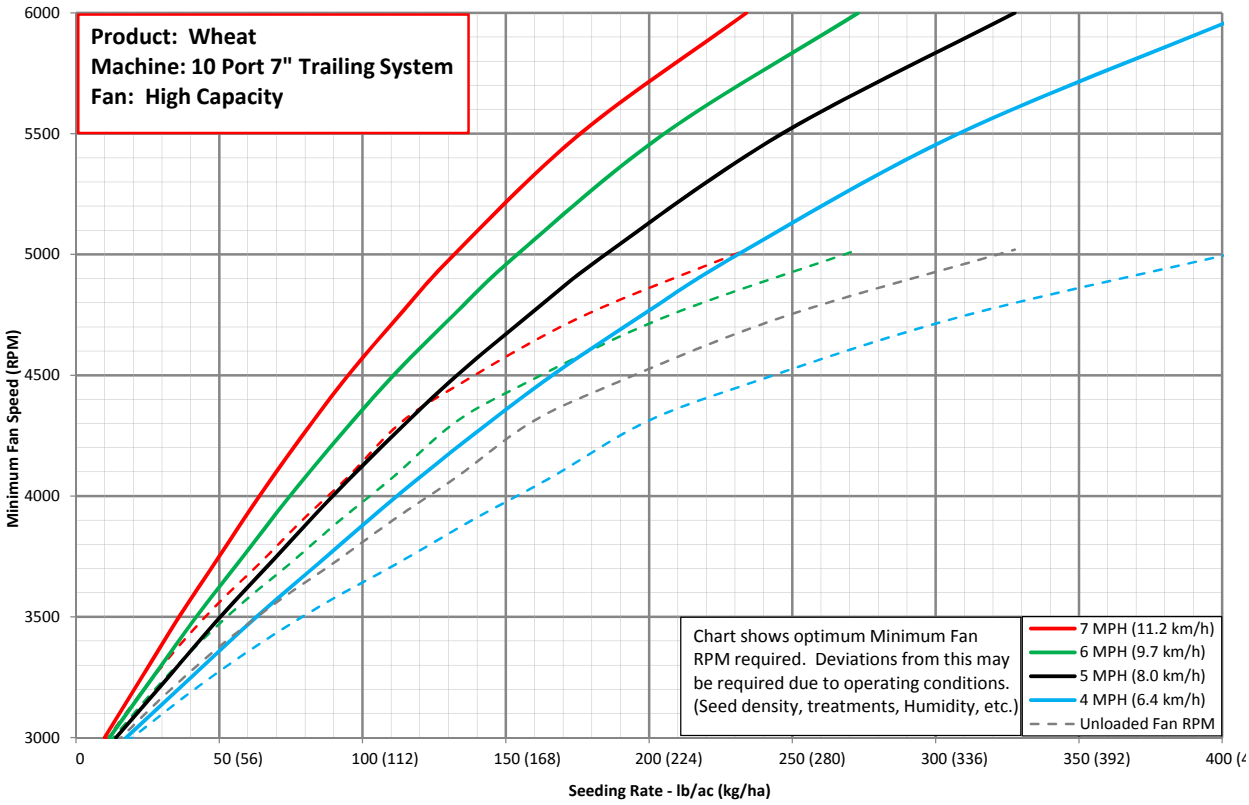


Chart 11A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 11B

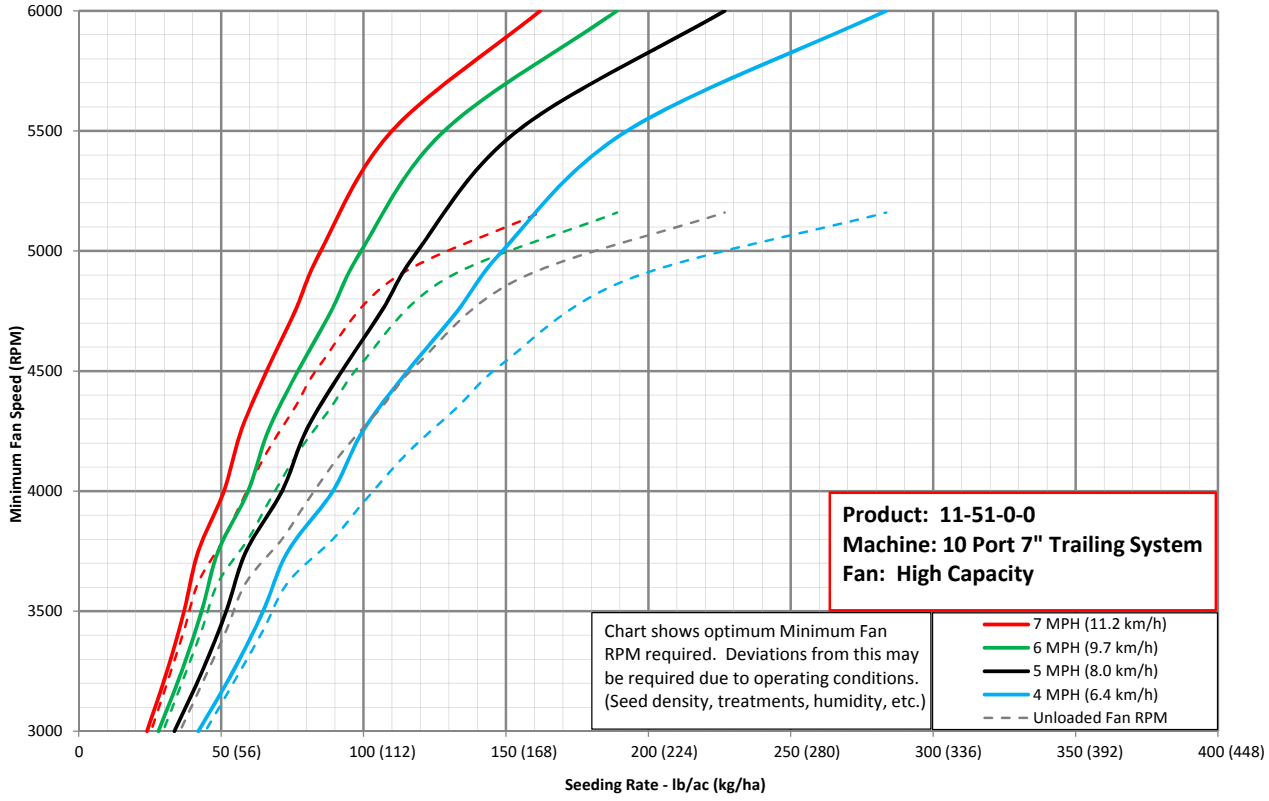
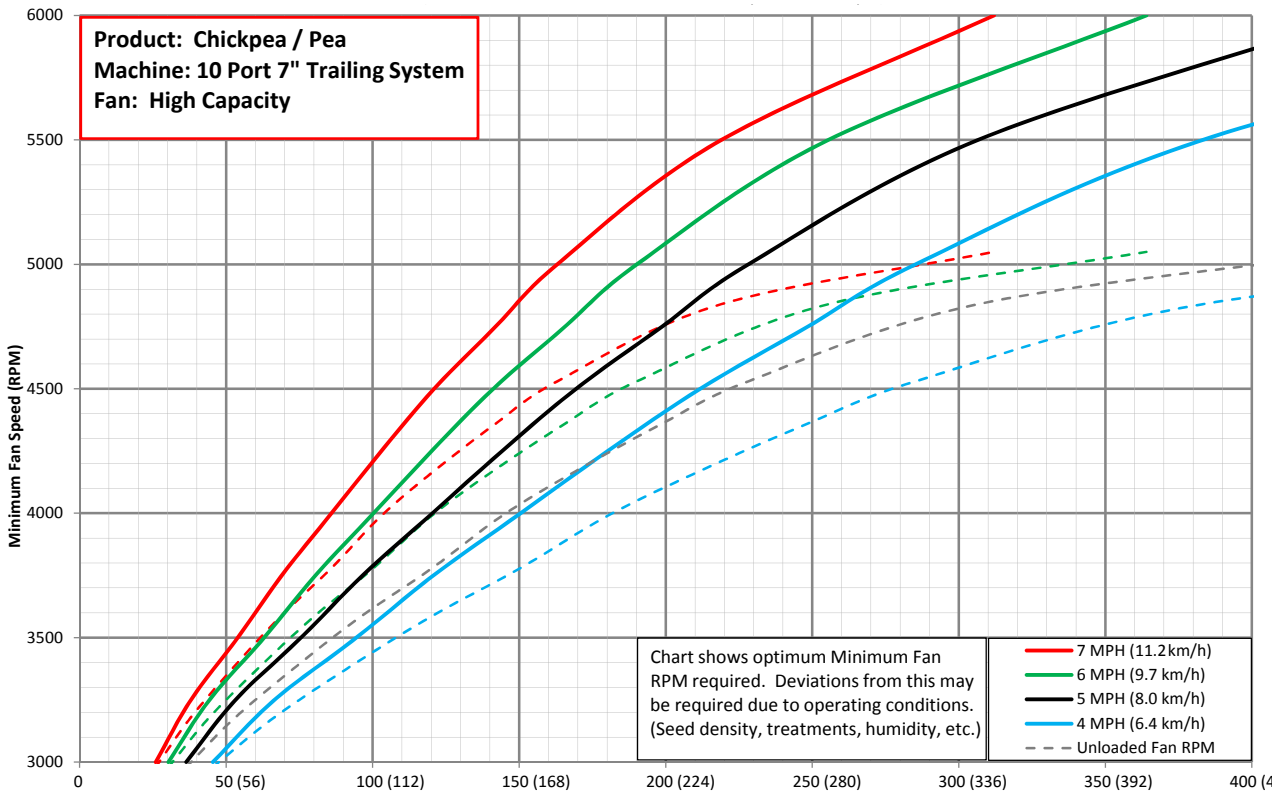


Chart 11C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 11D

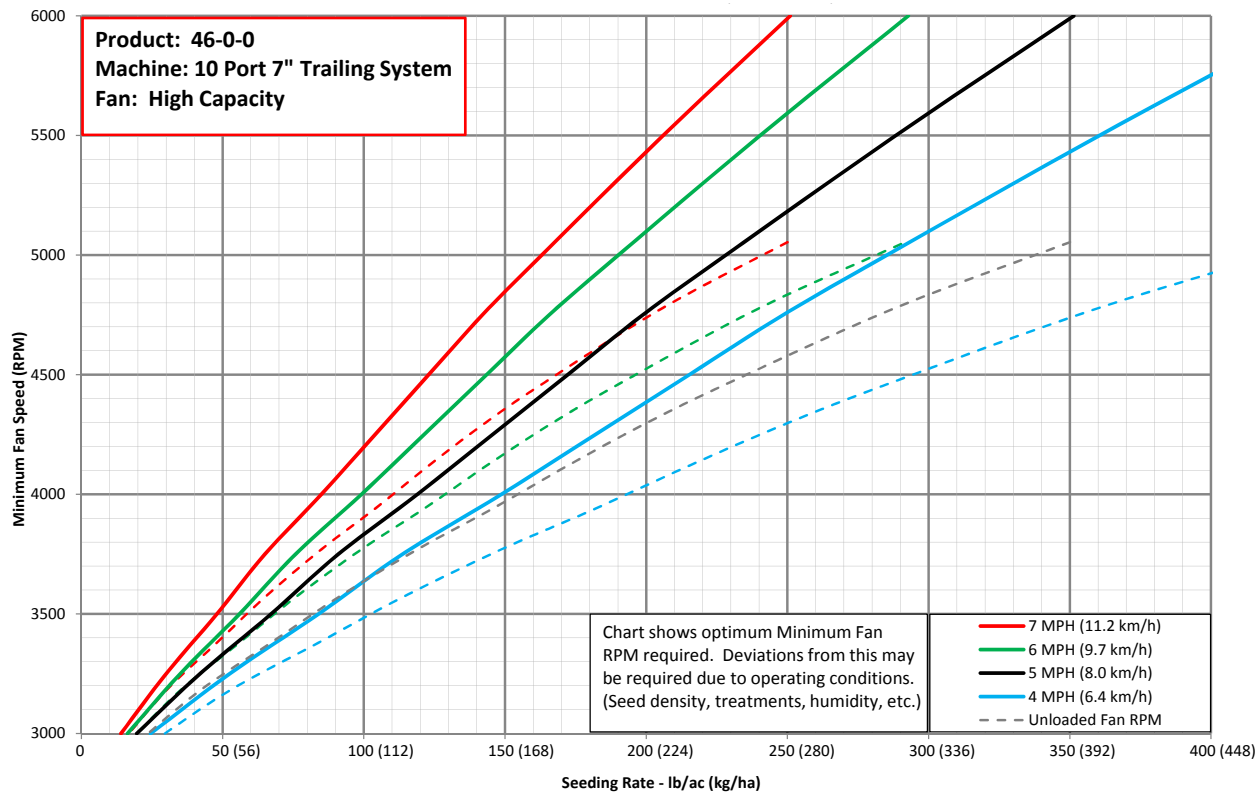
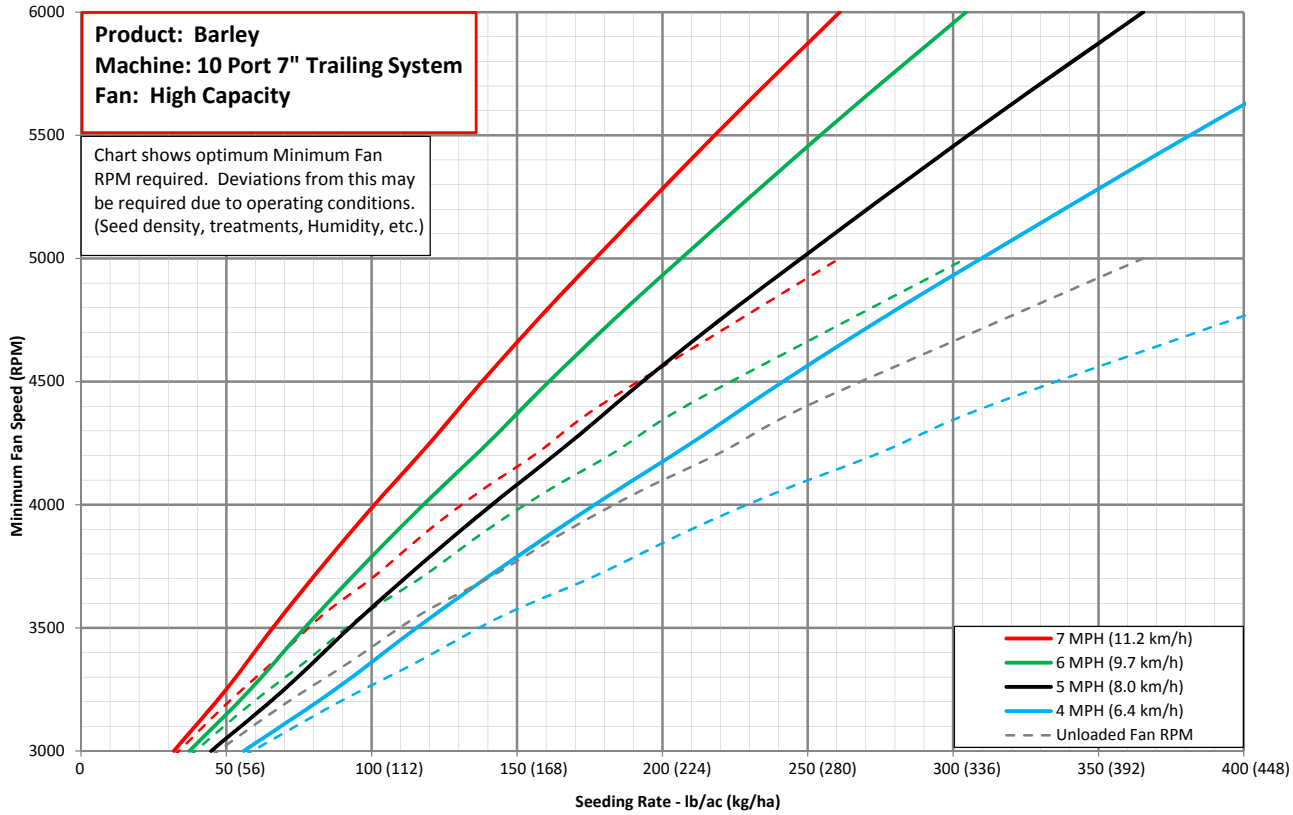


Chart 11E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 11F

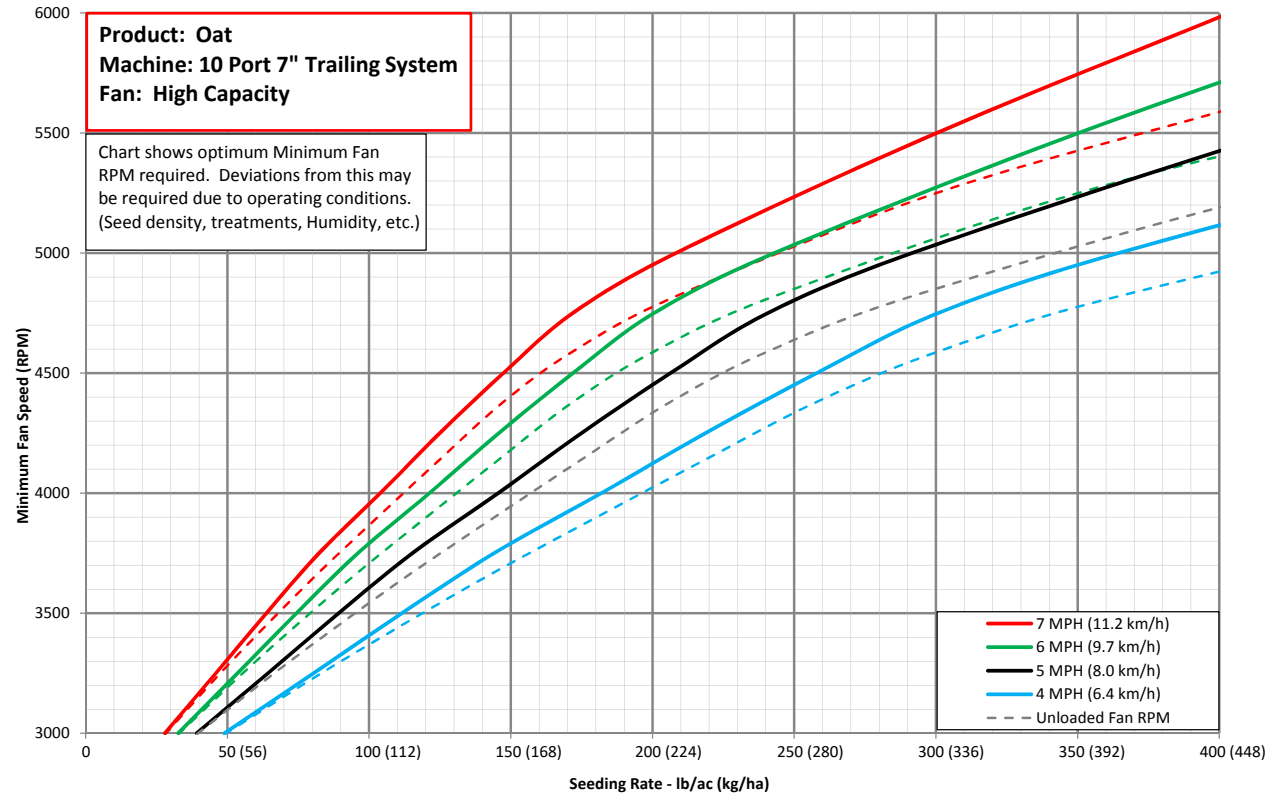
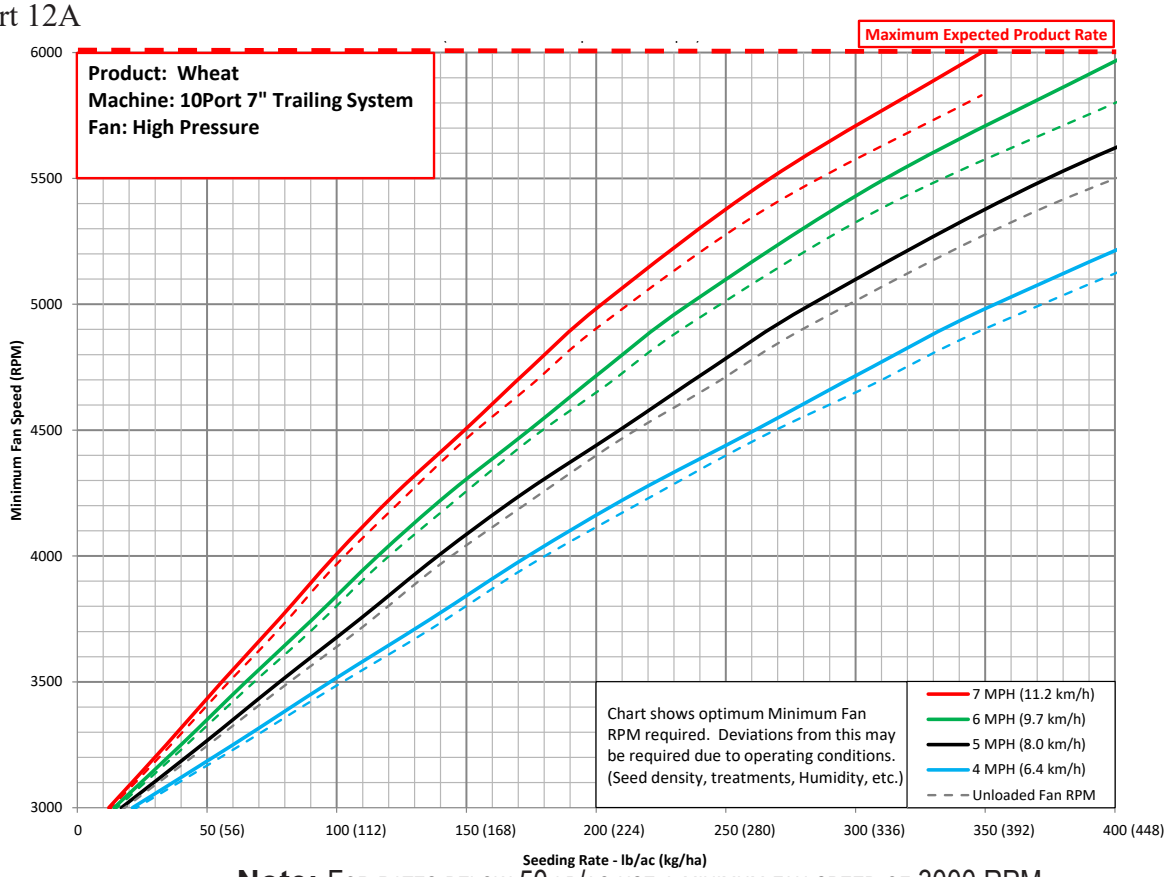


Chart 12A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 12B

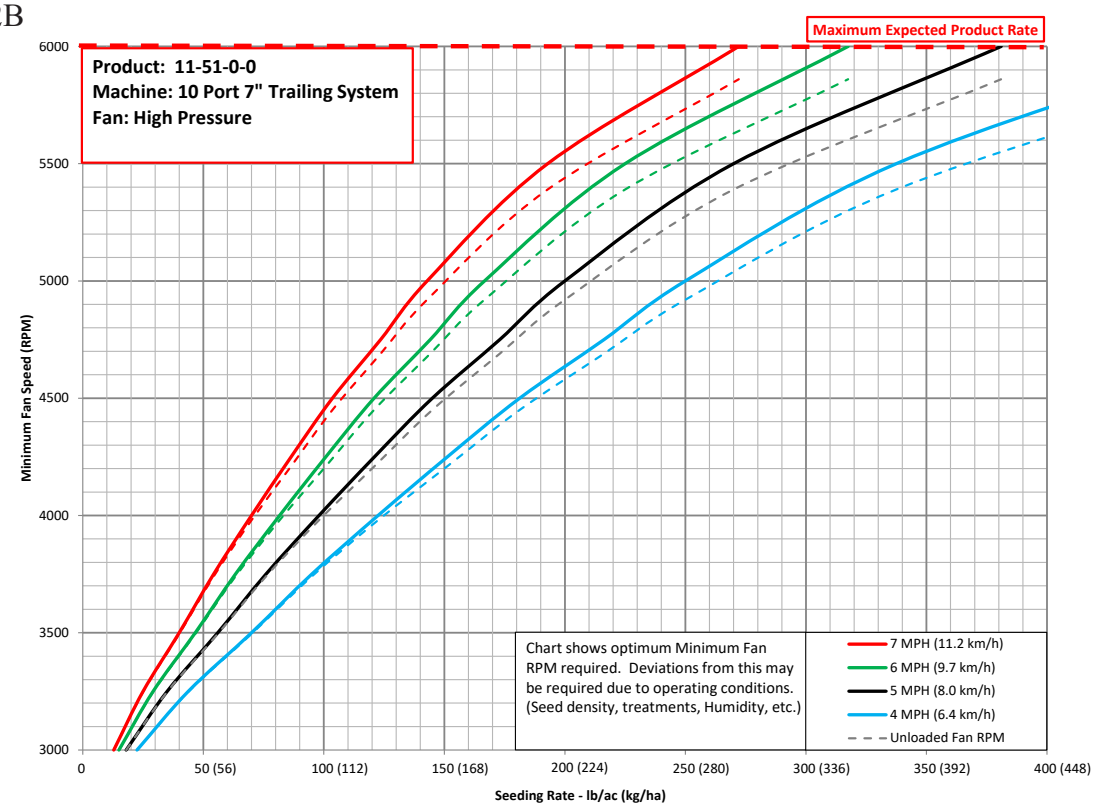
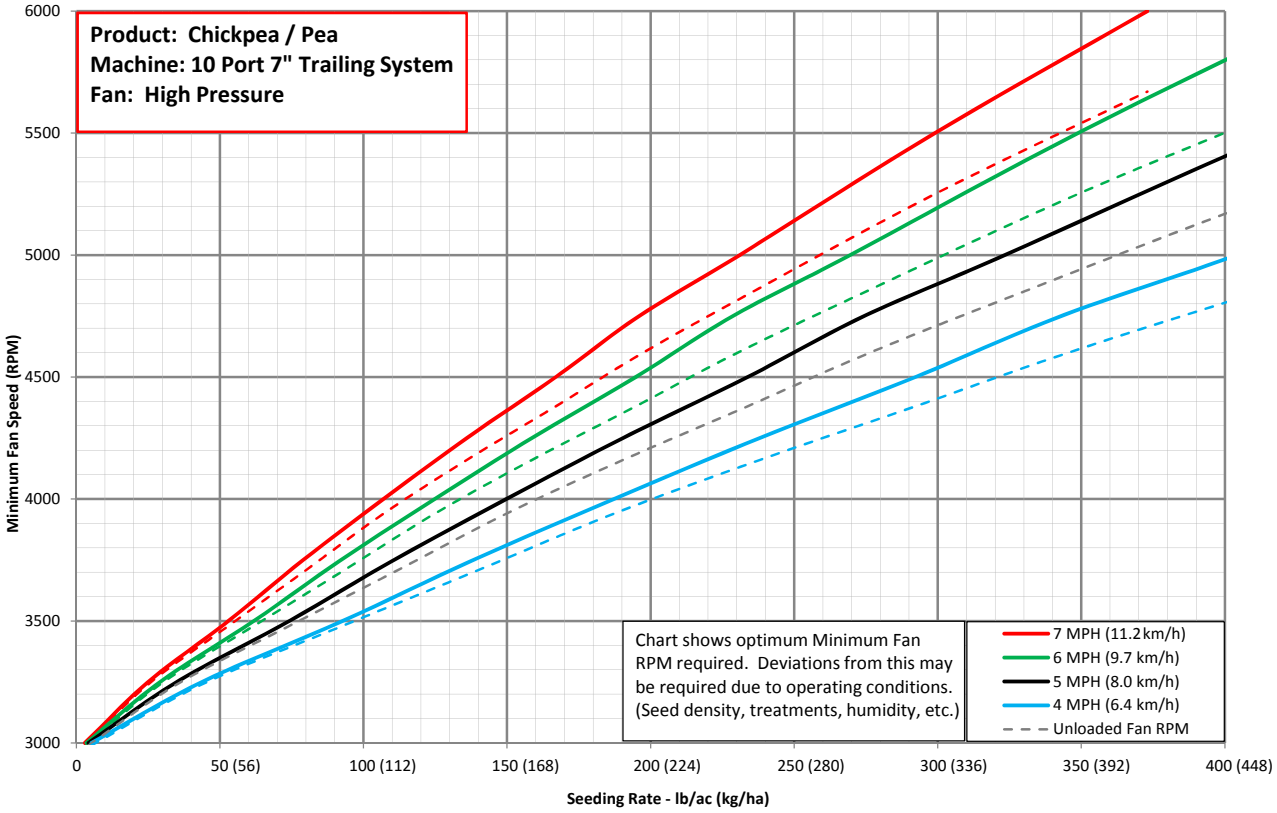


Chart 12C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 12D

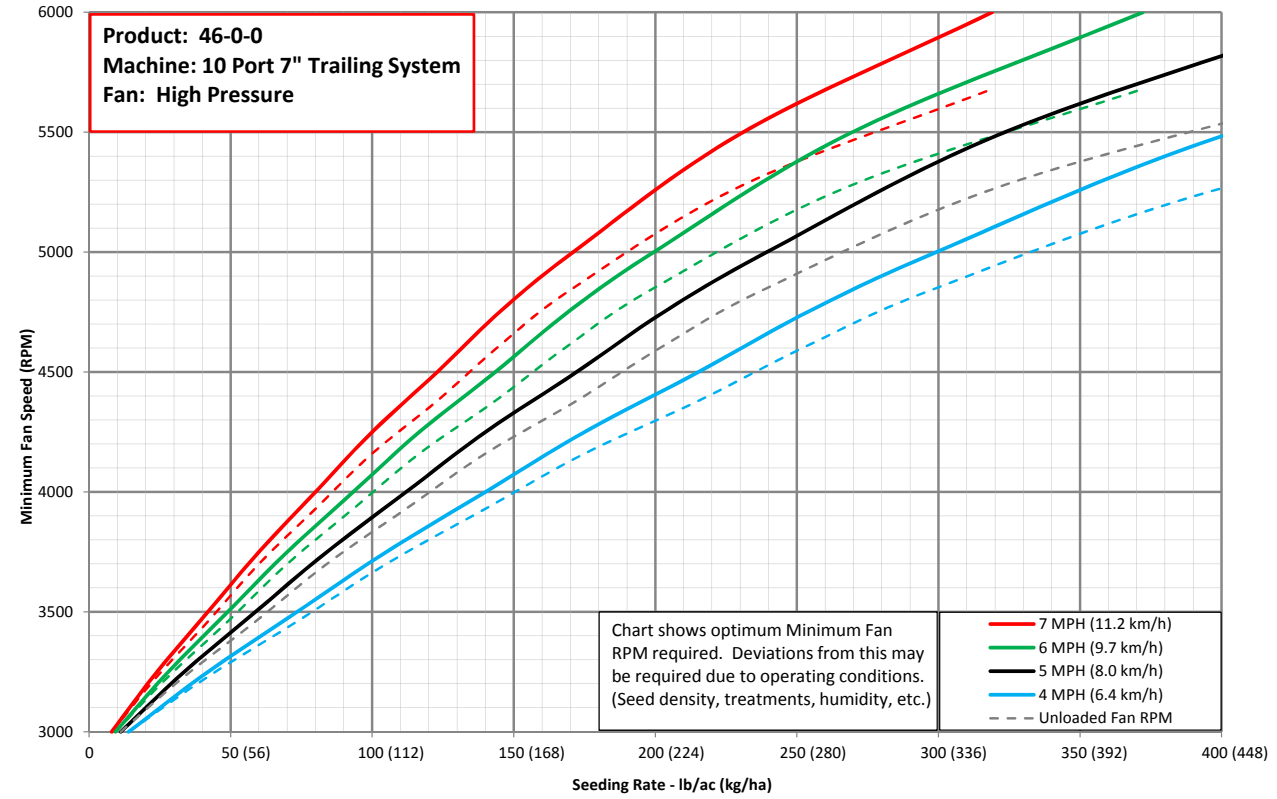
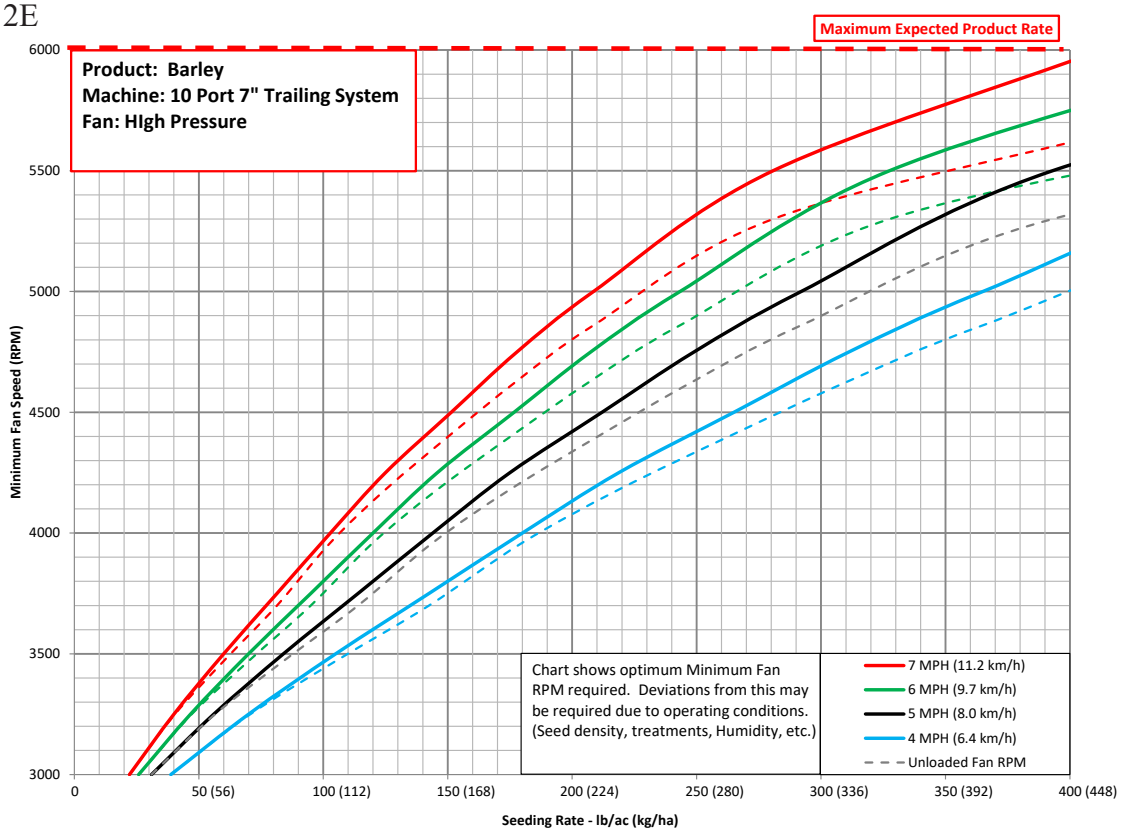


Chart 12E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 12F

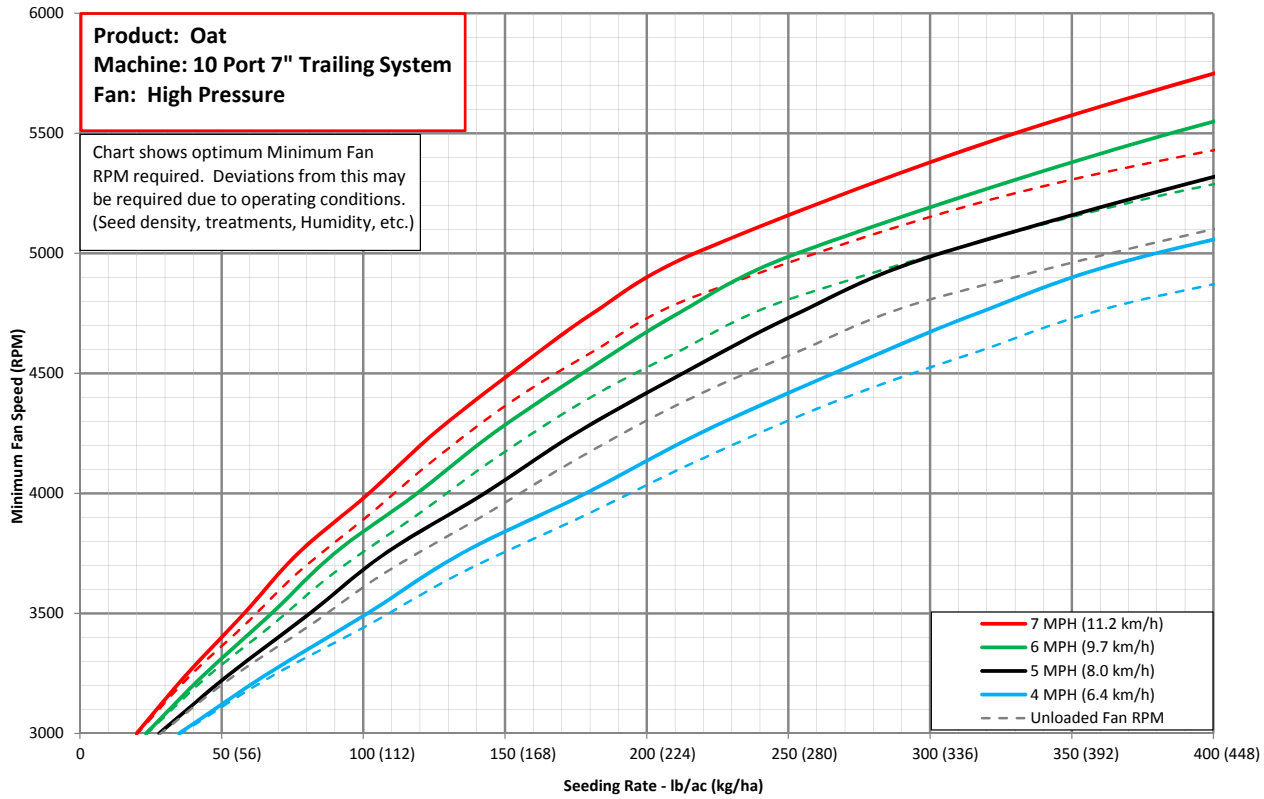
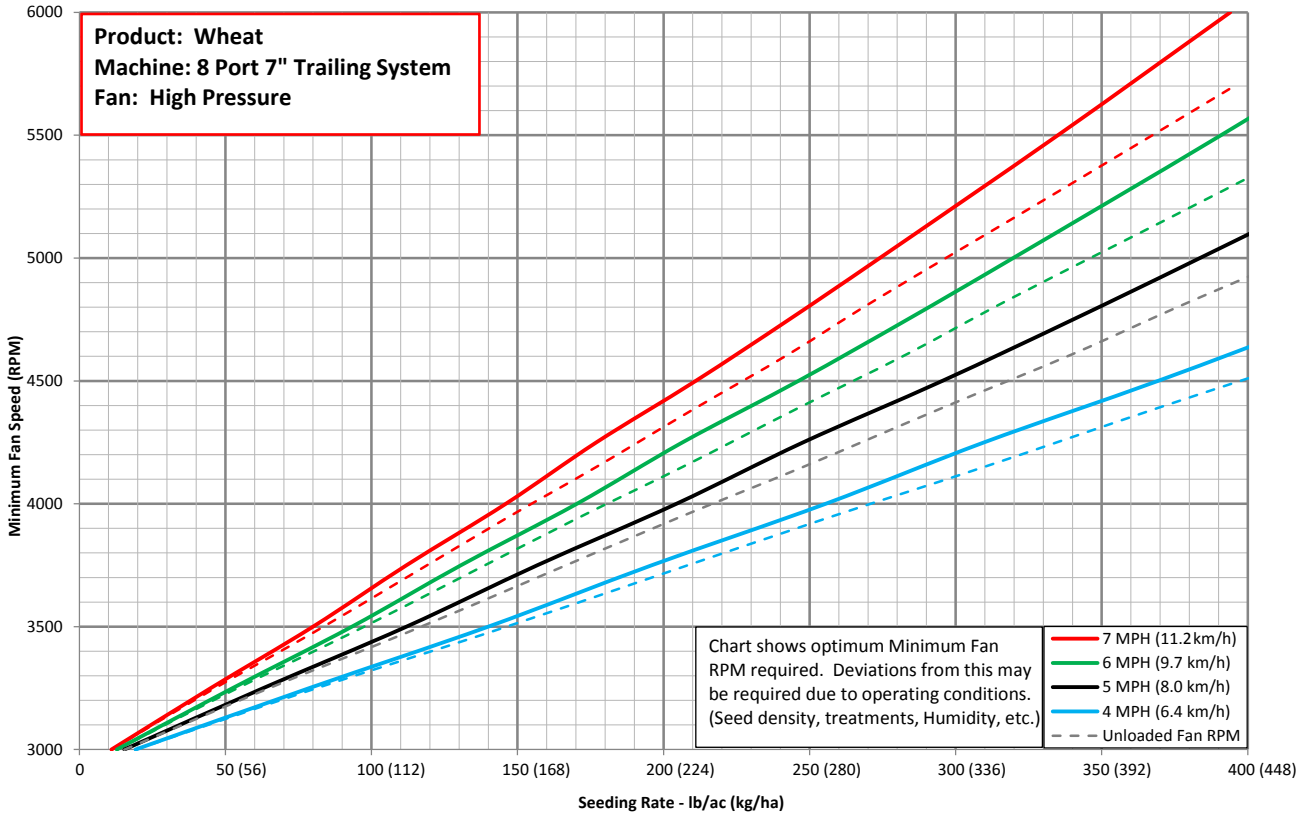


Chart 15A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 15B

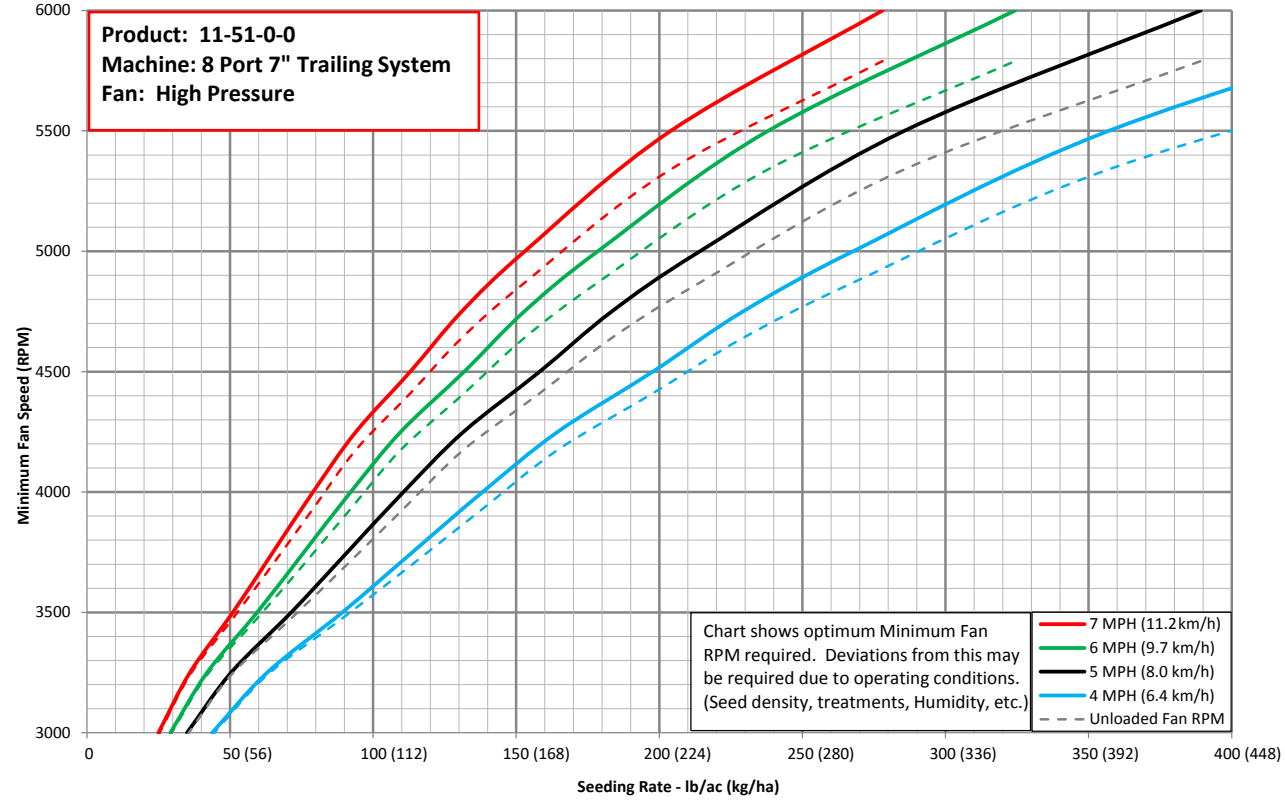
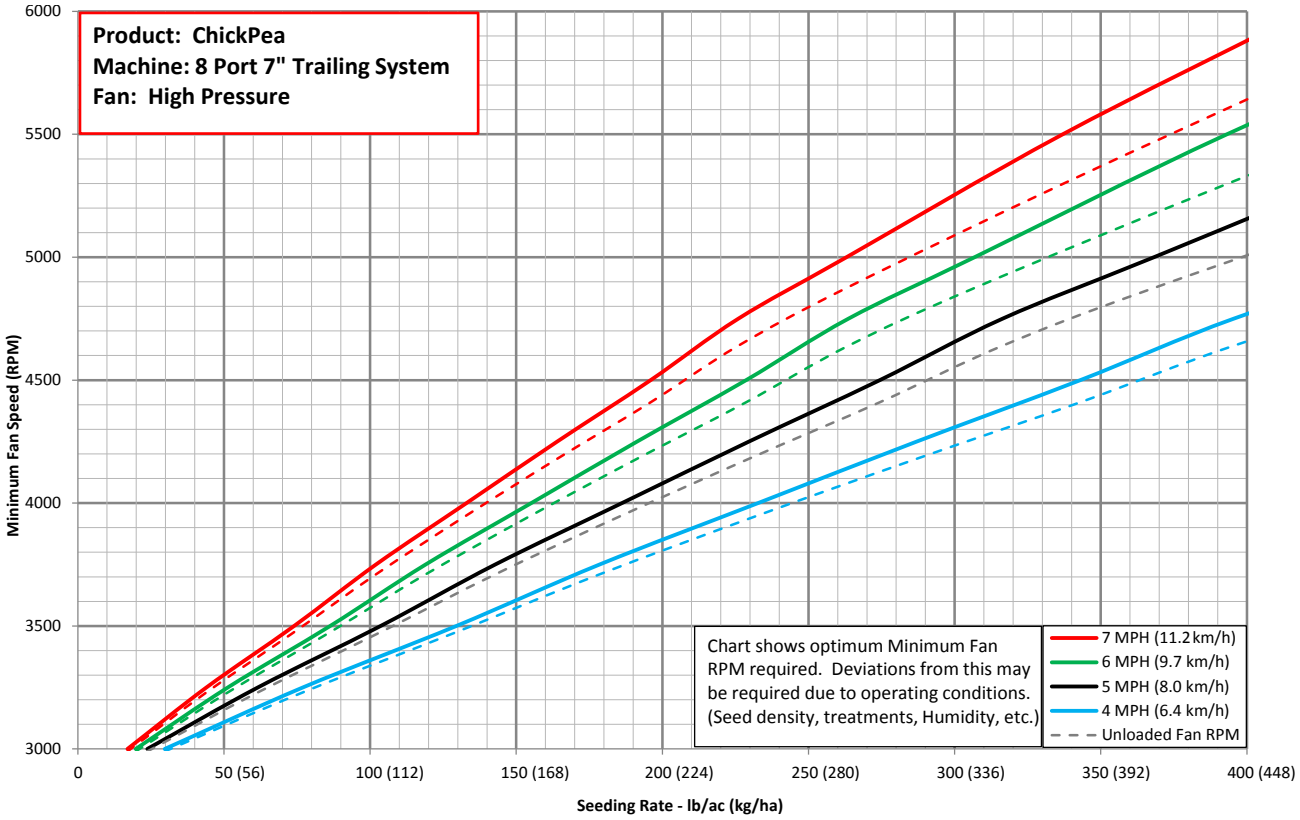


Chart 15C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 15D

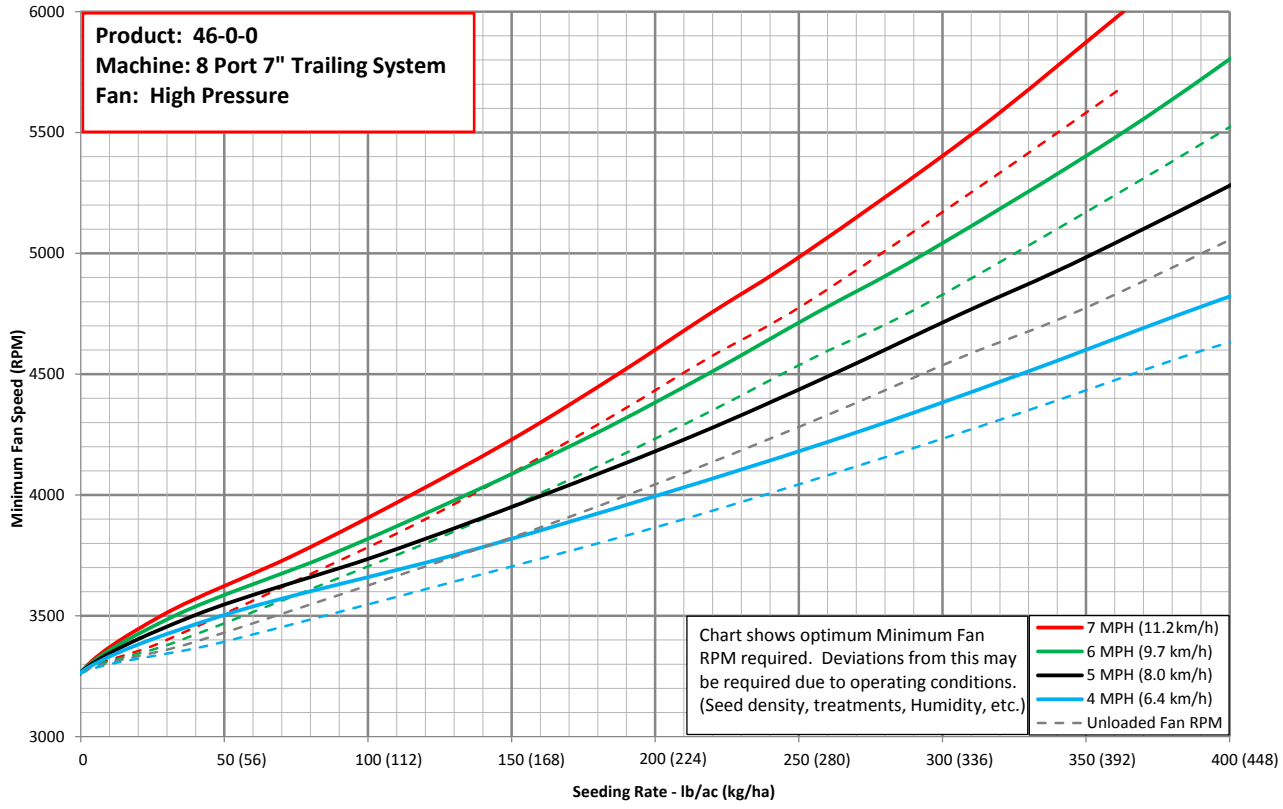
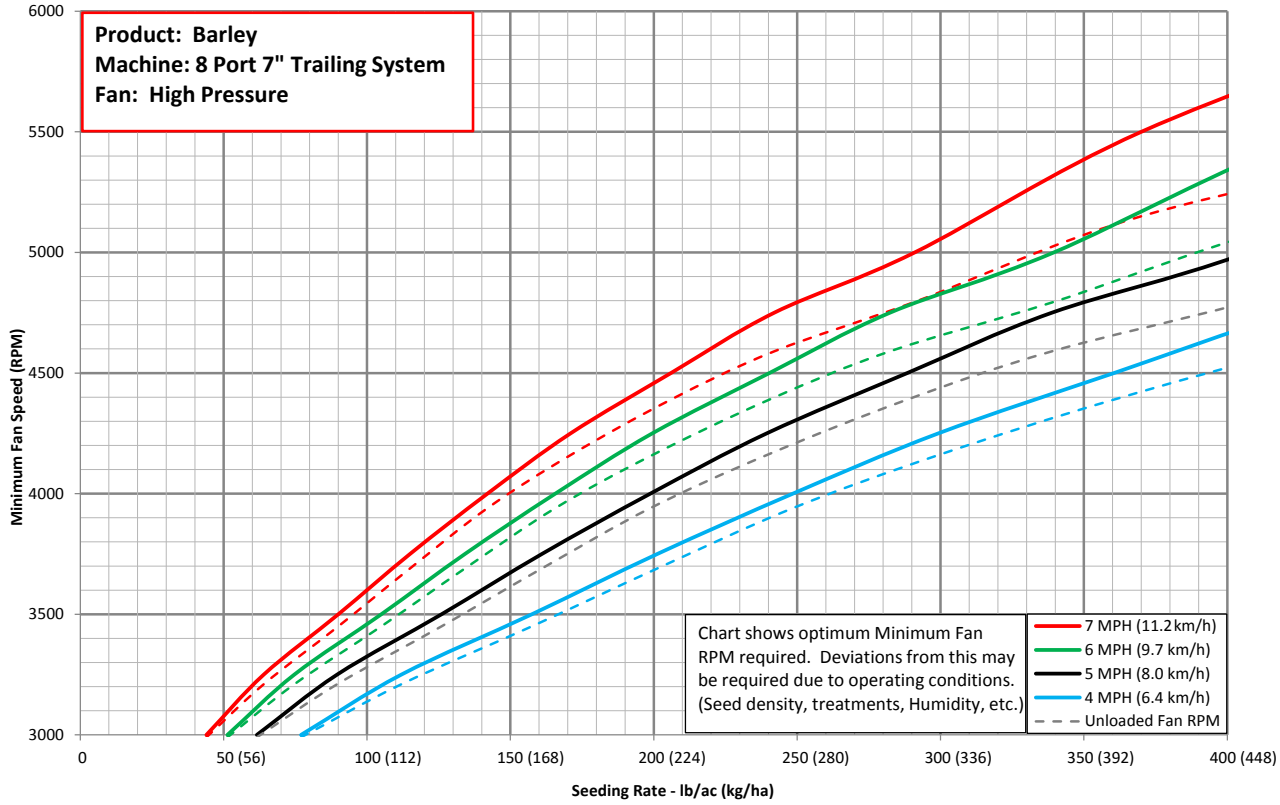


Chart 15E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 15F

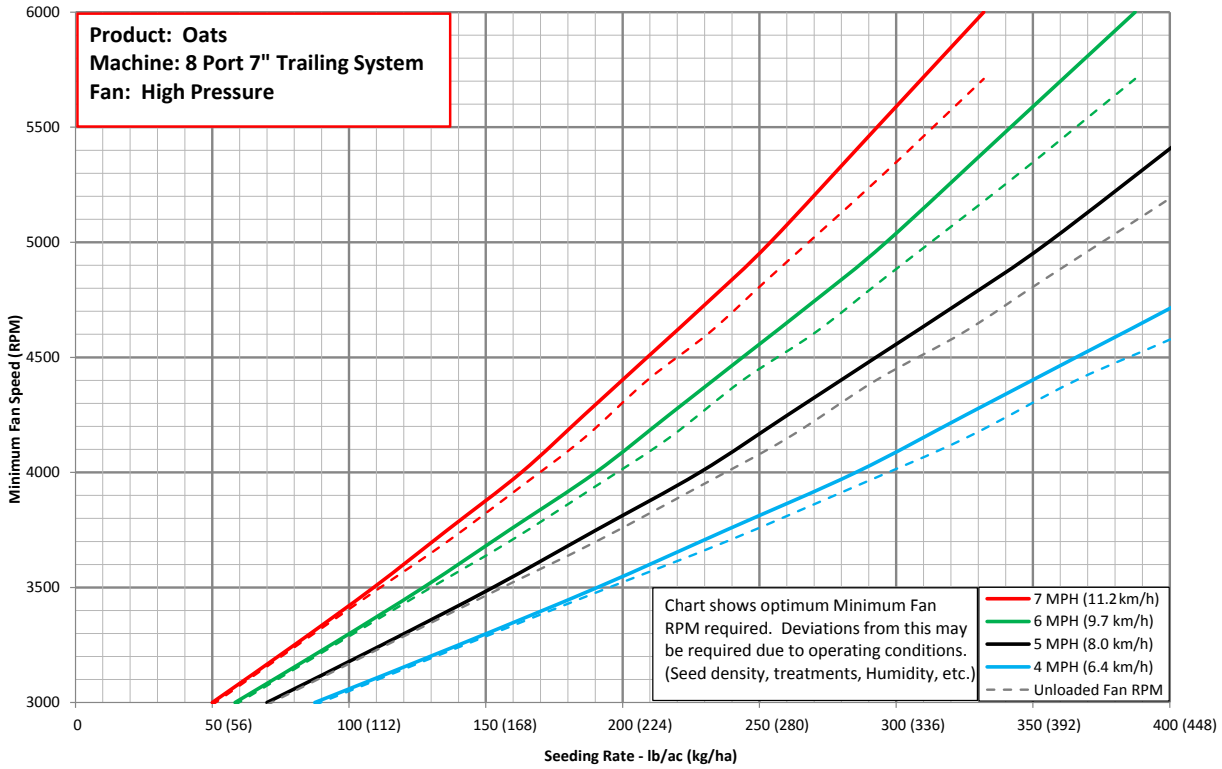
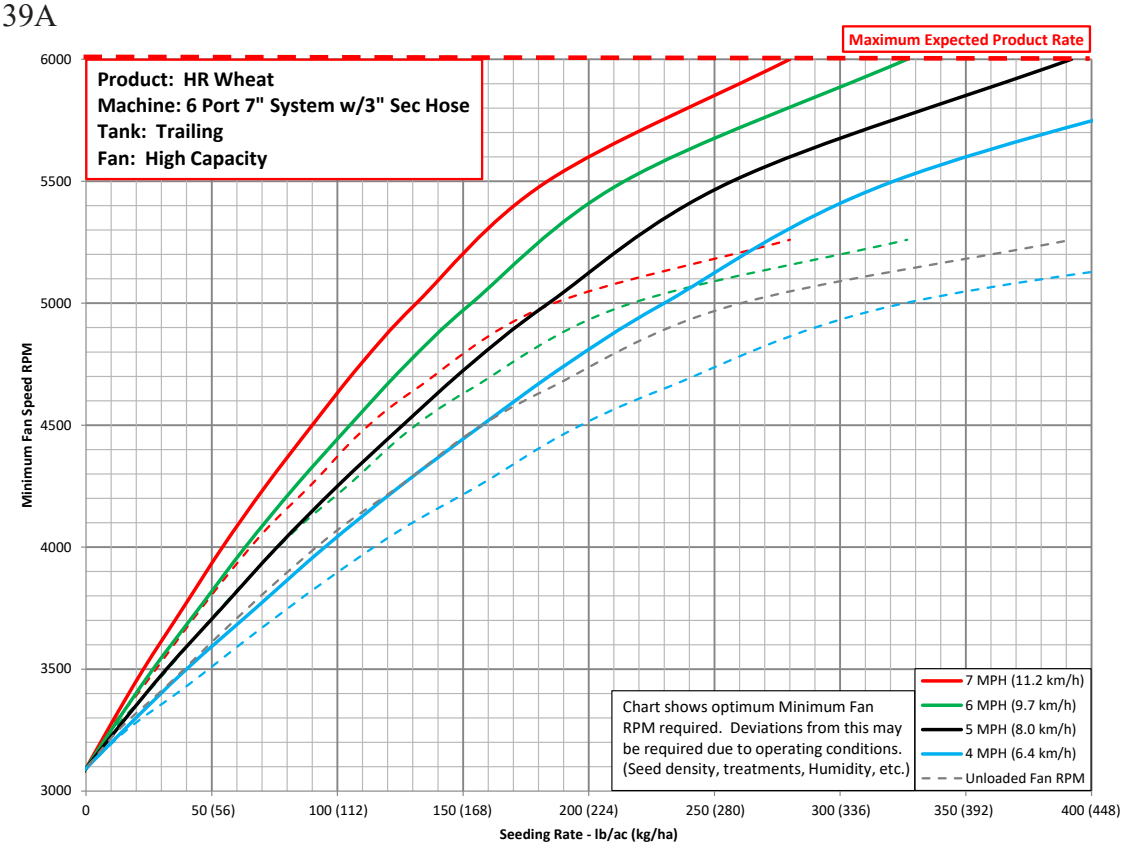


Chart 39A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 39B

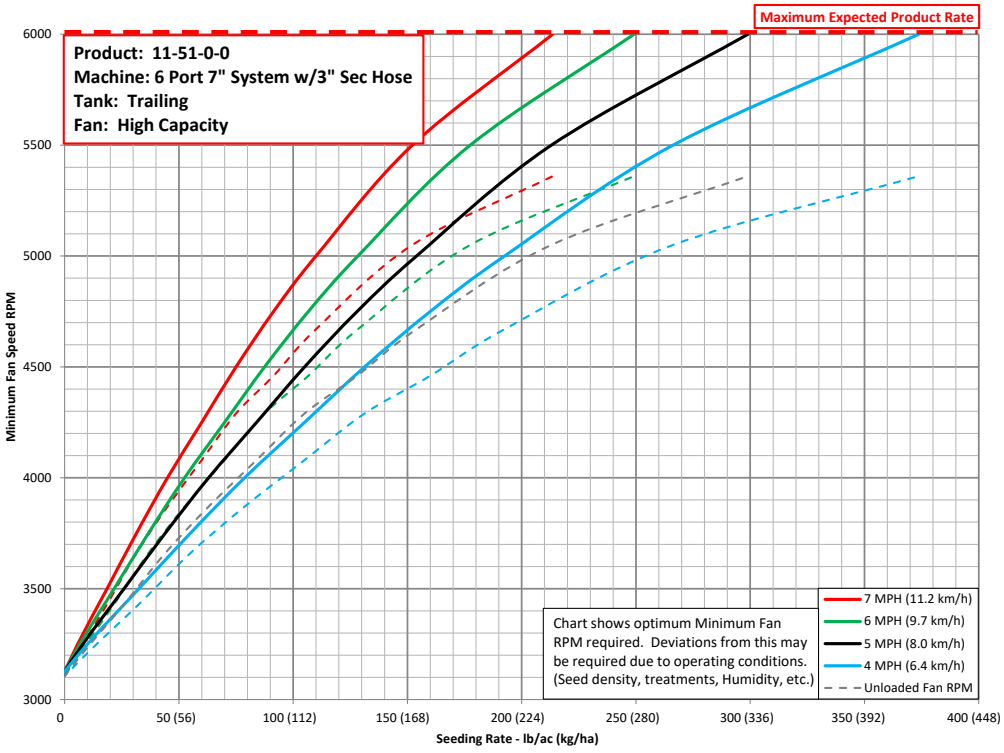
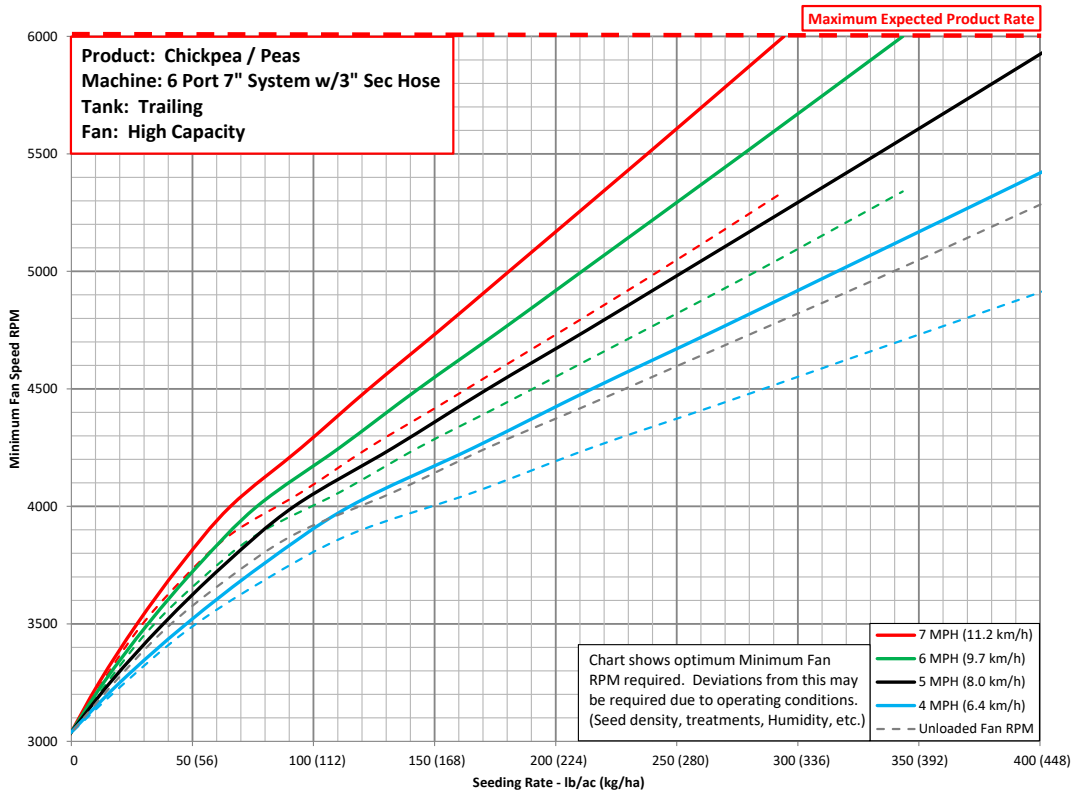


Chart 39C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 39D

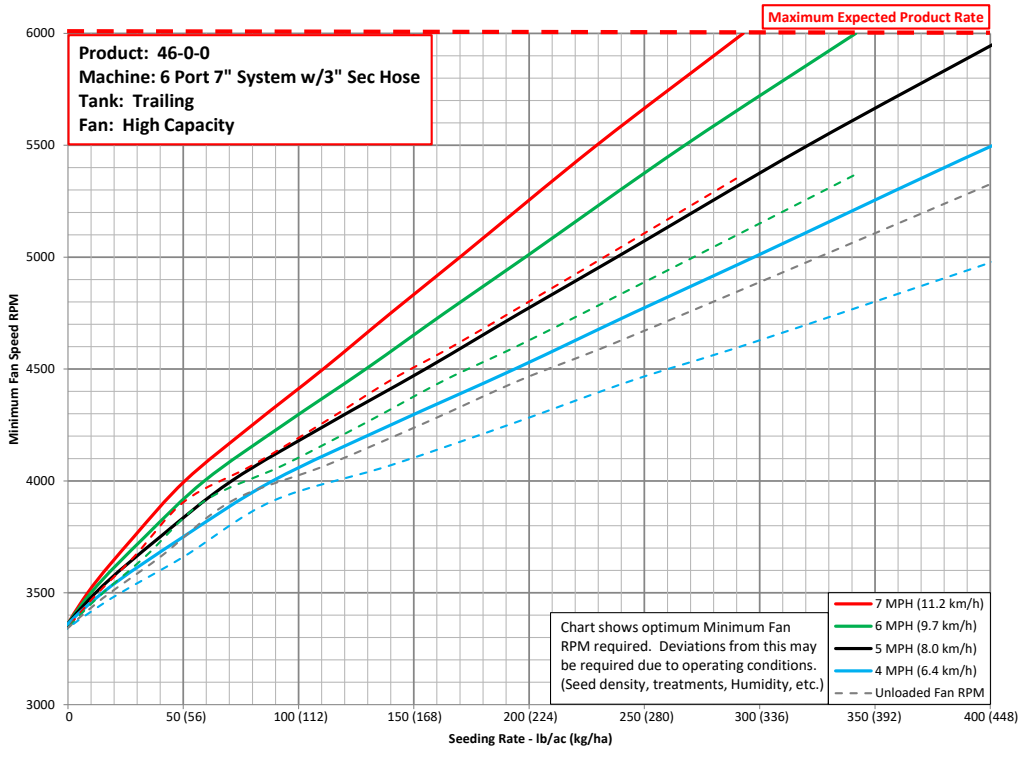
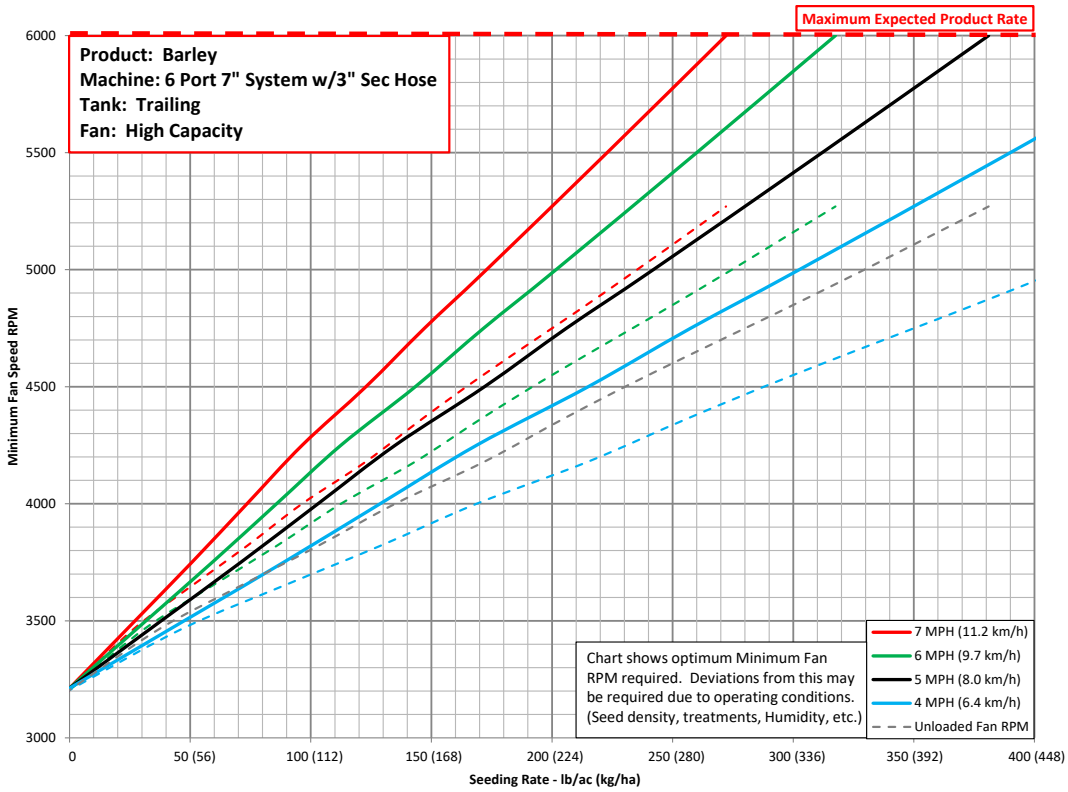


Chart 39E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 39F

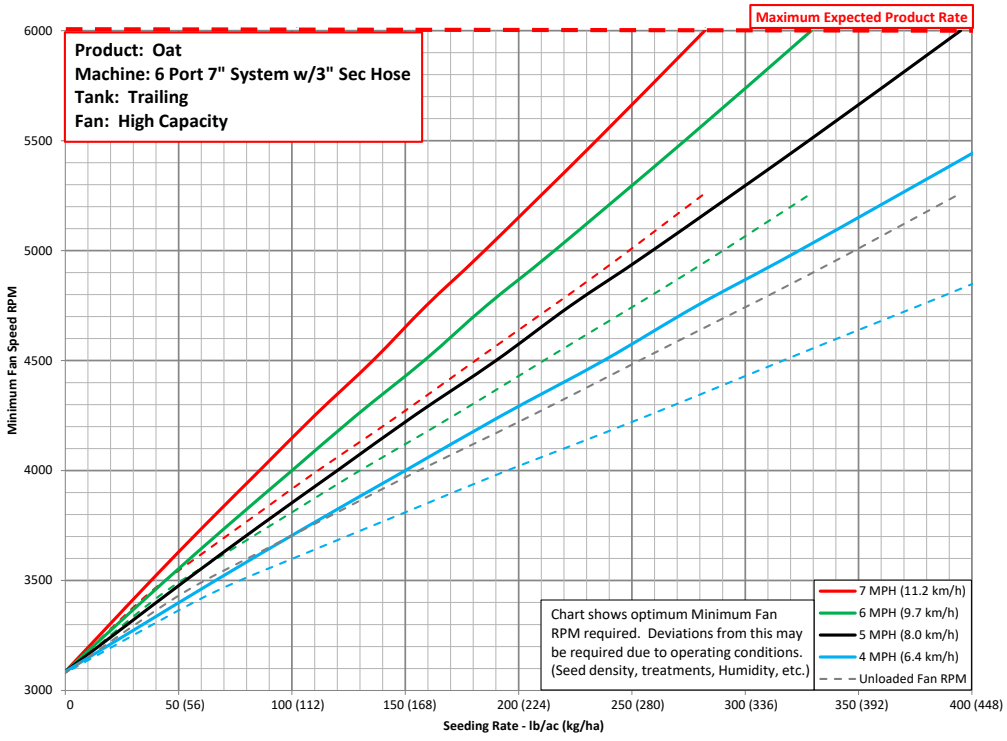
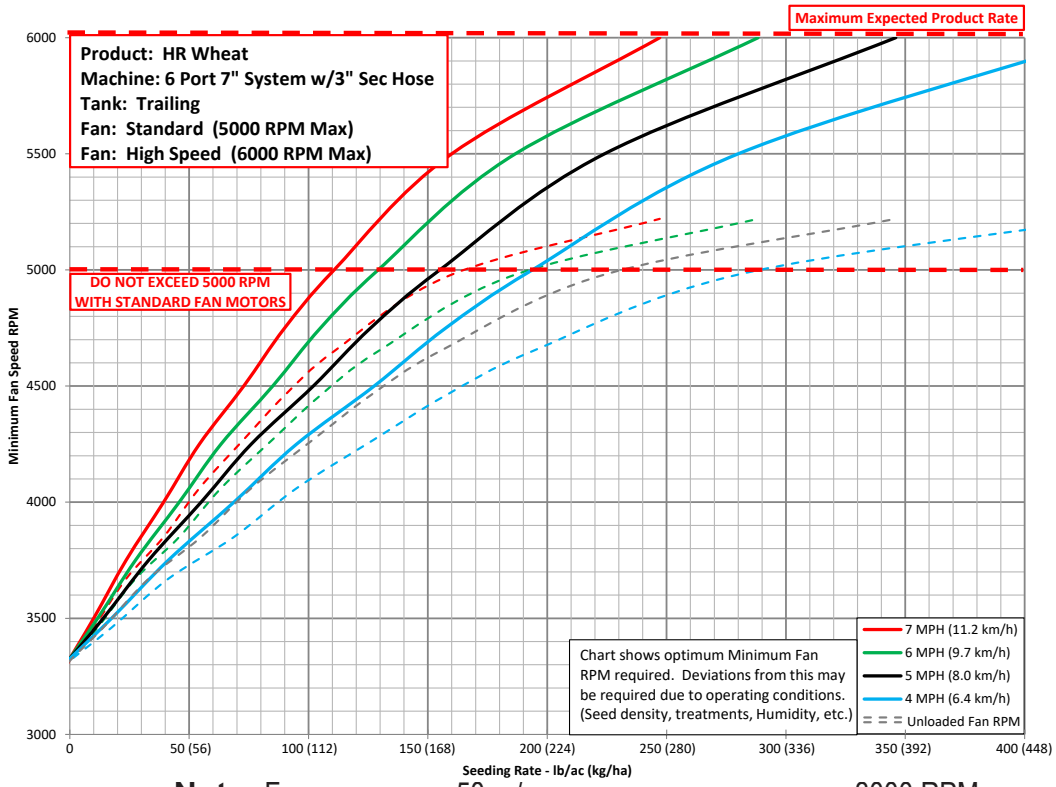


Chart 40A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 40B

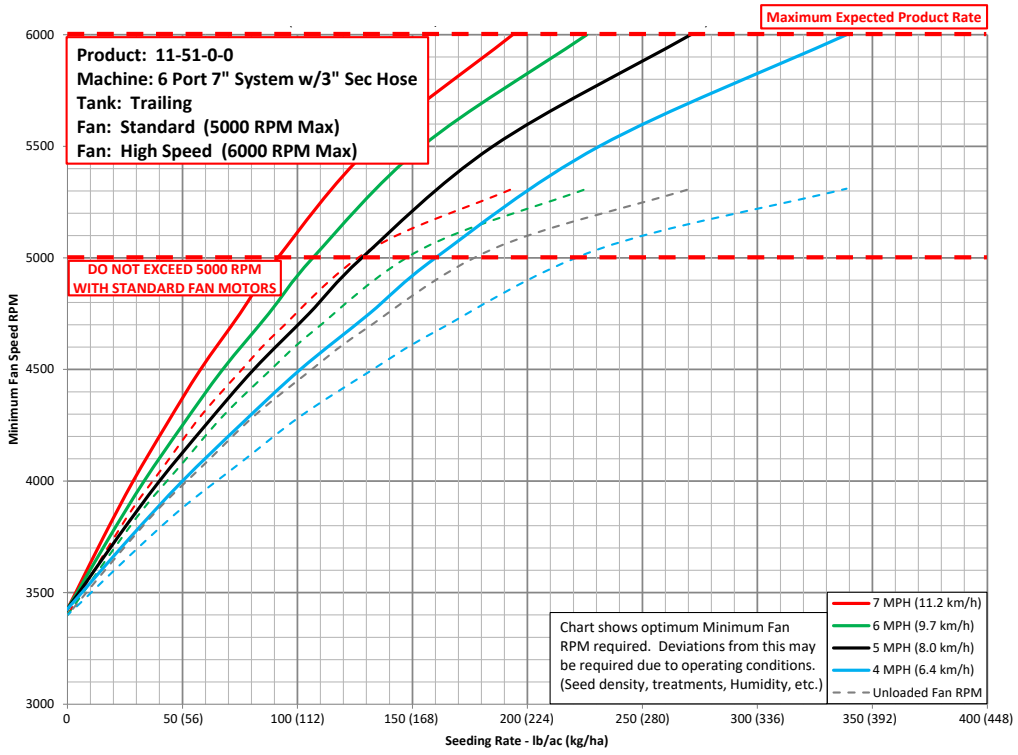
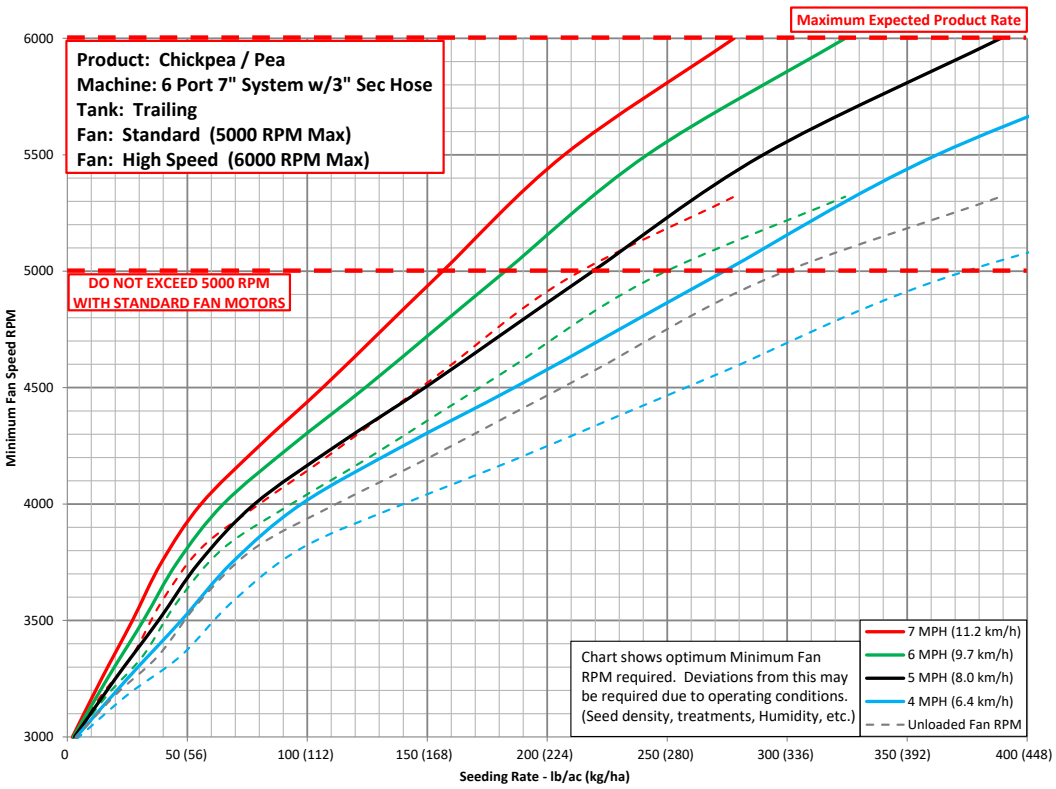


Chart 40C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 40D

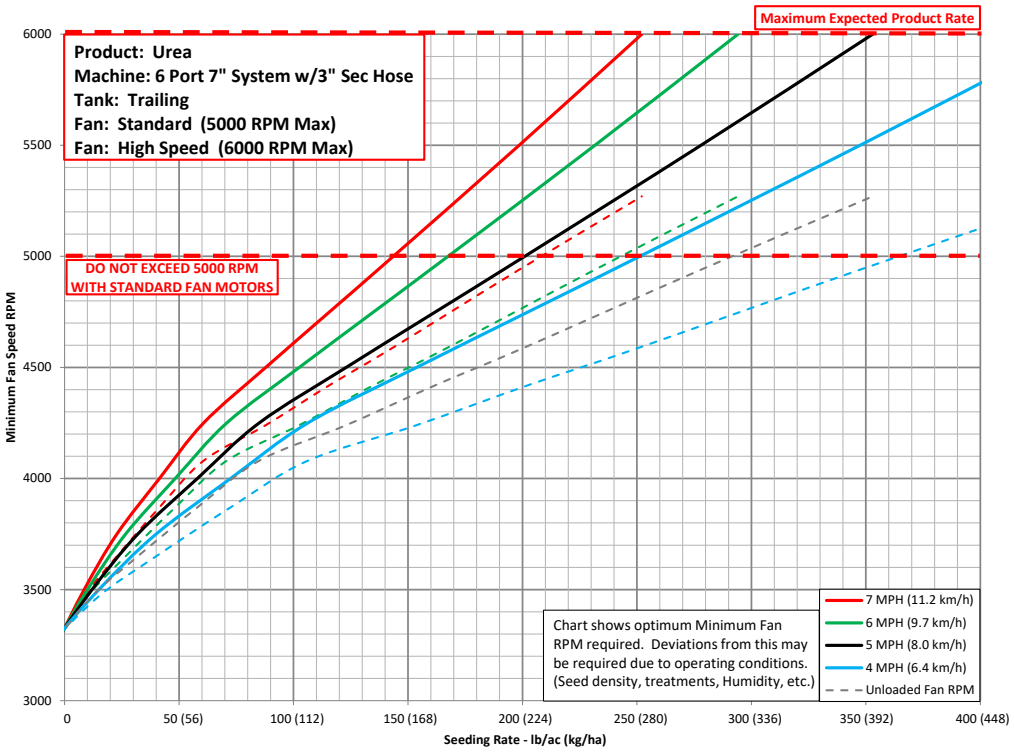
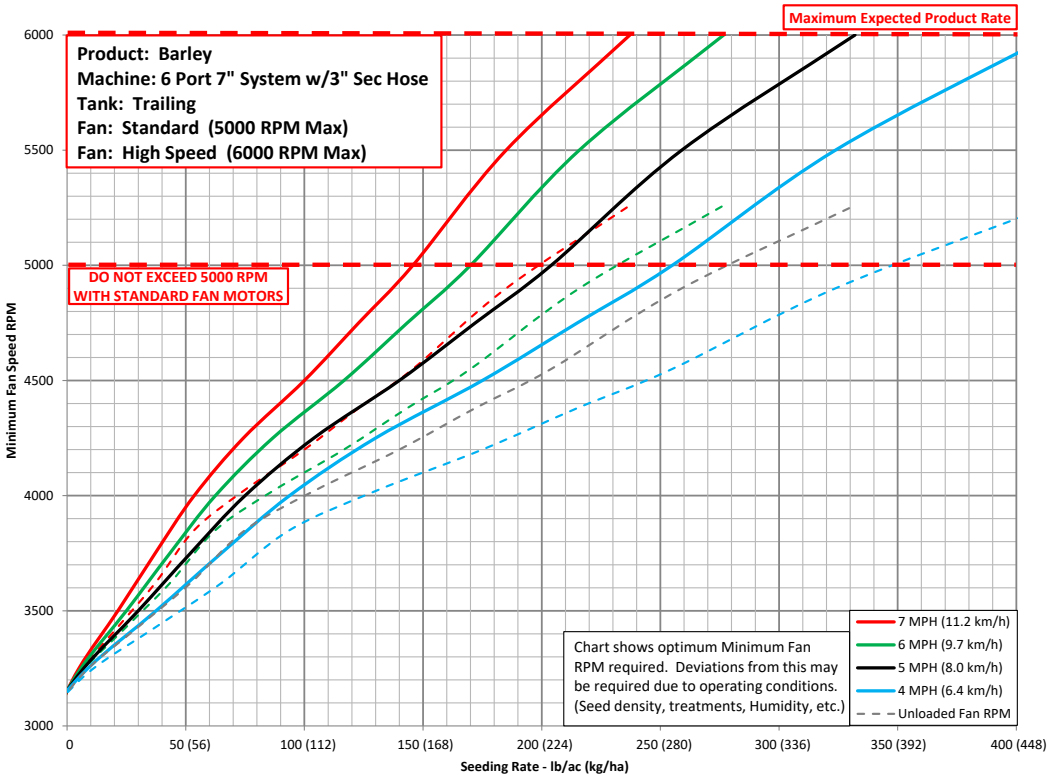


Chart 40E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 40F

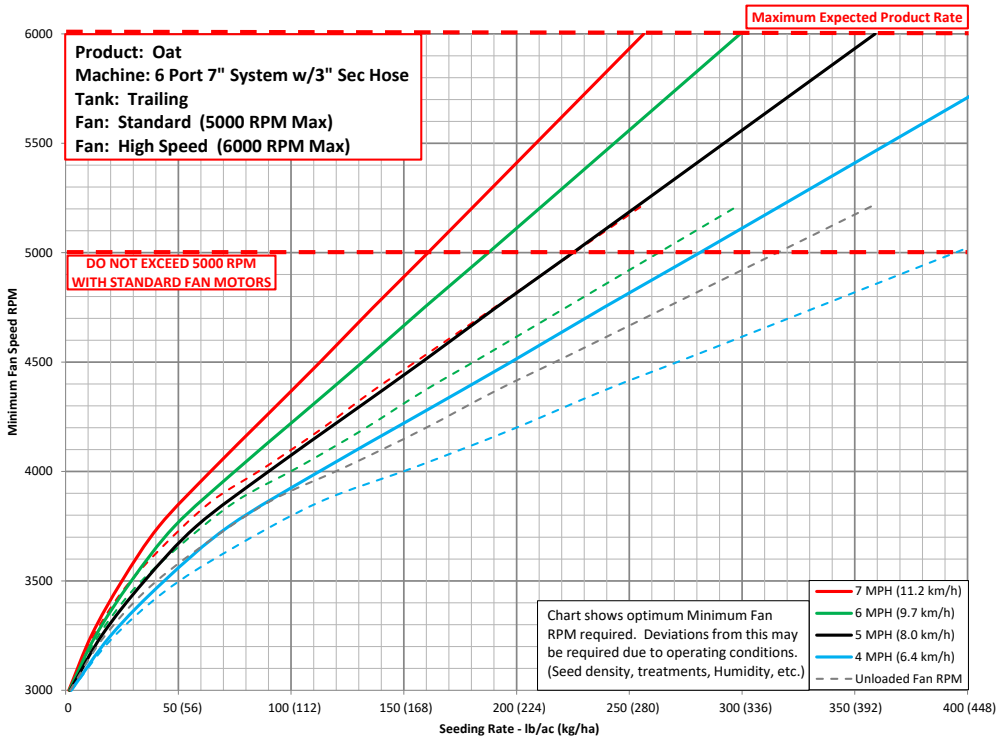
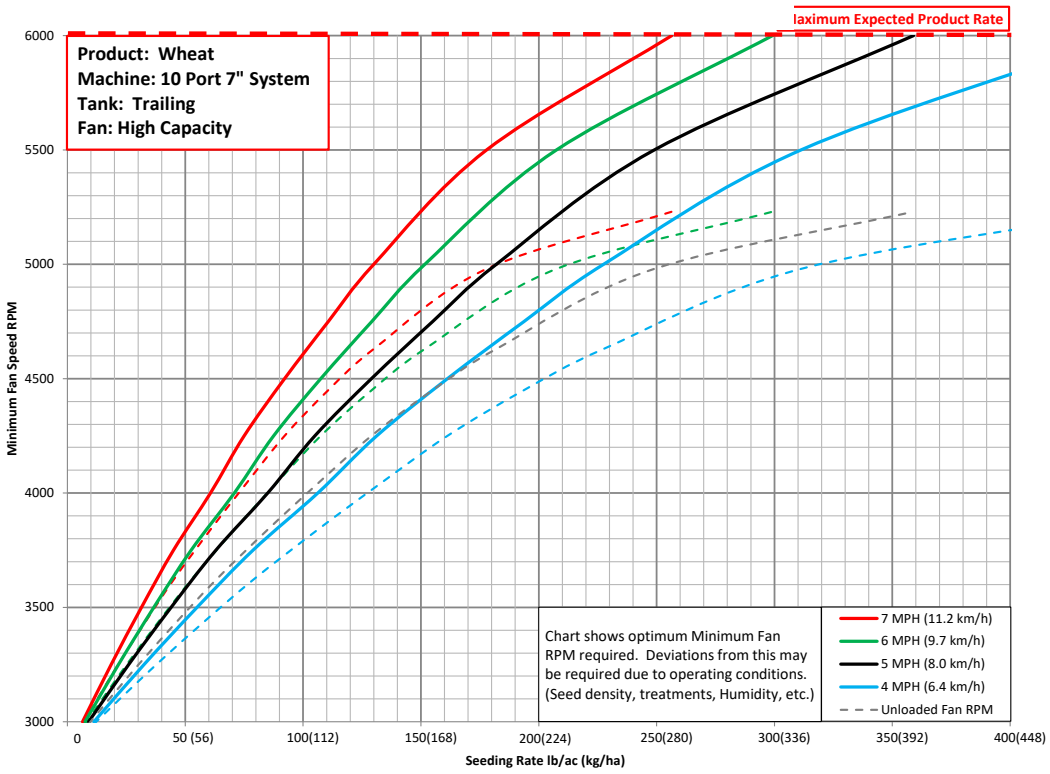


Chart 41A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 41B

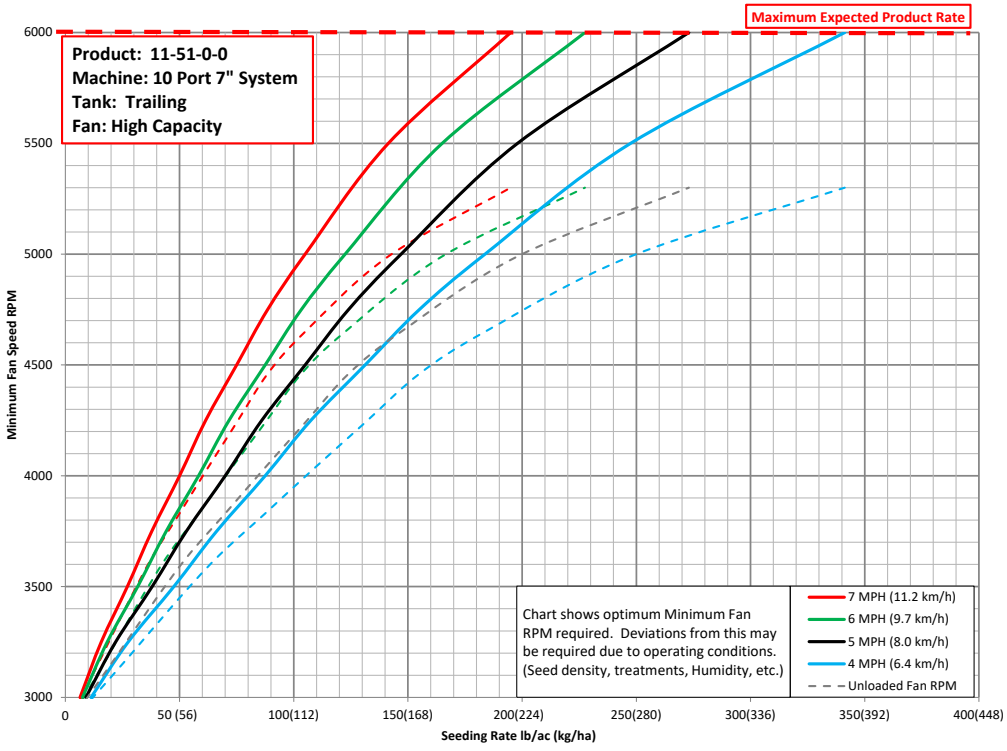
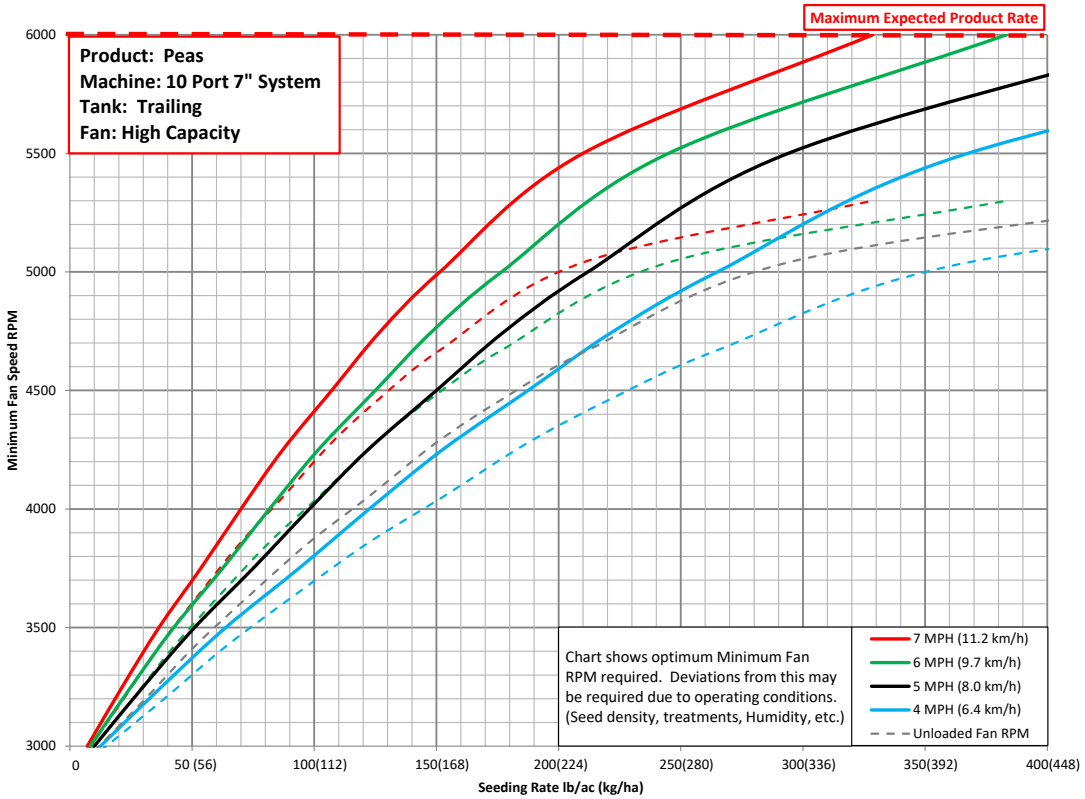


Chart 41C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 41D

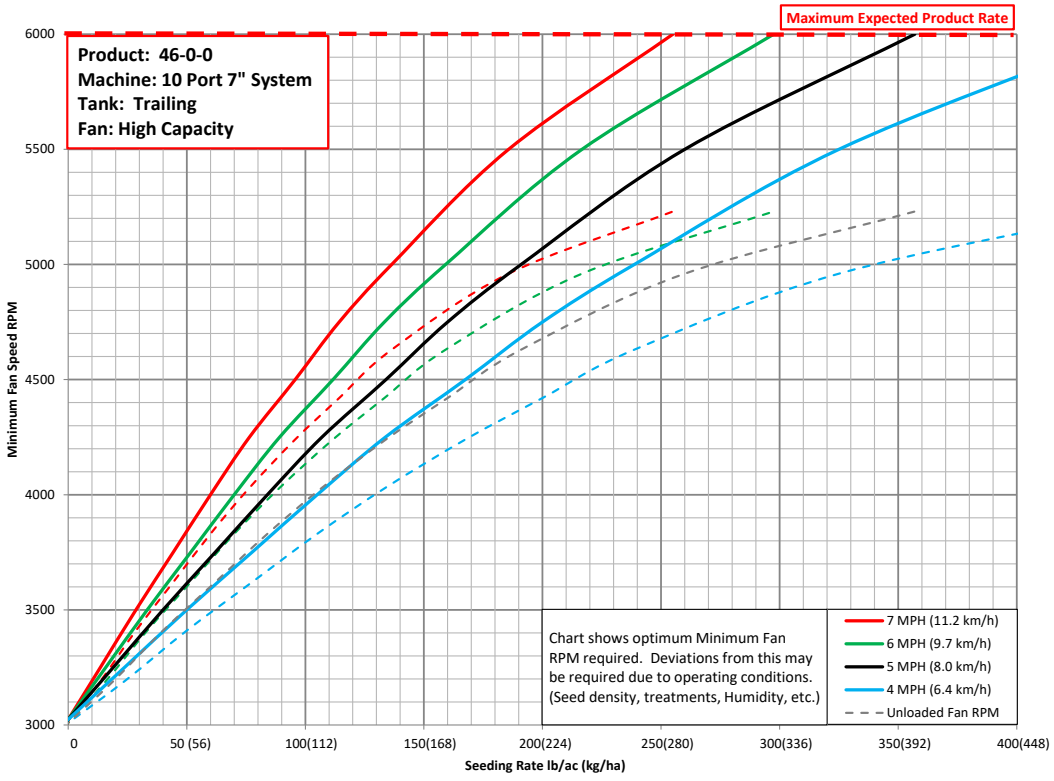
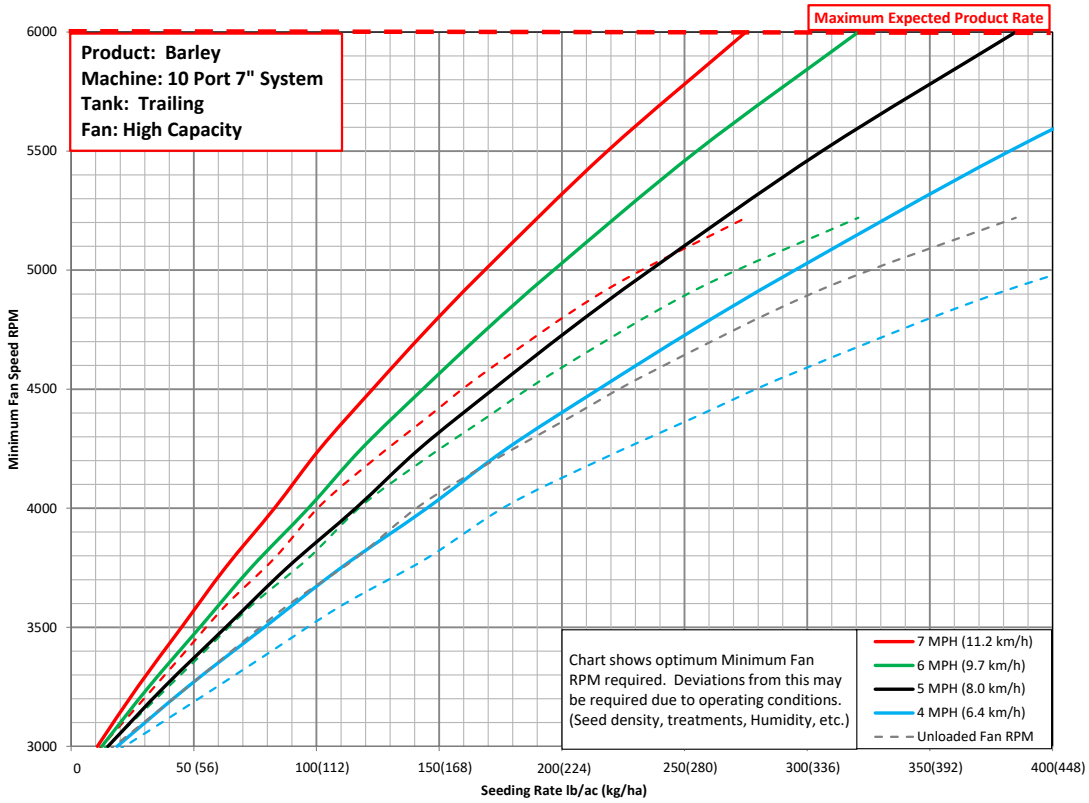


Chart 41E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 41F

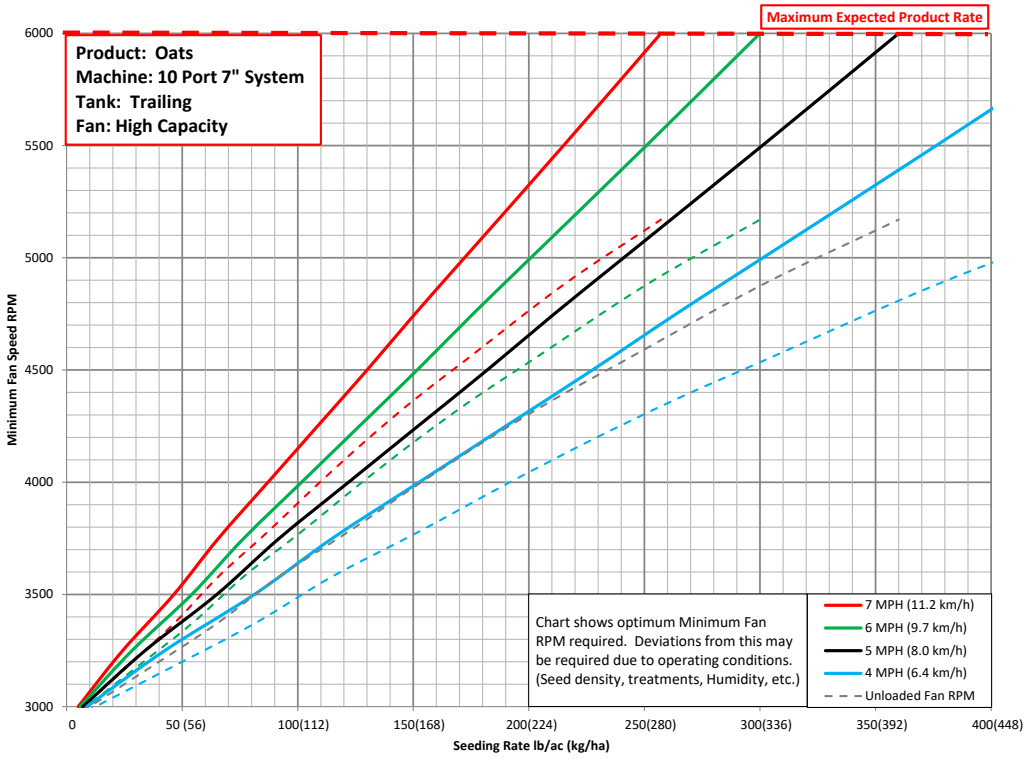
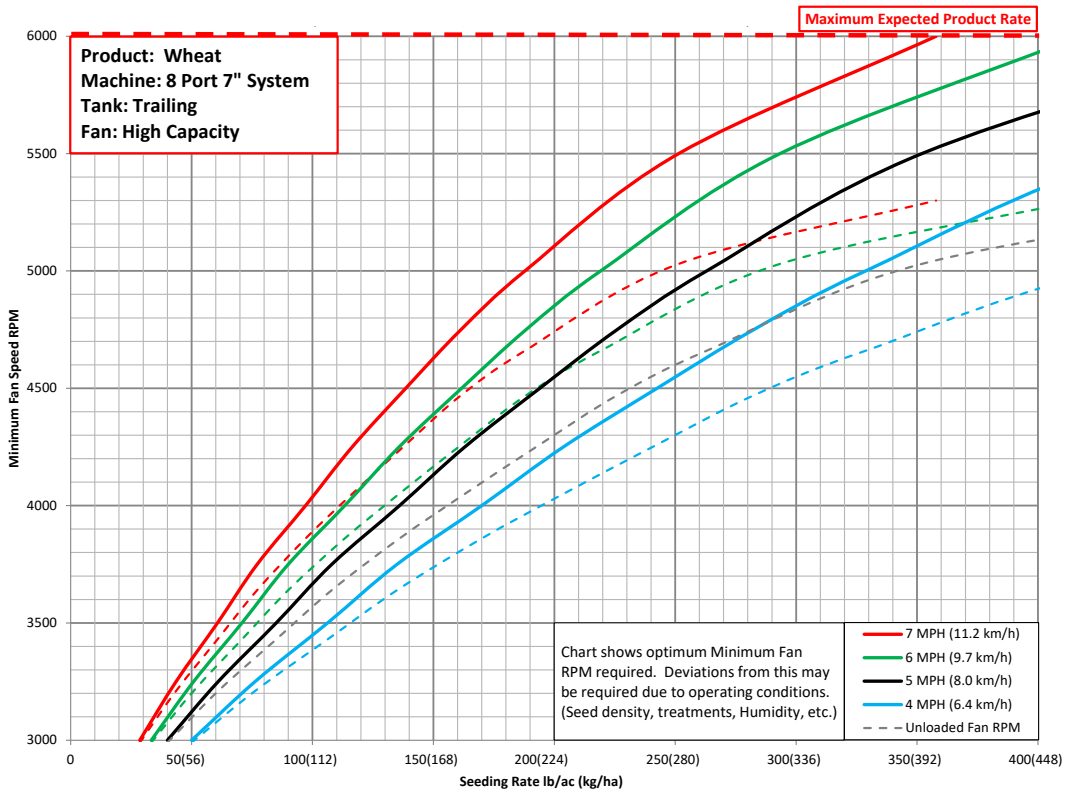


Chart 42A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 42B

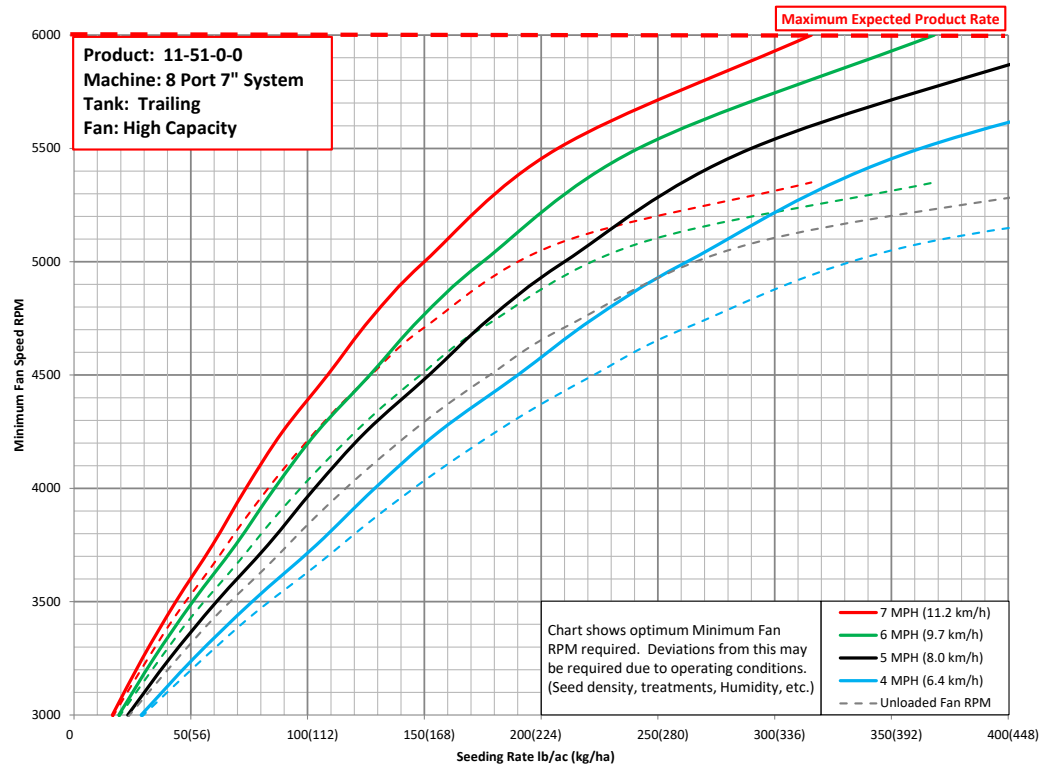
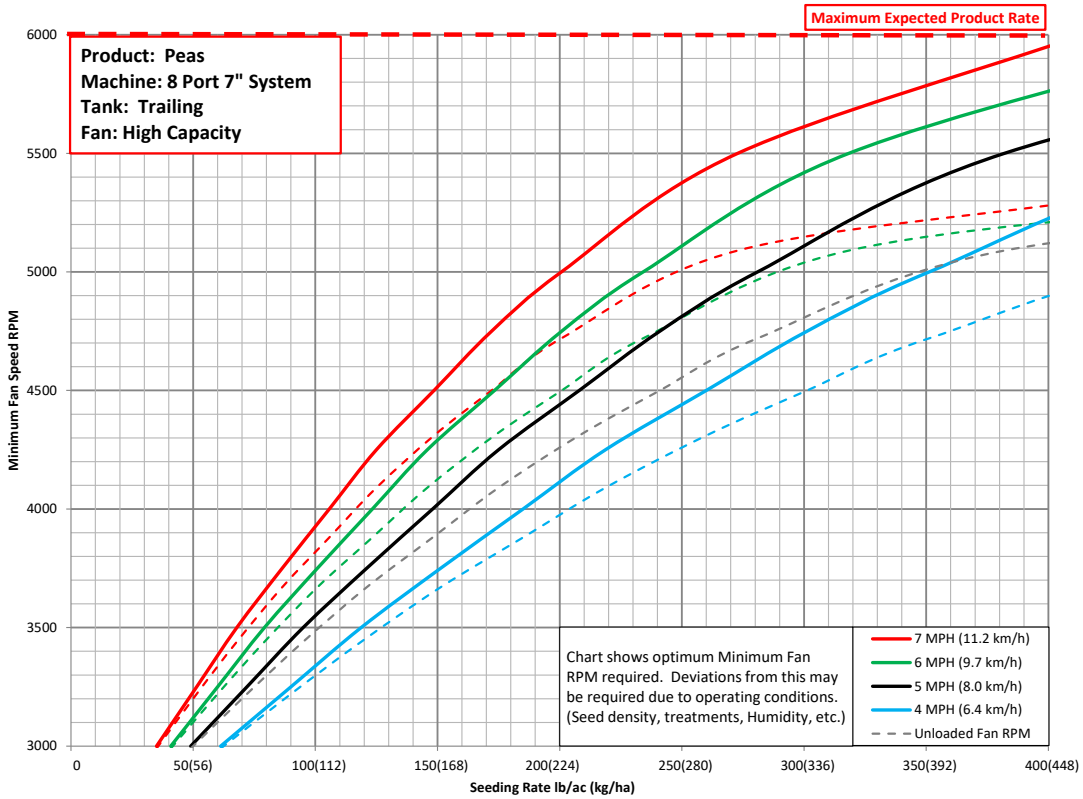


Chart 42C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 42D

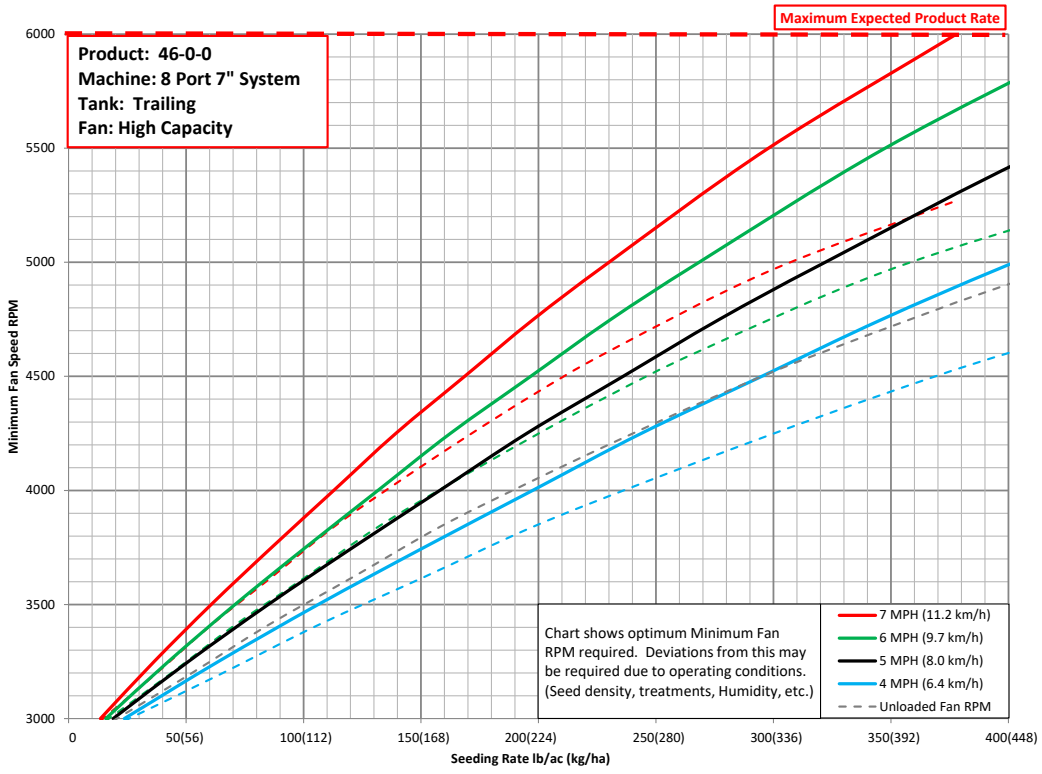
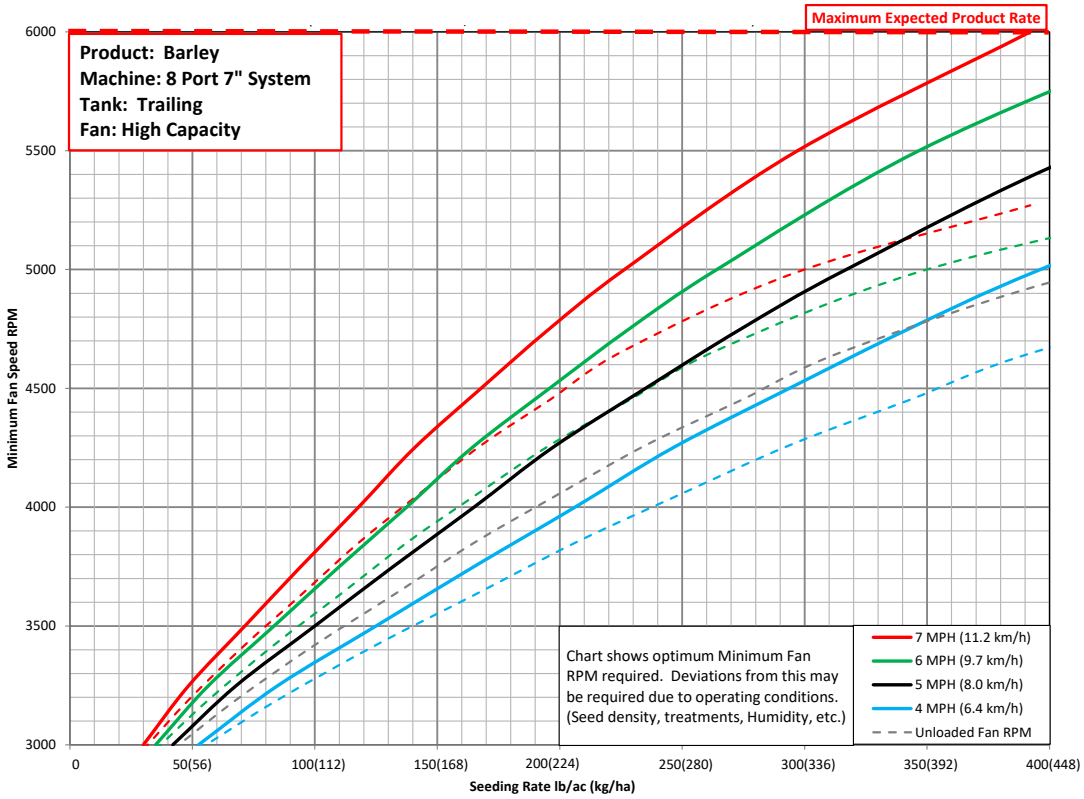


Chart 42E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 42E

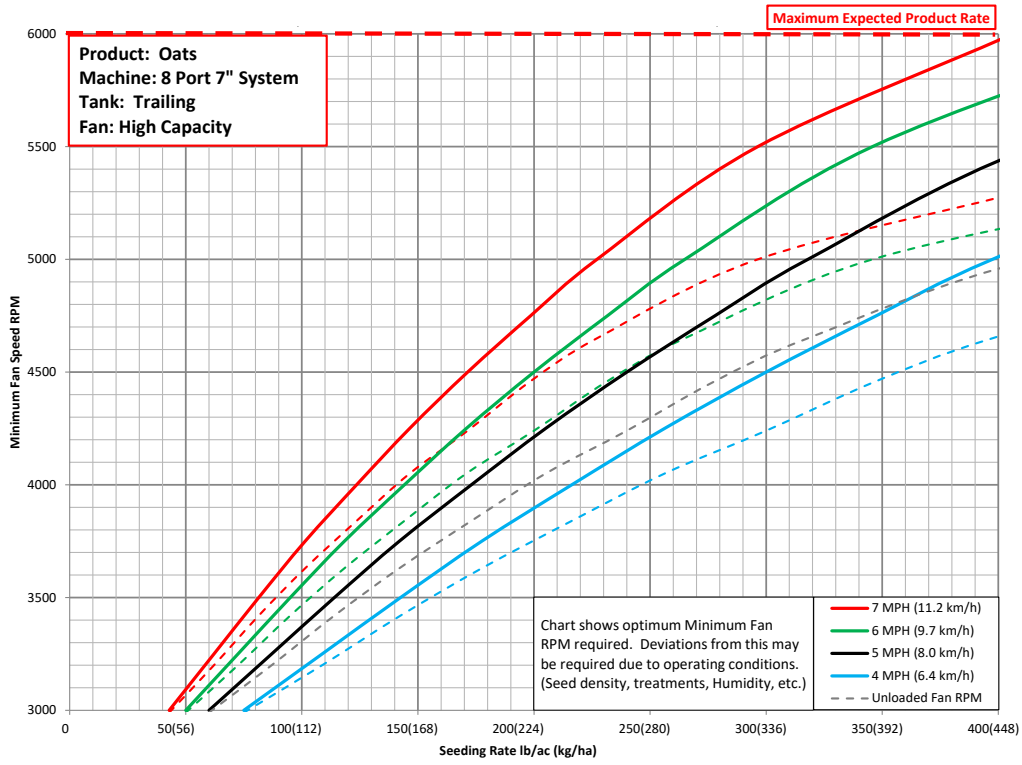
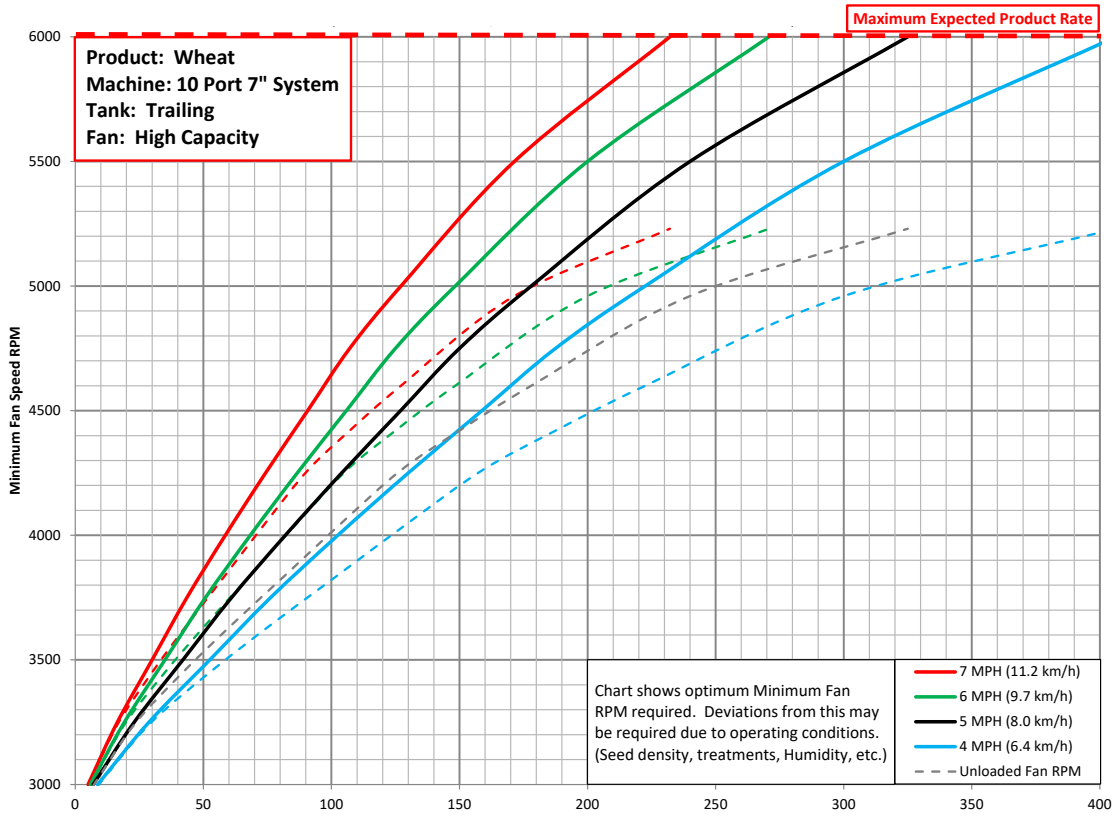


Chart 43A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 43B

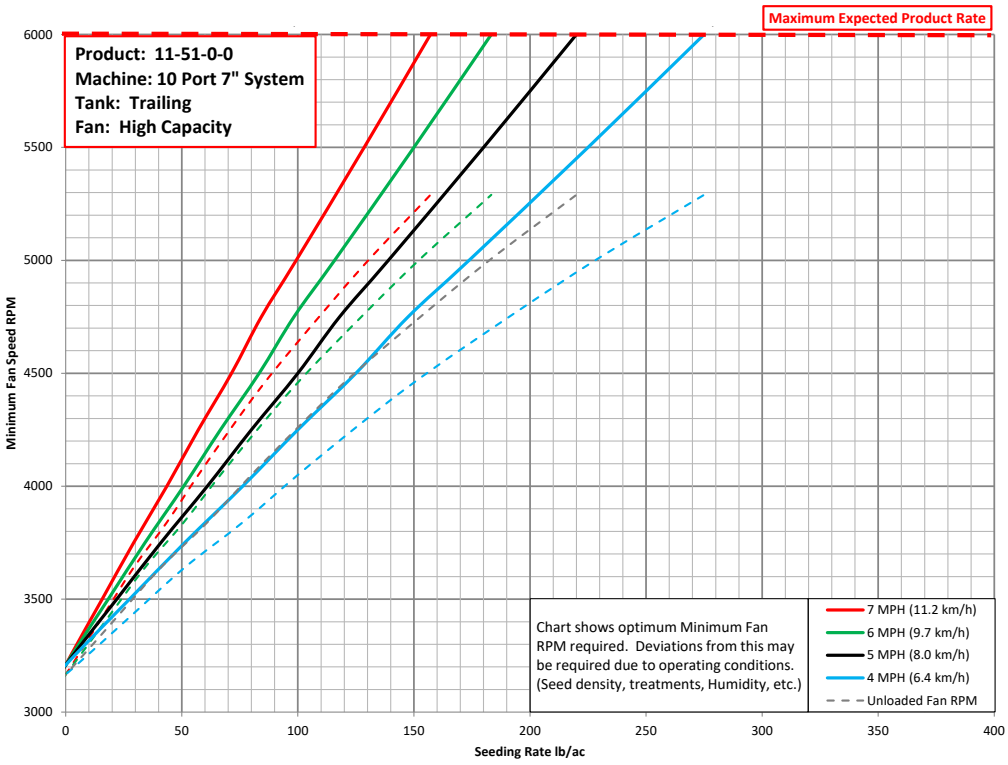
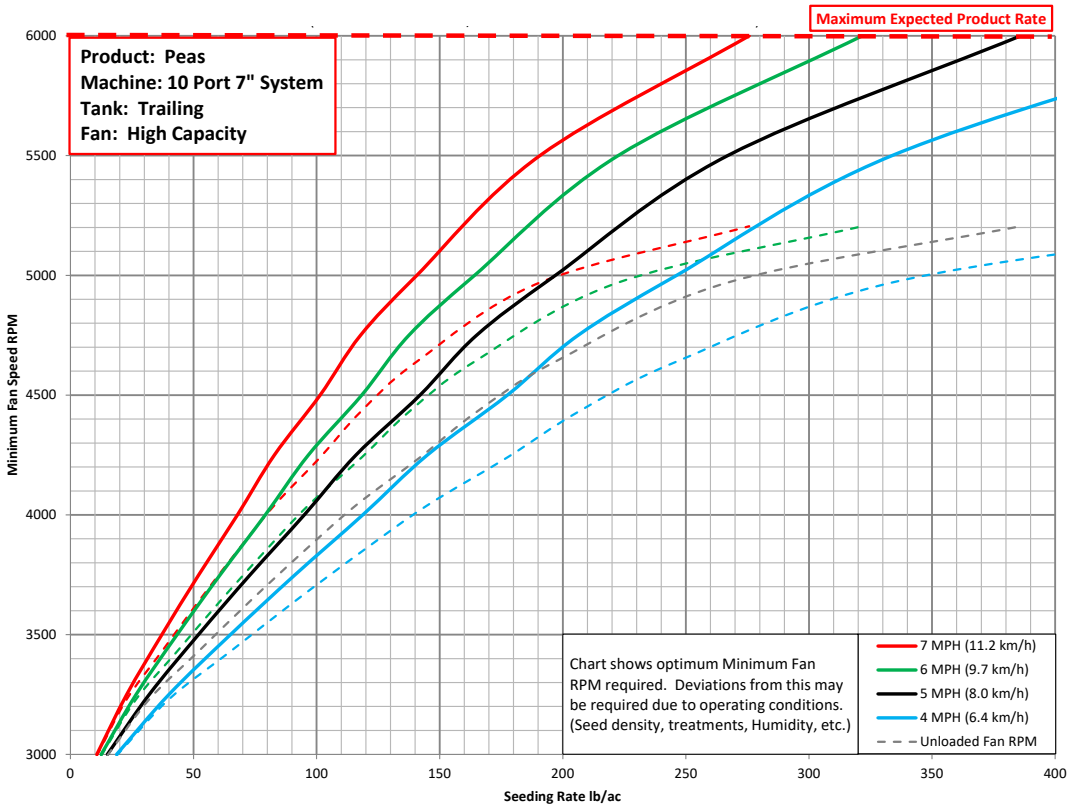


Chart 43C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 43D

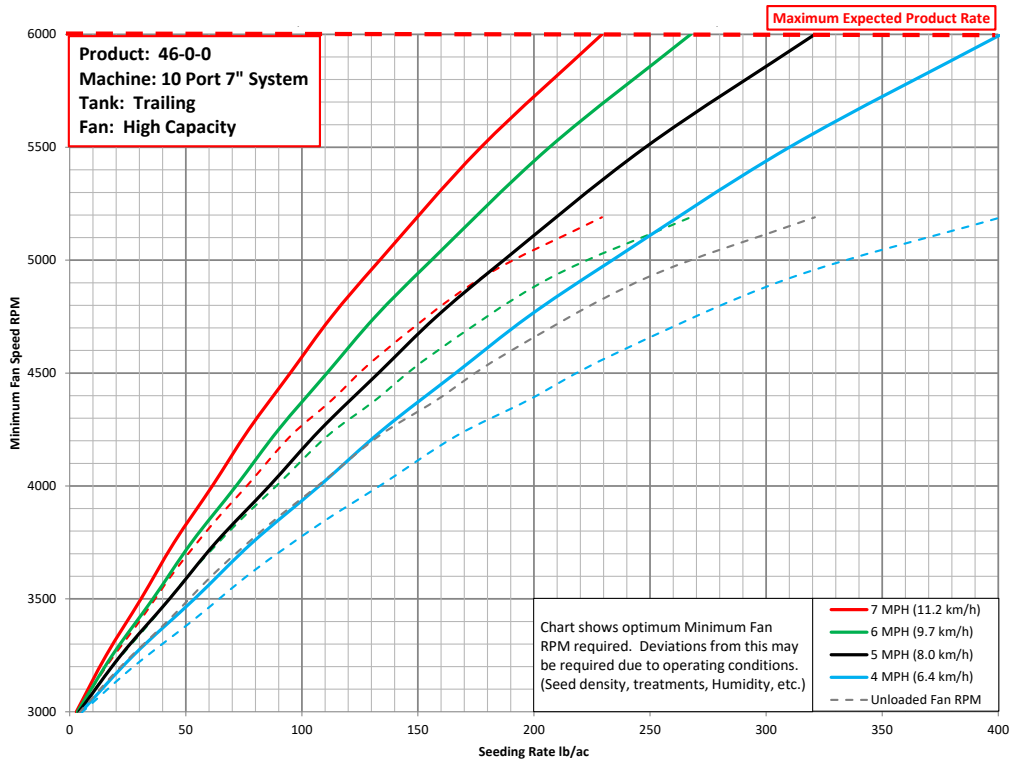
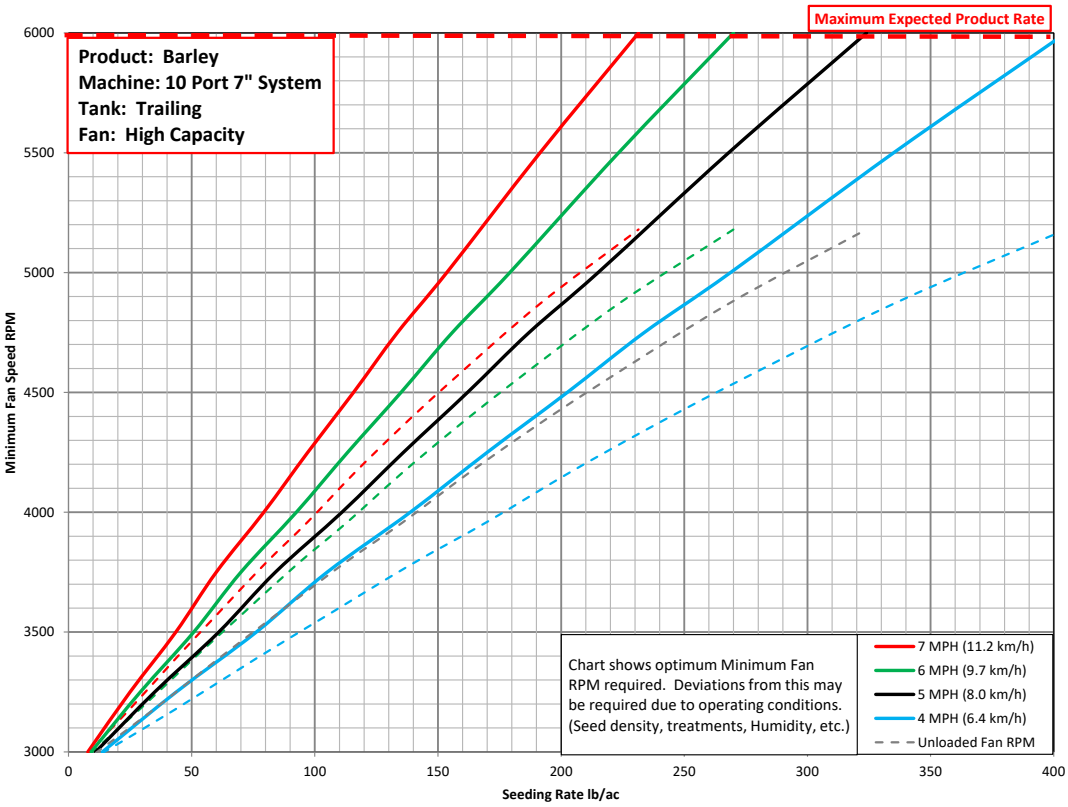


Chart 43E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 43F

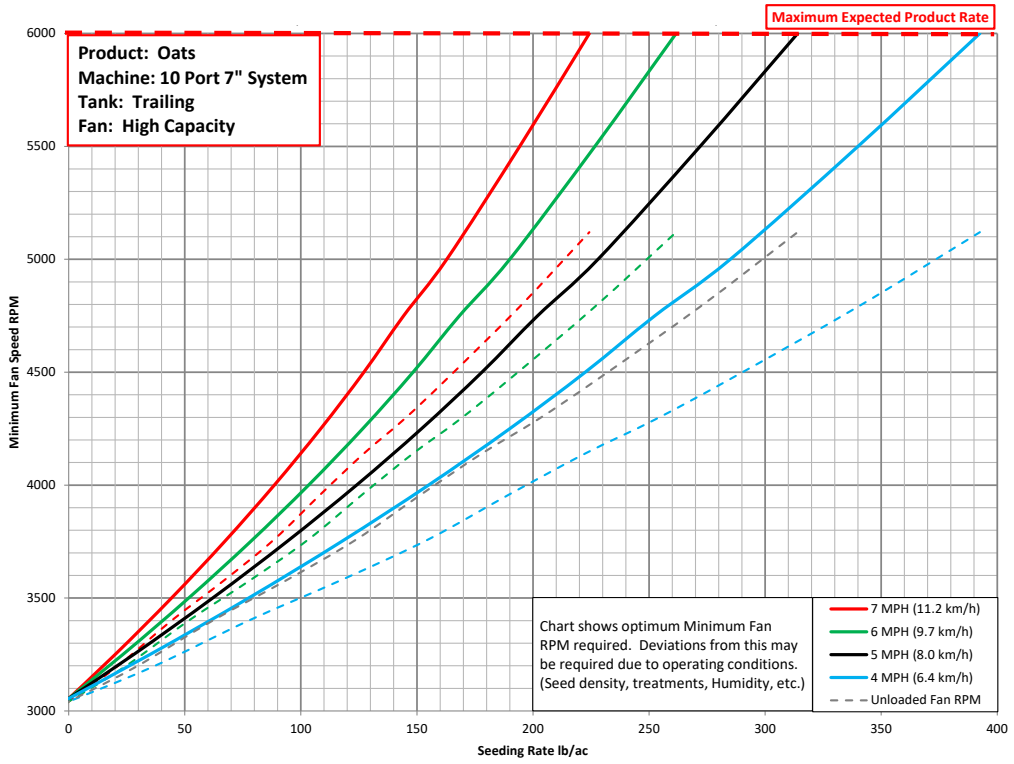
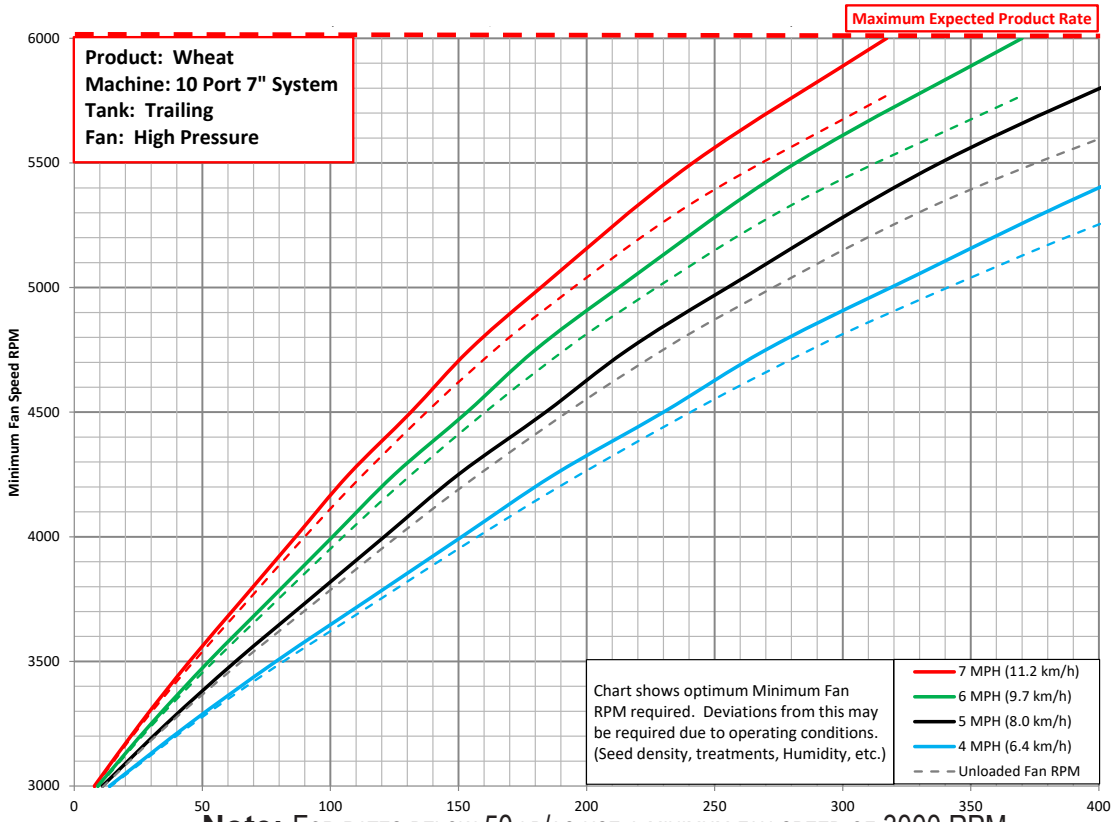


Chart 44A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 44B

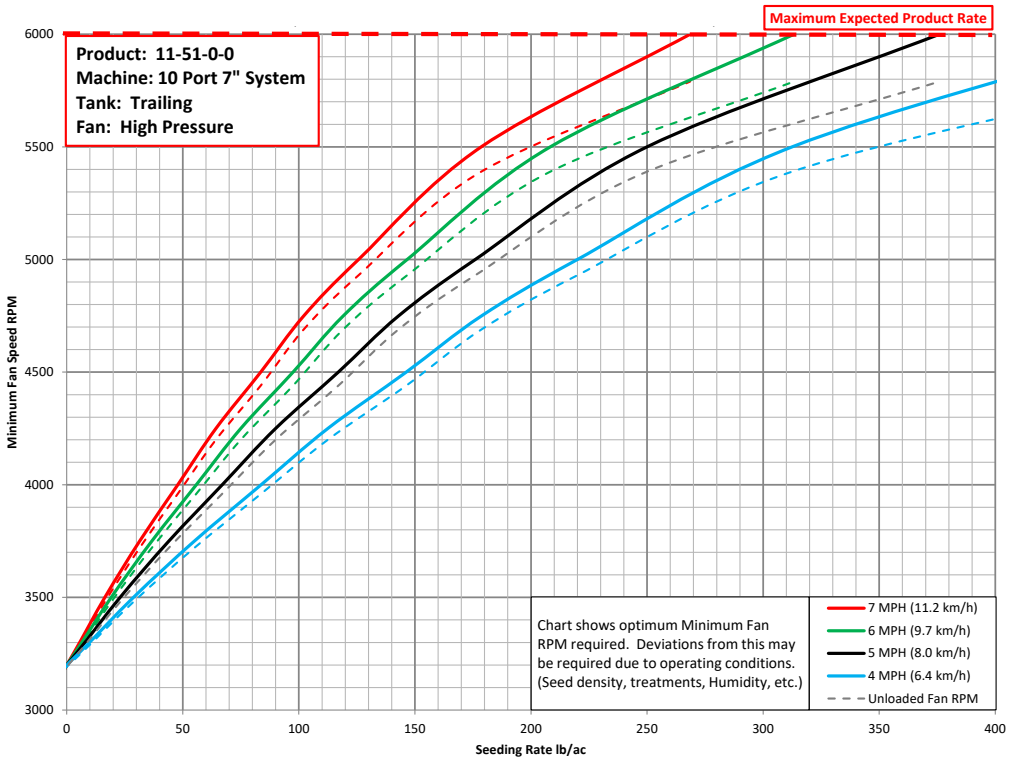
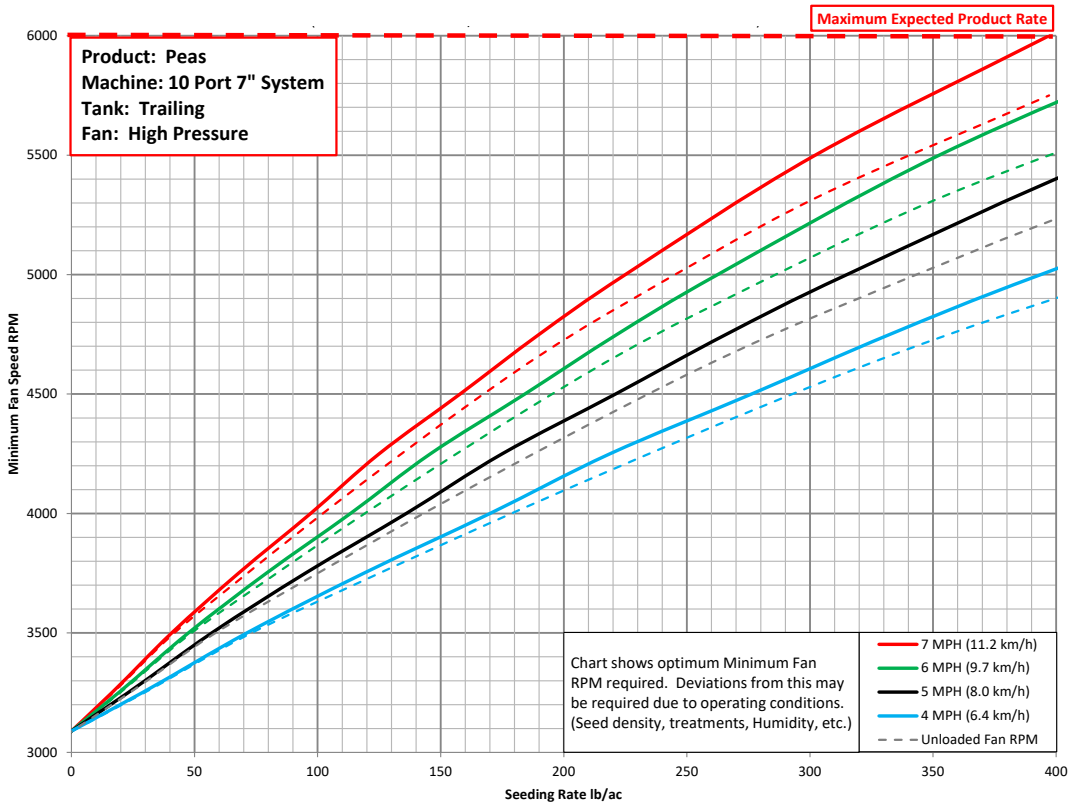


Chart 44C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 44D

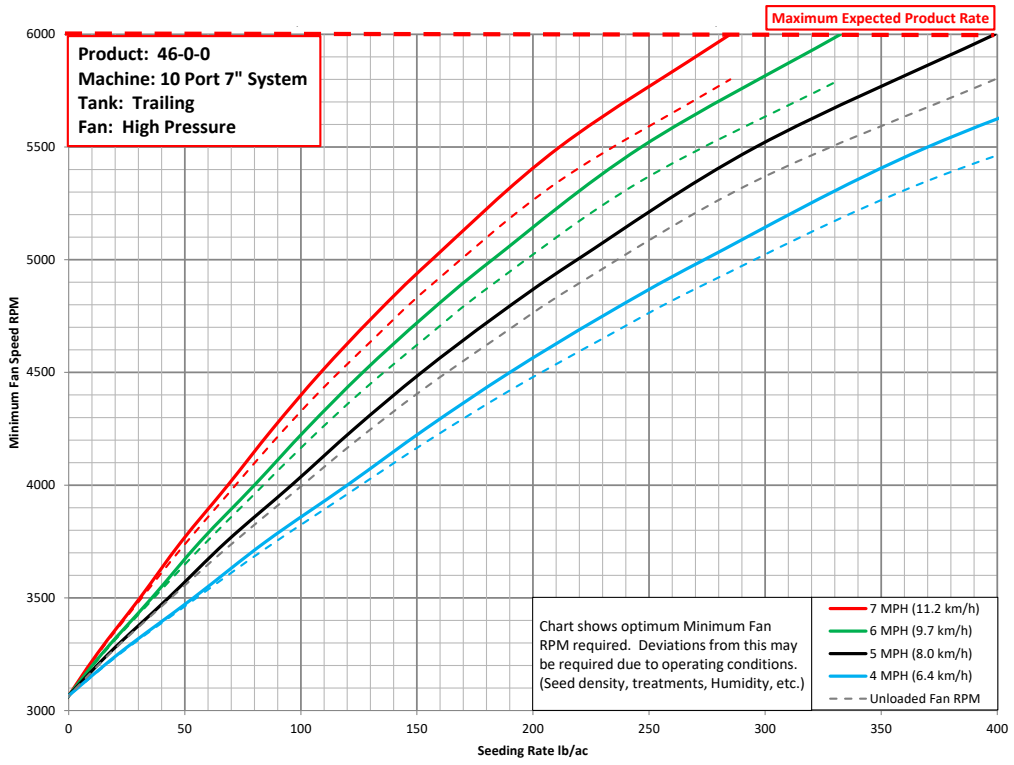
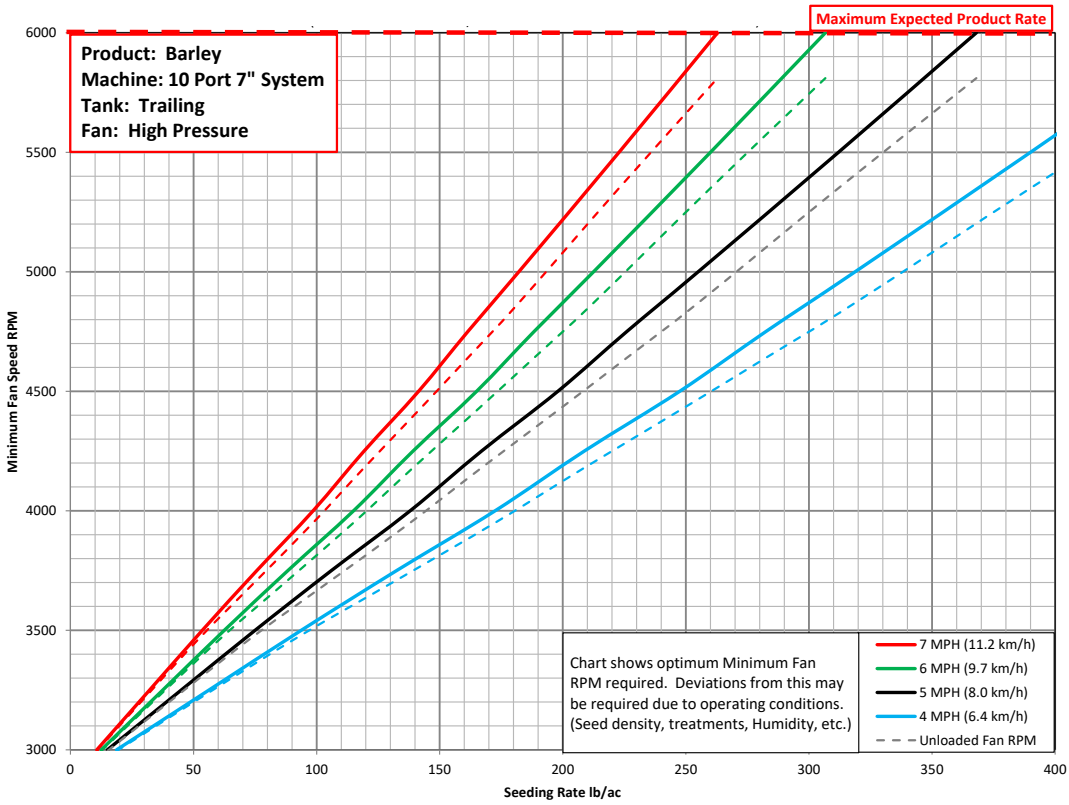
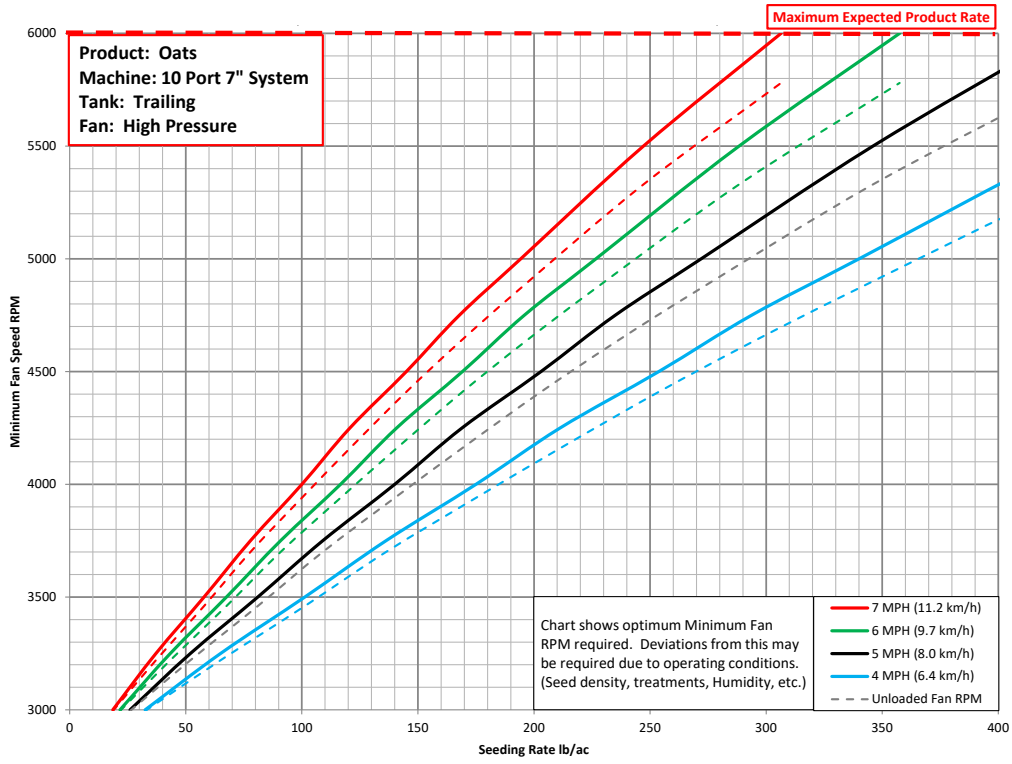


Chart 44E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

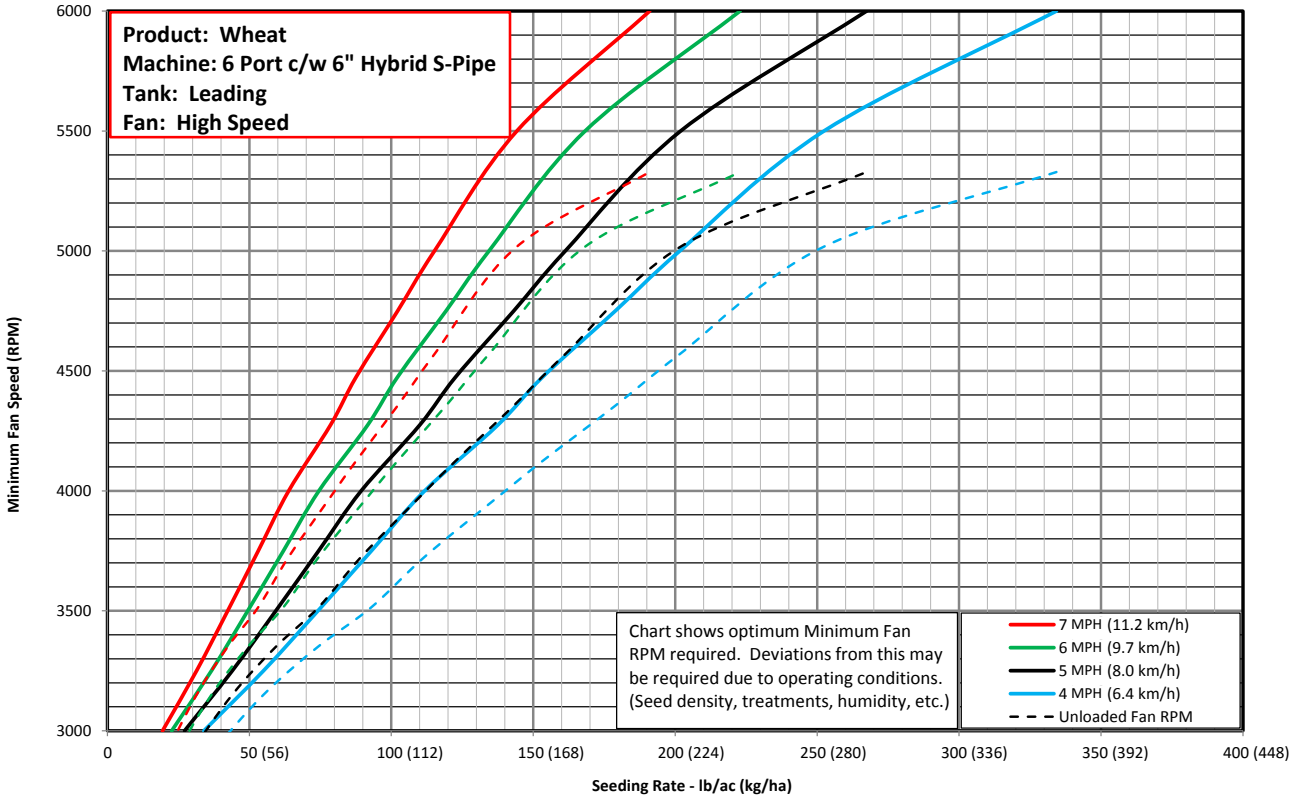
Chart 44F



Note: For rates below 50 lb/ac use a minimum fan speed of 3000 RPM.

3 Leading Air Cart Charts

Chart 7A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 7B

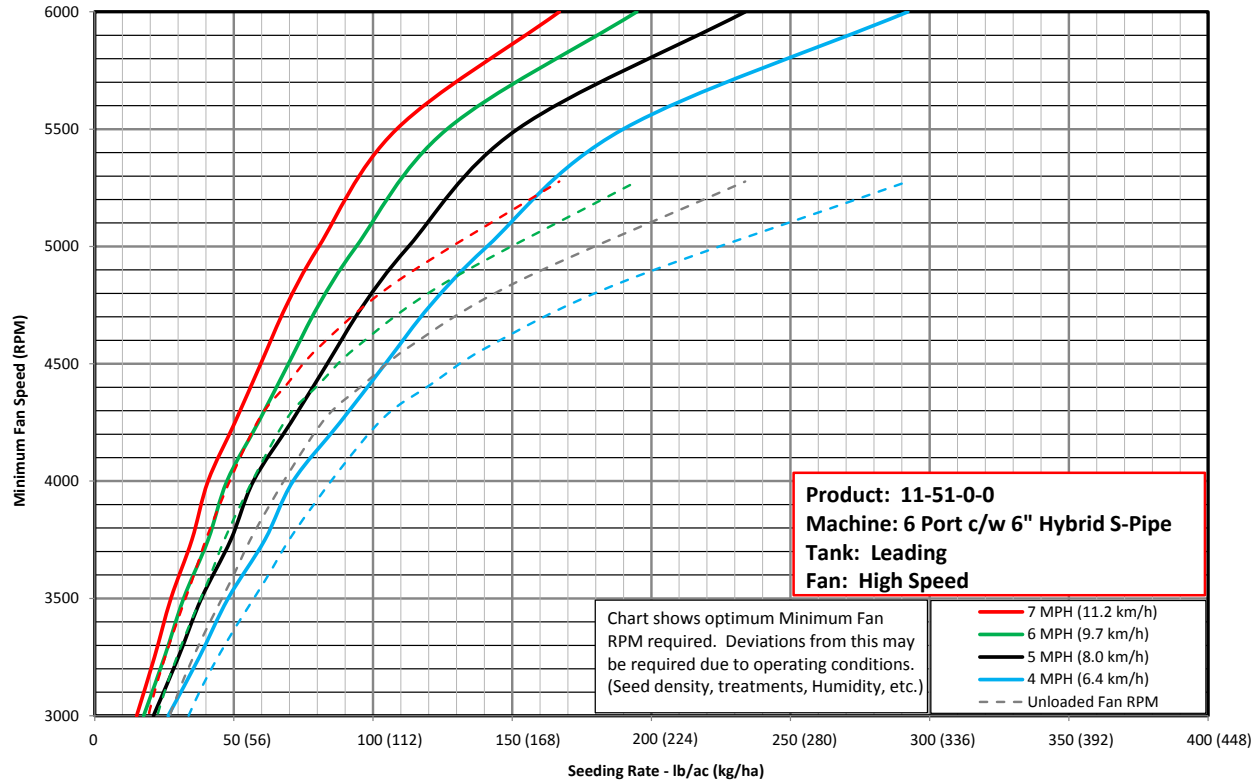
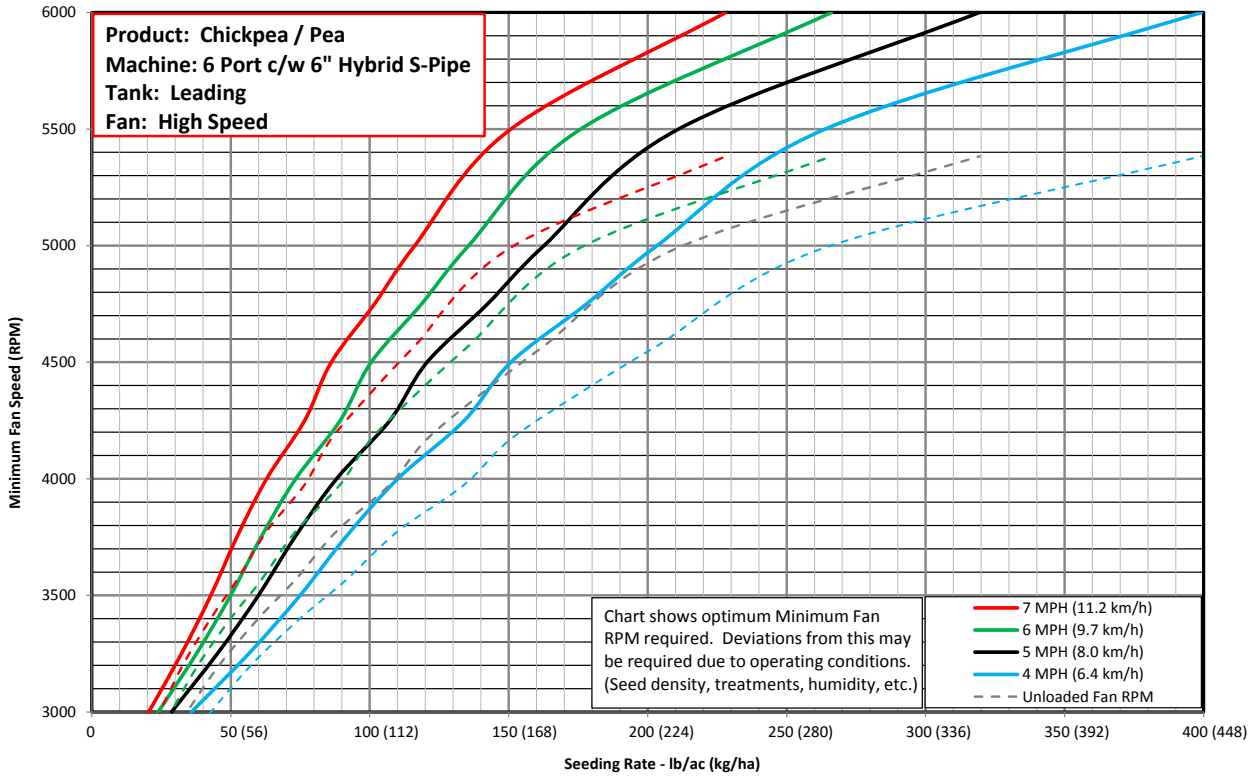


Chart 7C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 7D

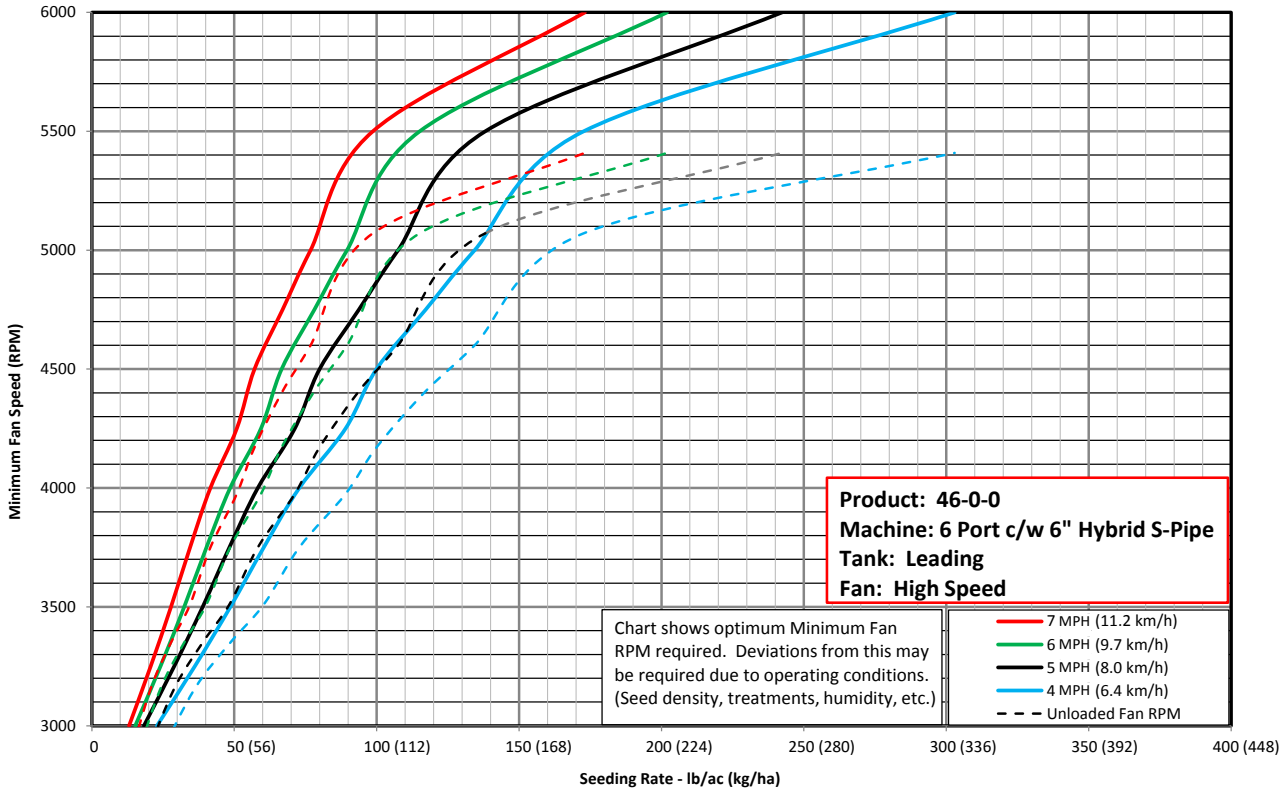
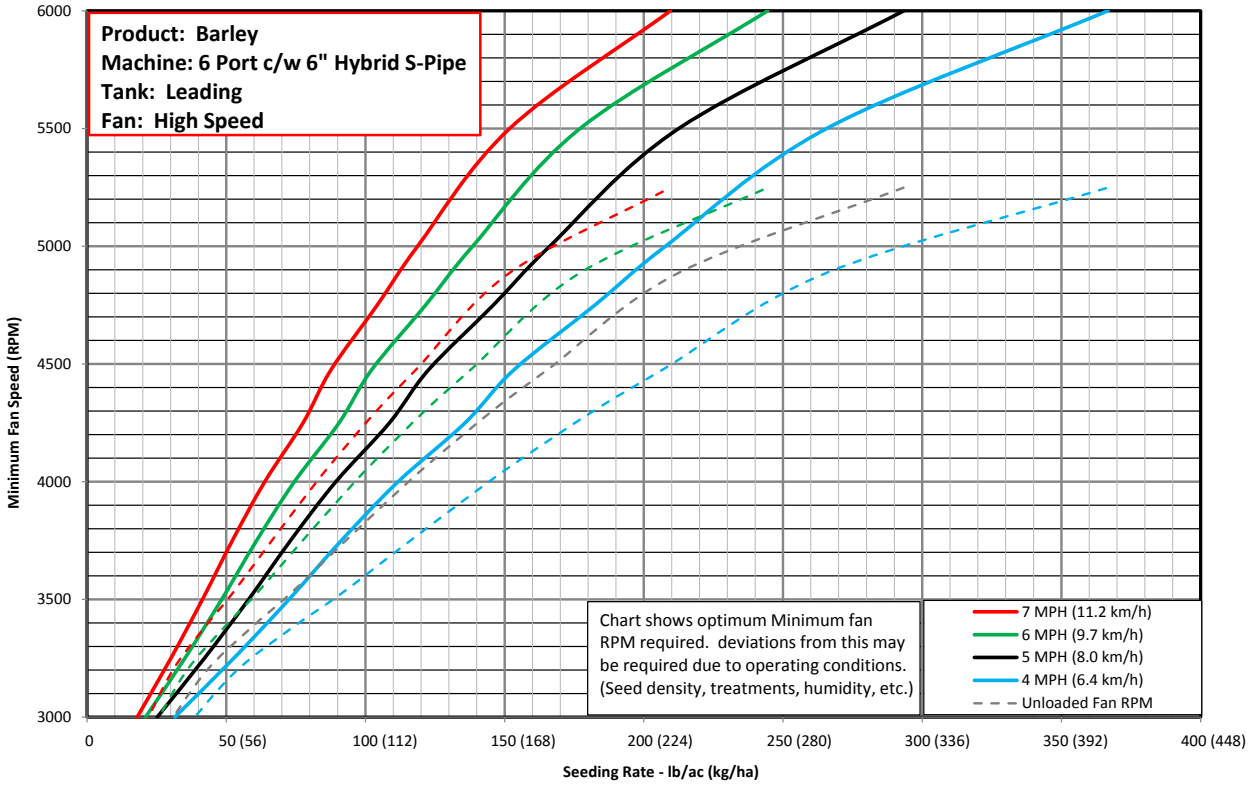


Chart 7E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 7F

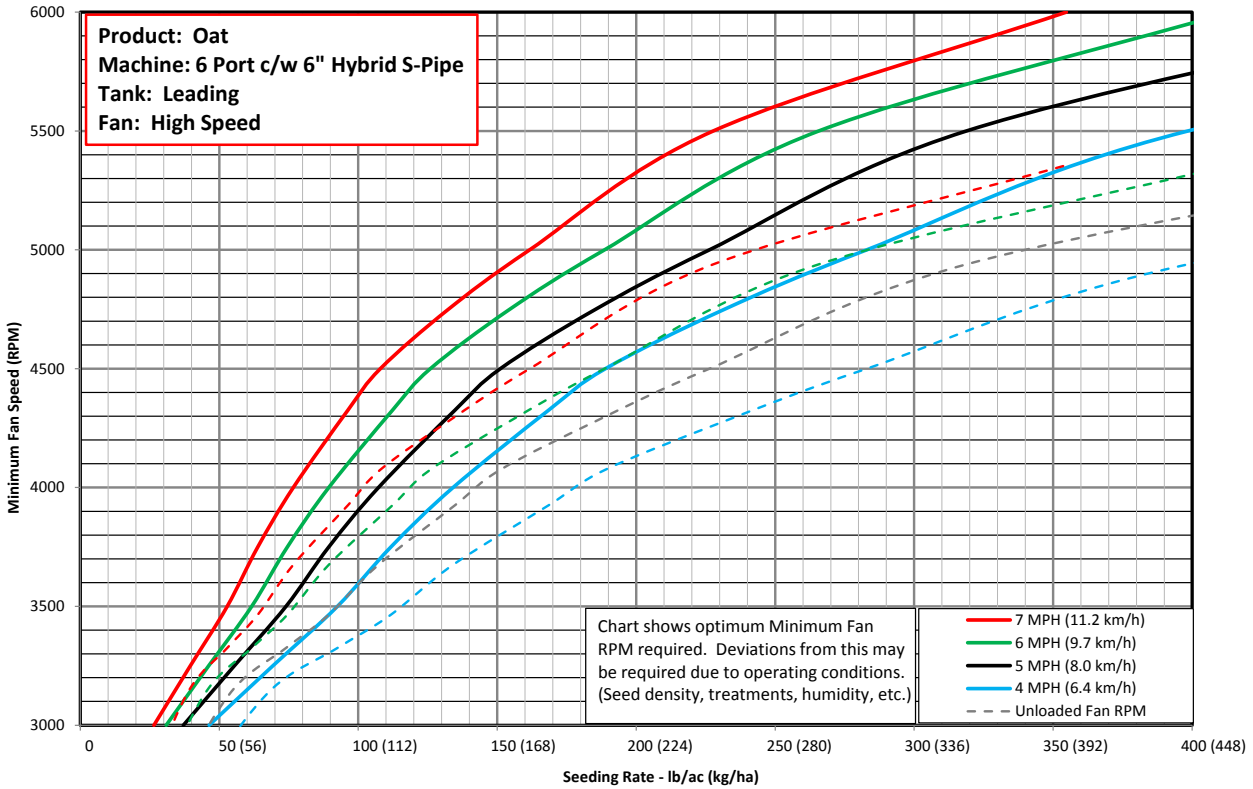
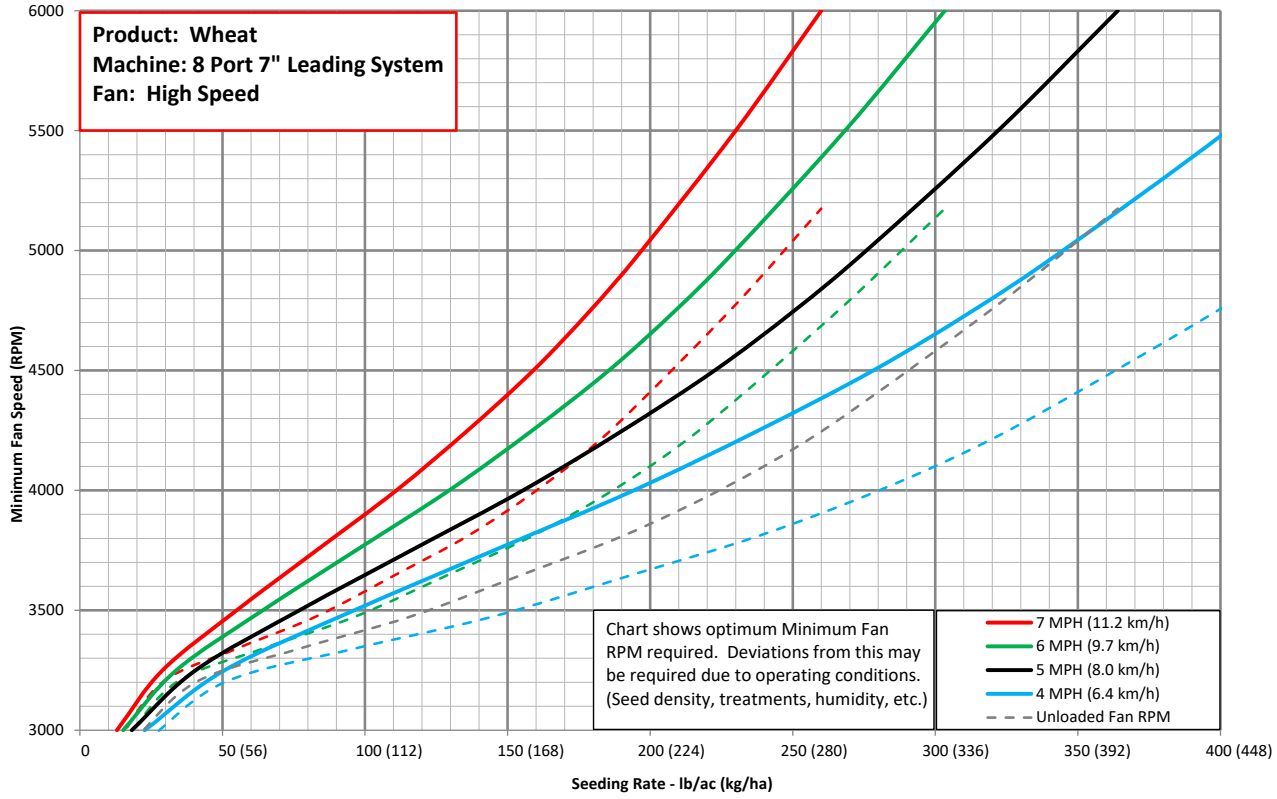


Chart 8A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 8B

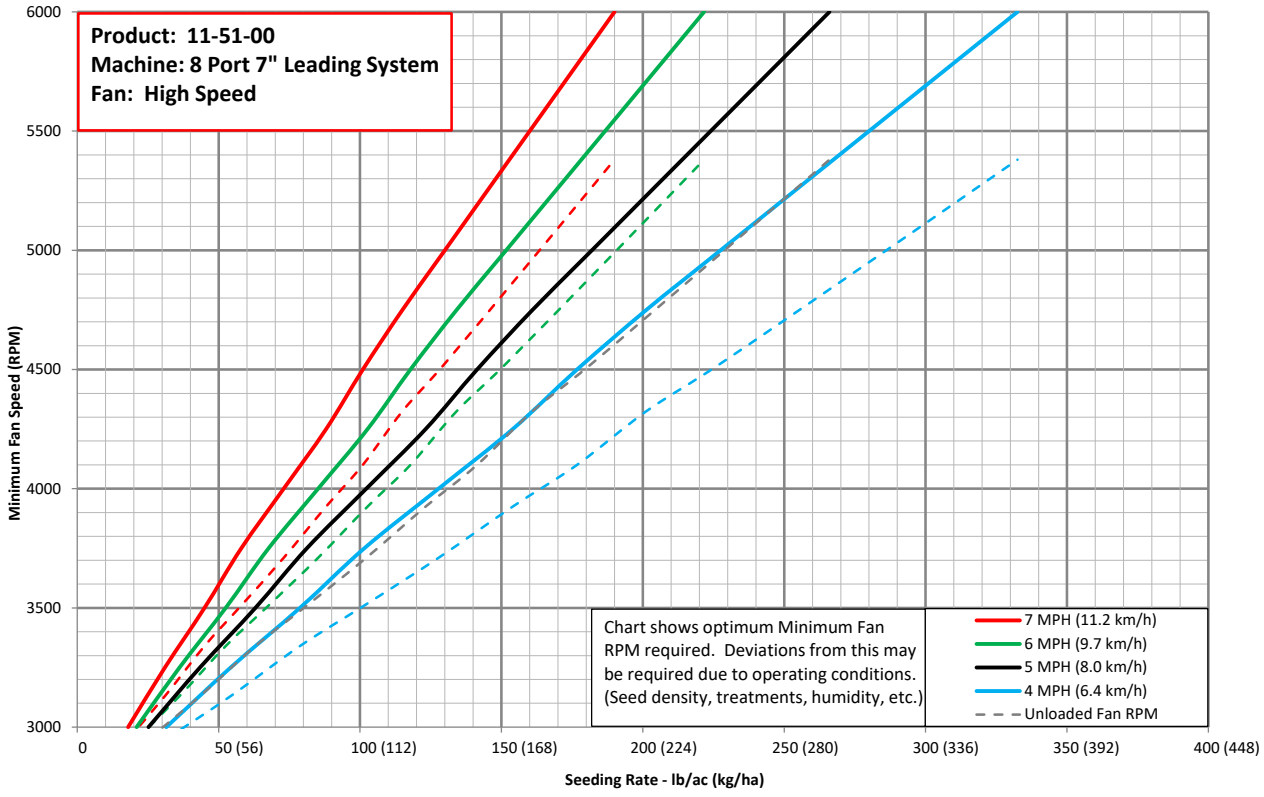


Chart 8C

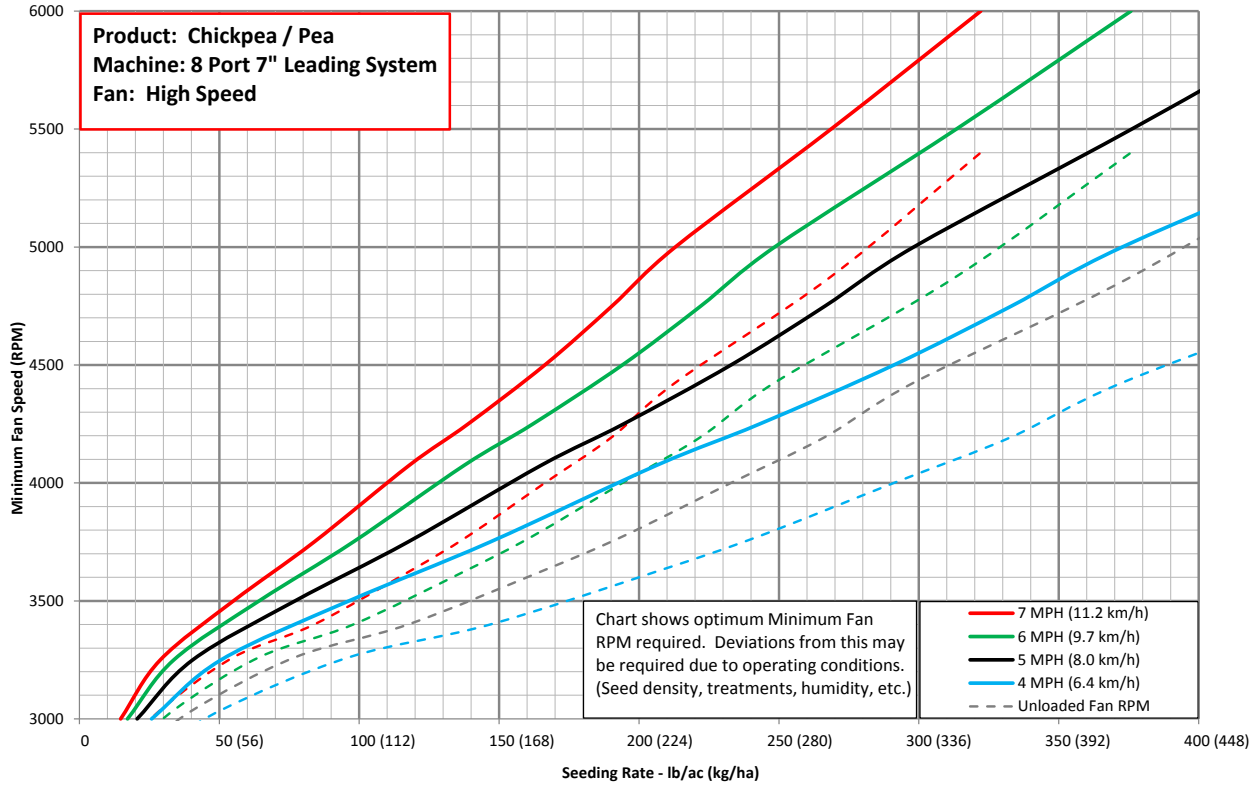


Chart 8D

Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

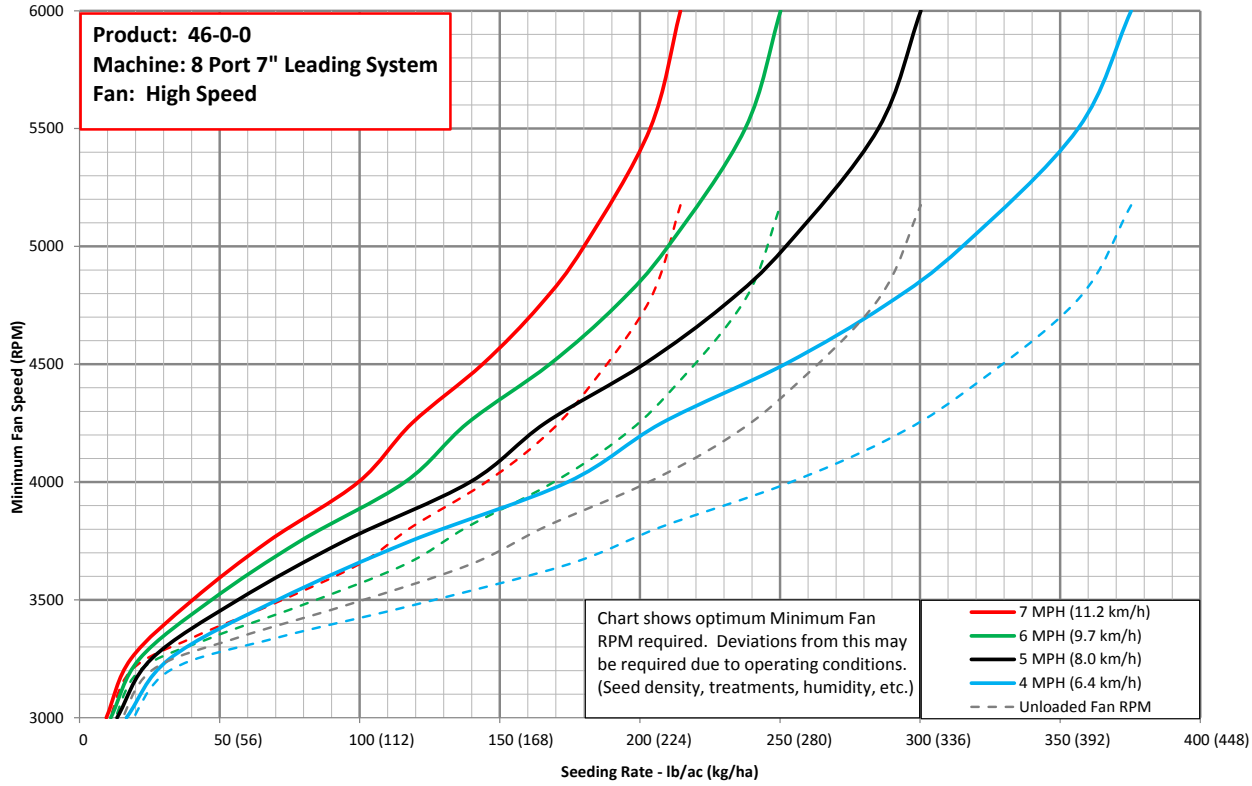


Chart 8E

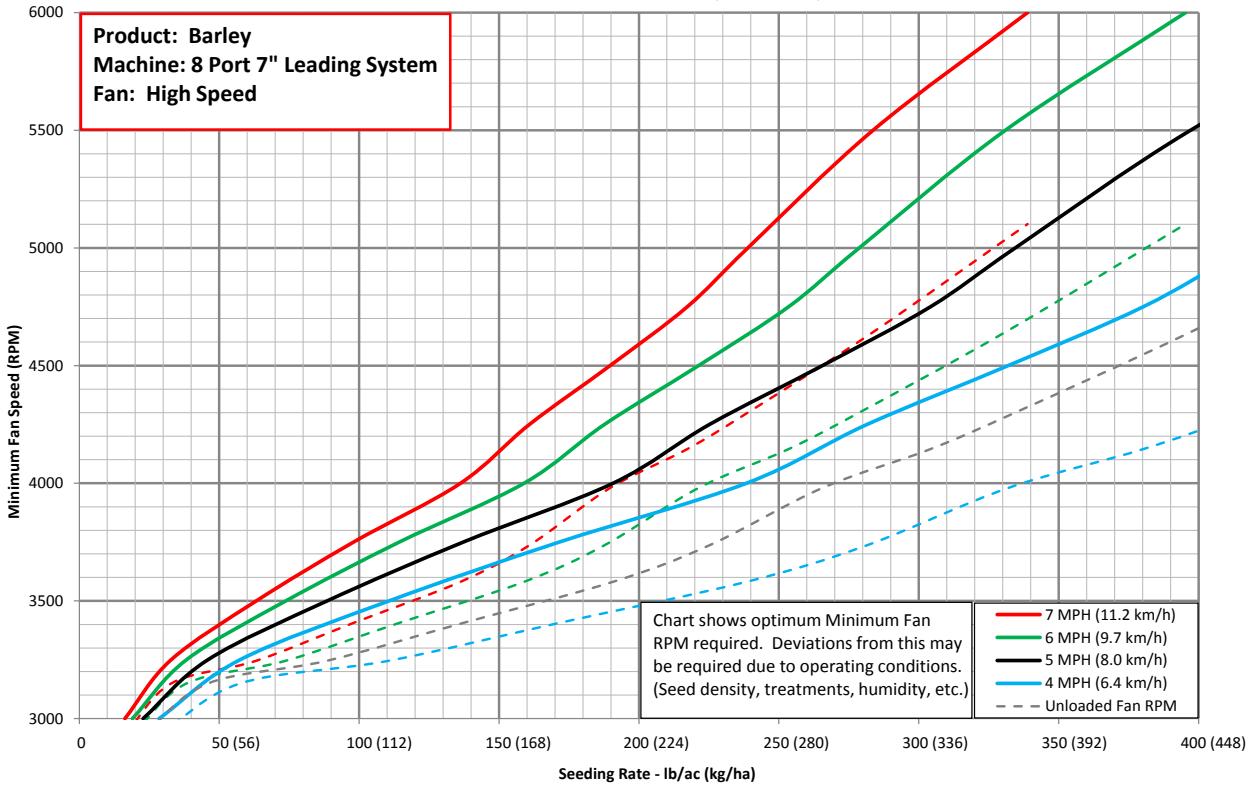


Chart 8F

Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

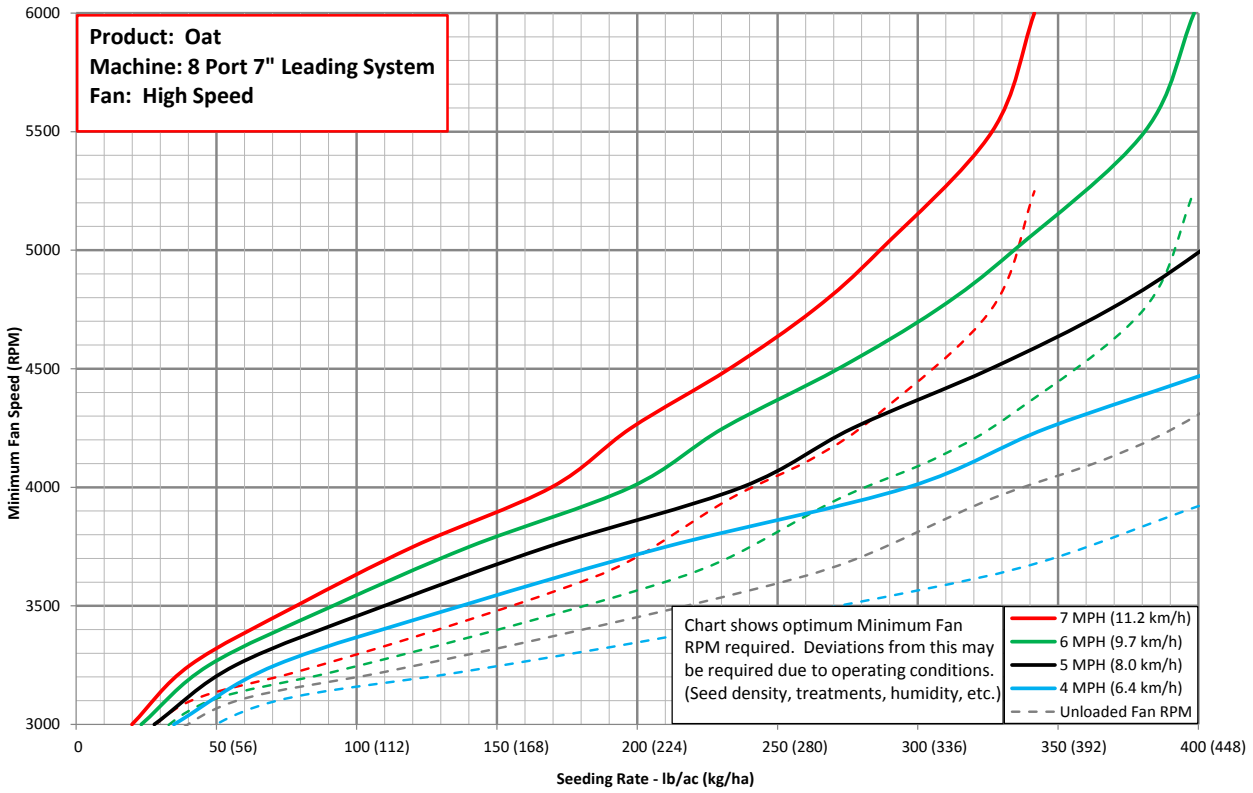
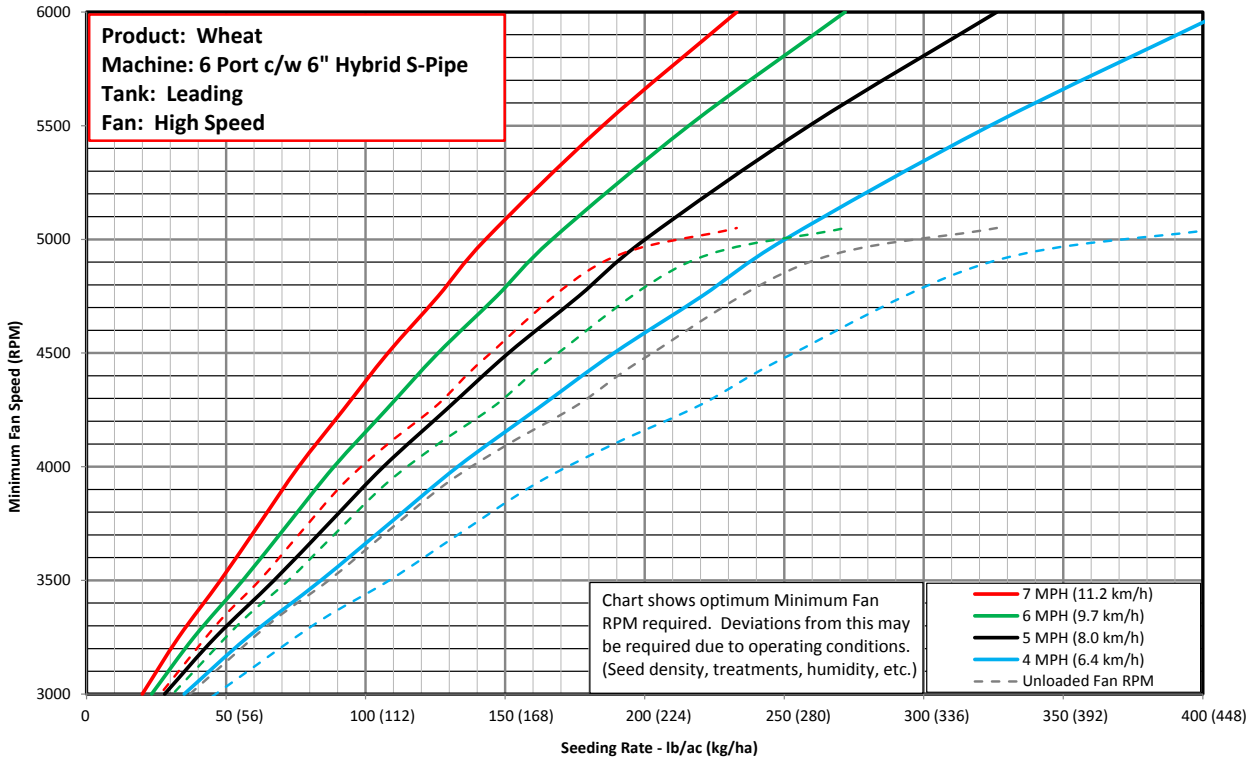


Chart 9A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 9B

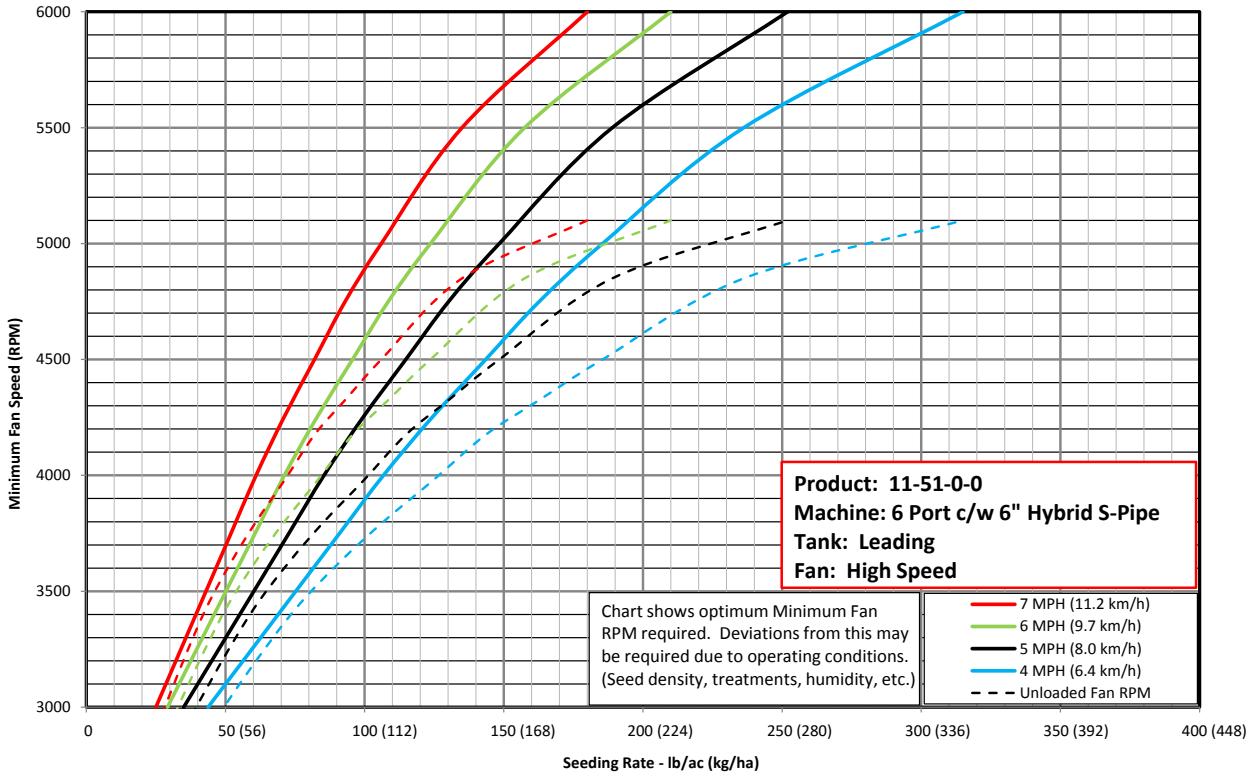
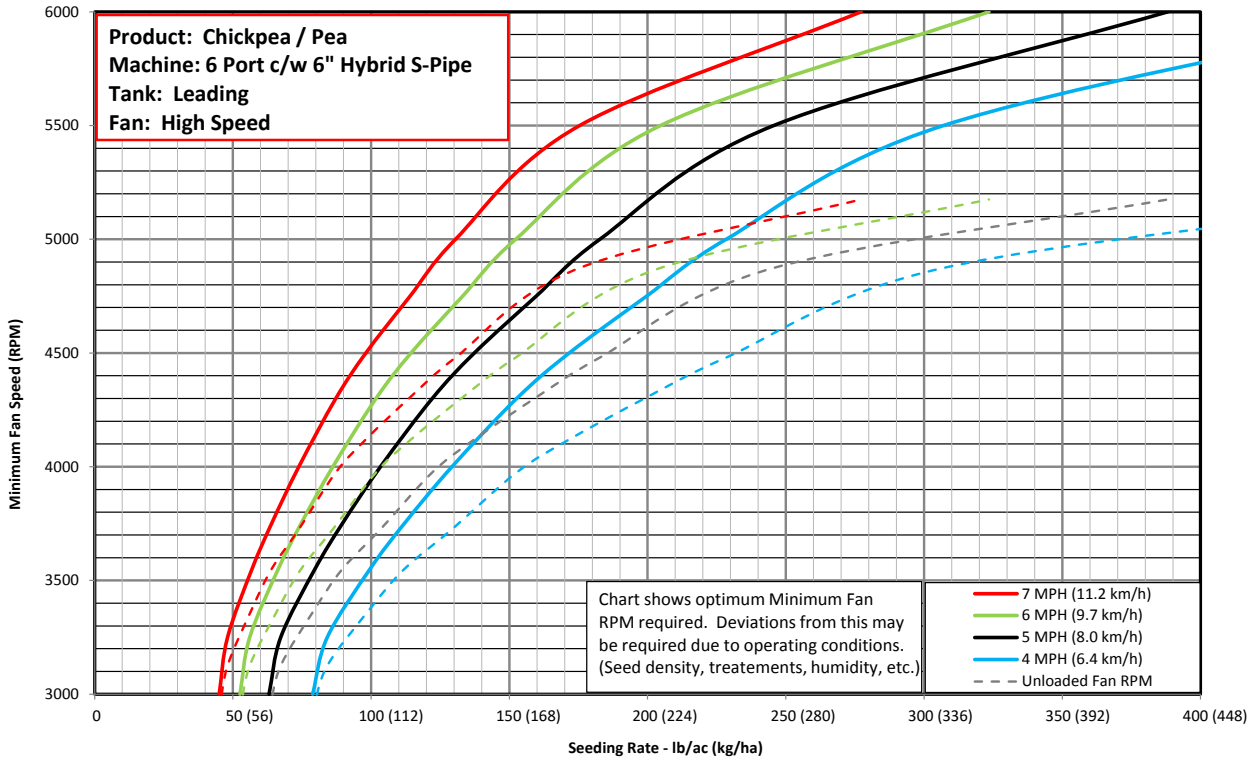


Chart 9C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 9D

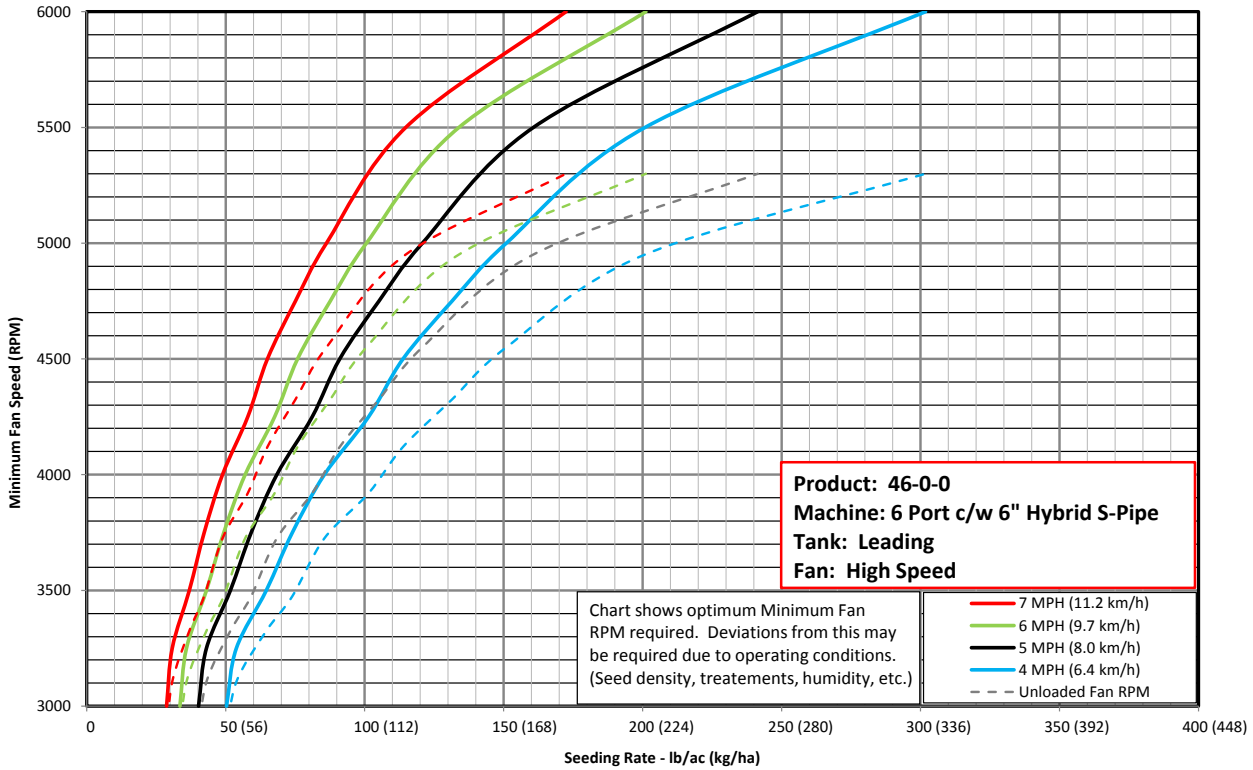
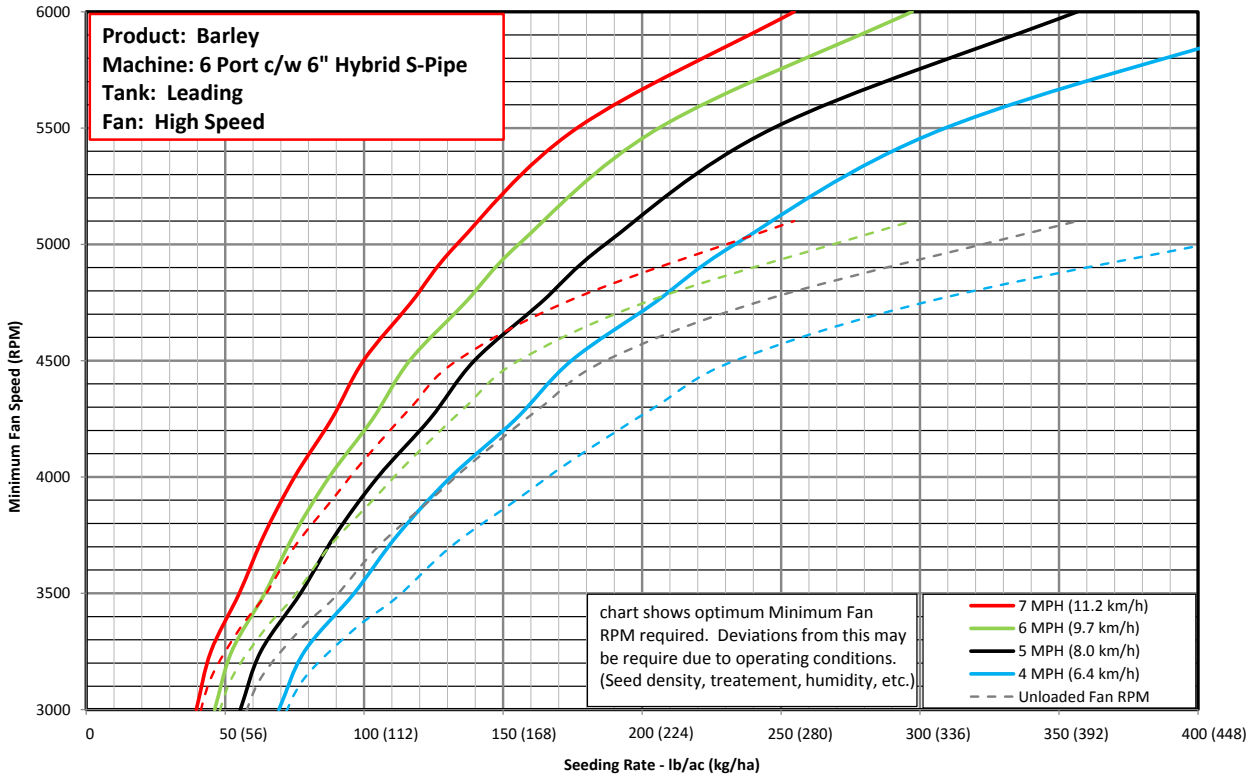


Chart 9E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 9F

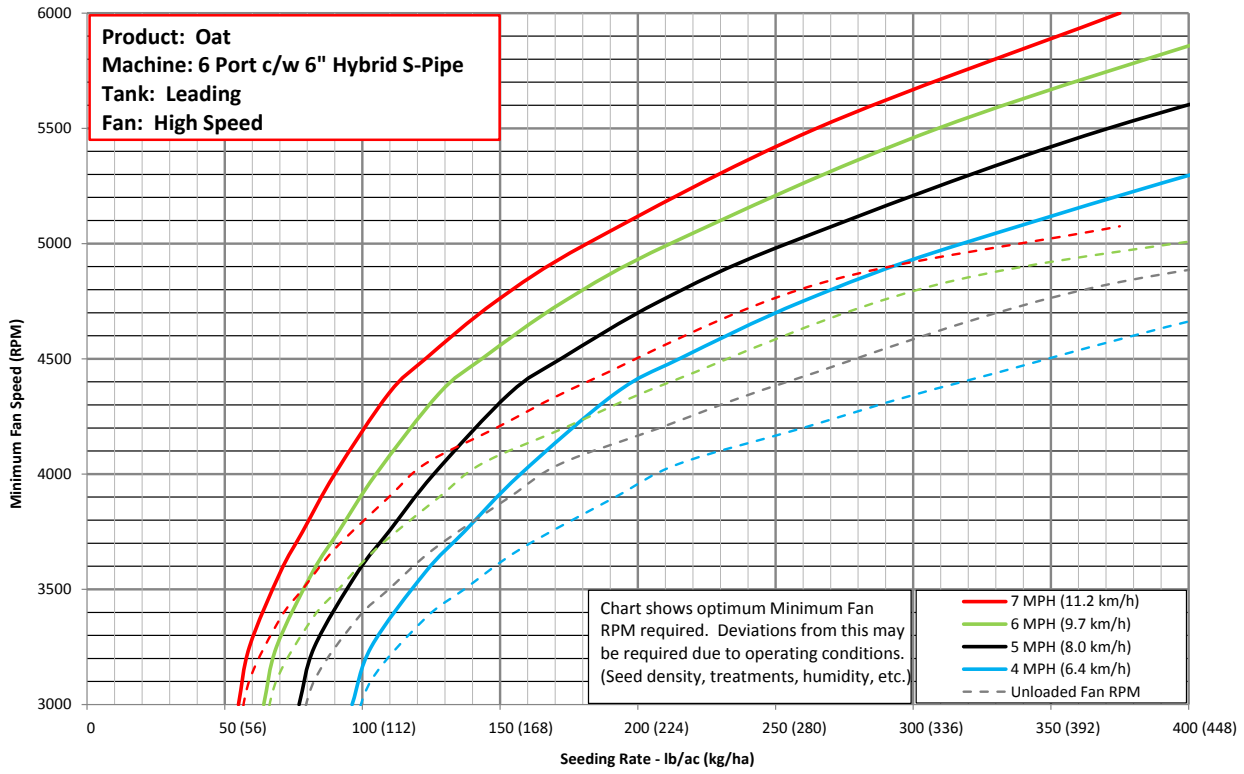
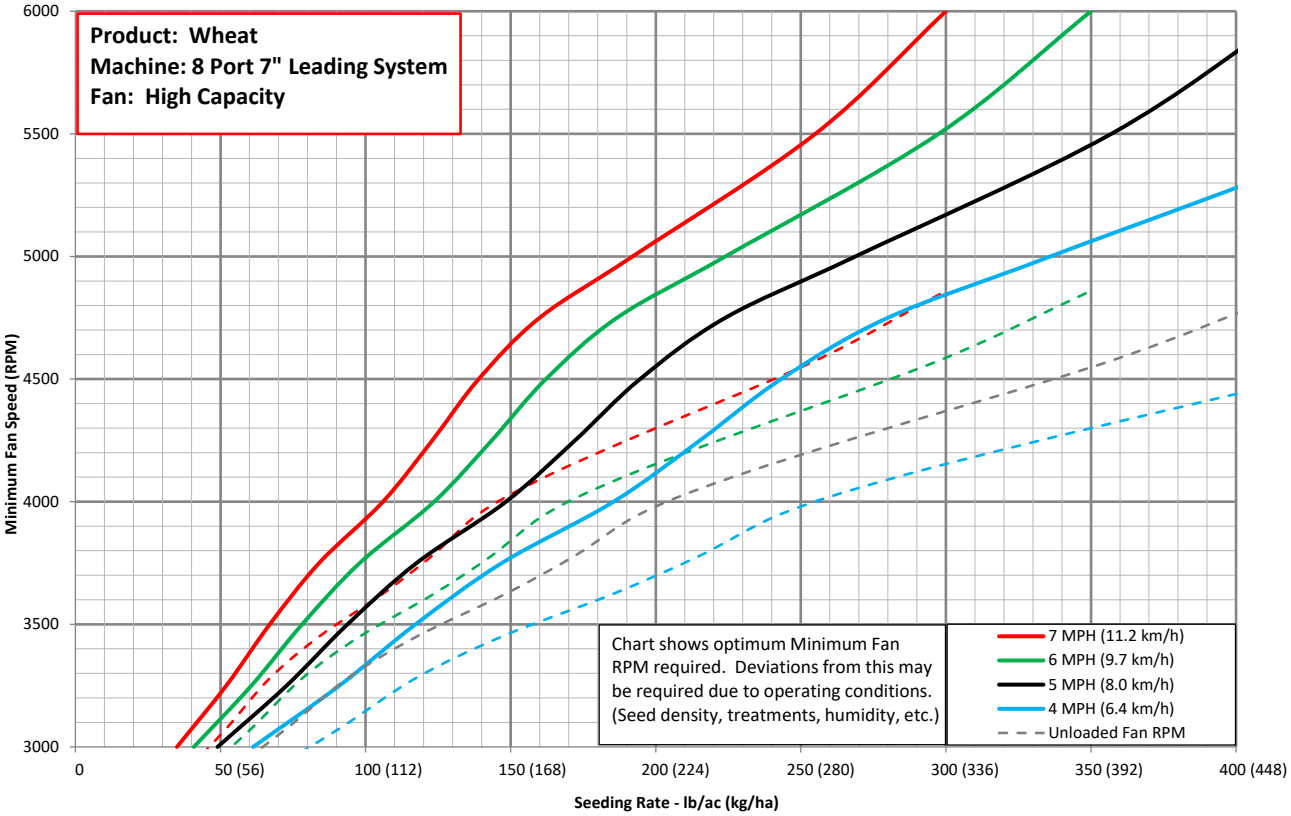


Chart 10A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 10B

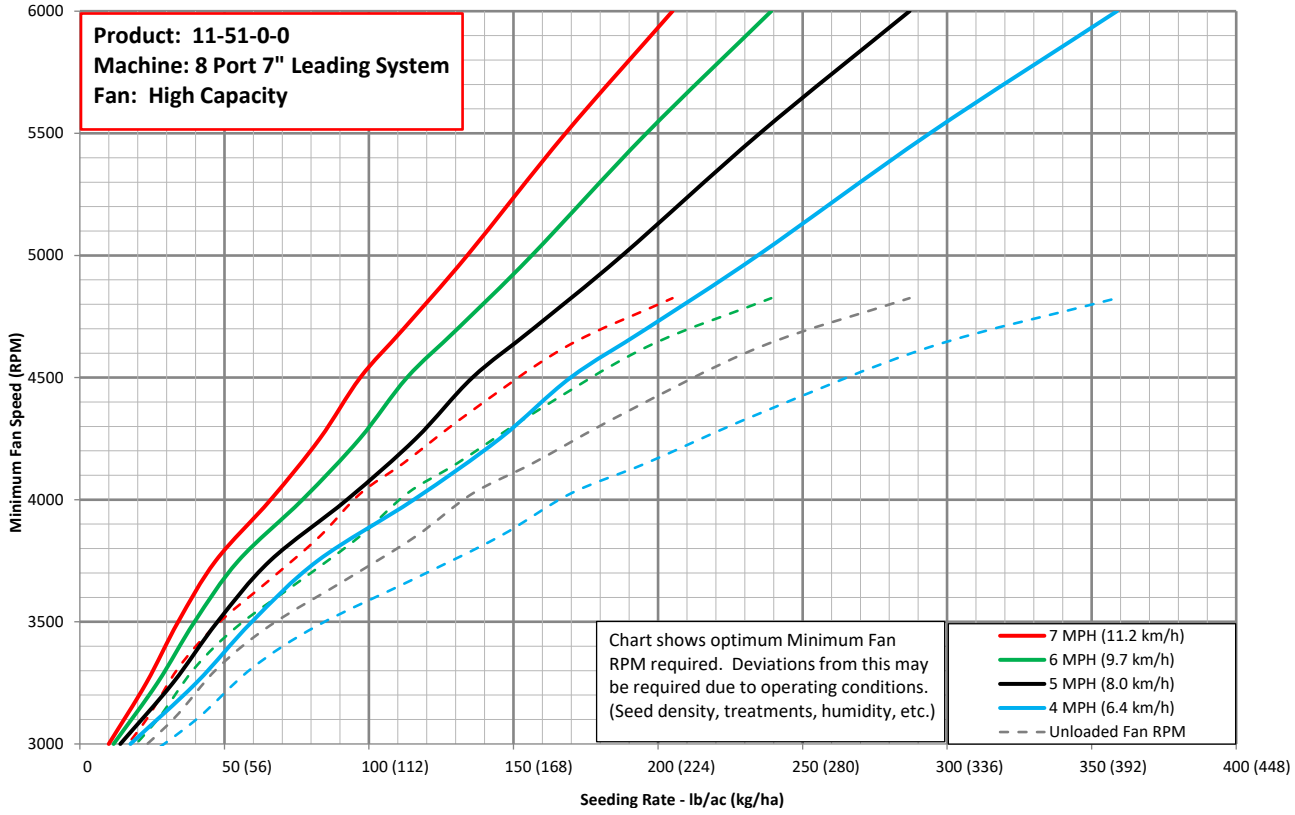
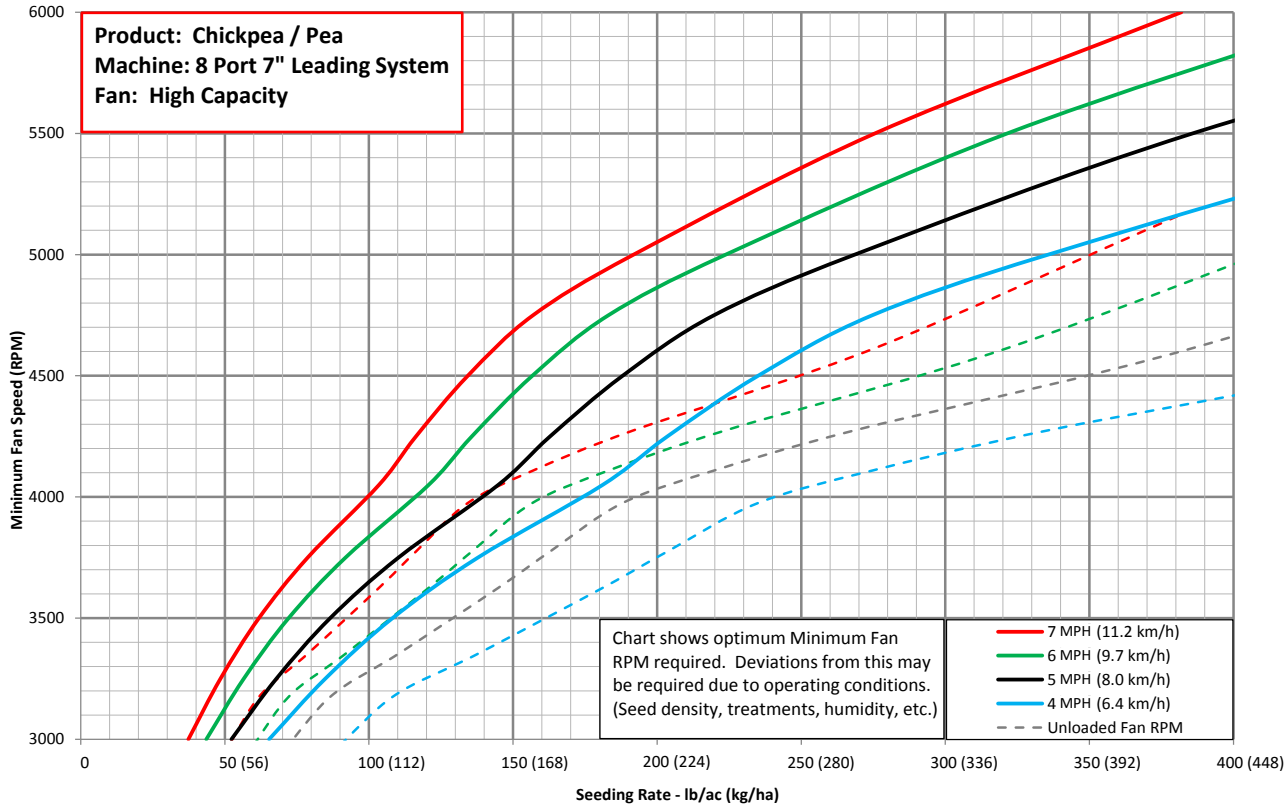


Chart 10C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 10D

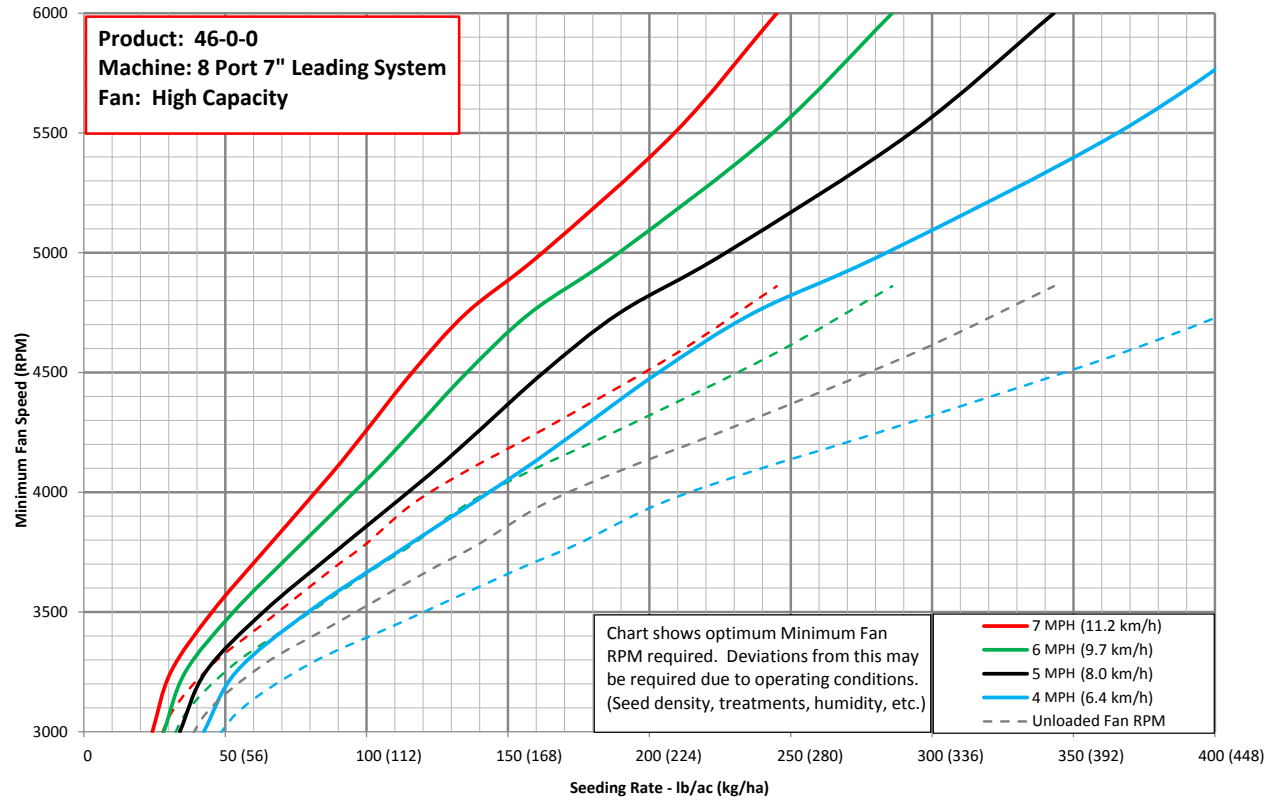
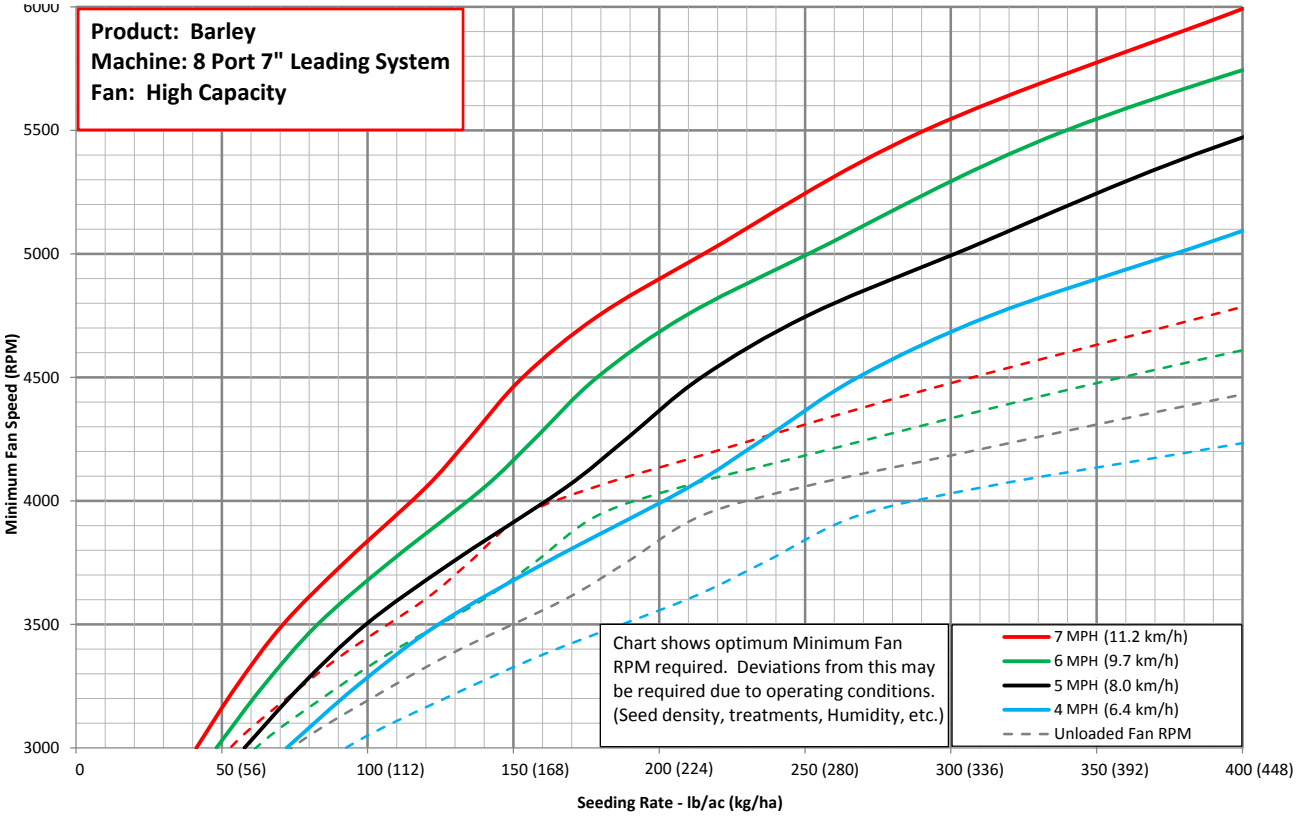


Chart 10E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 10F

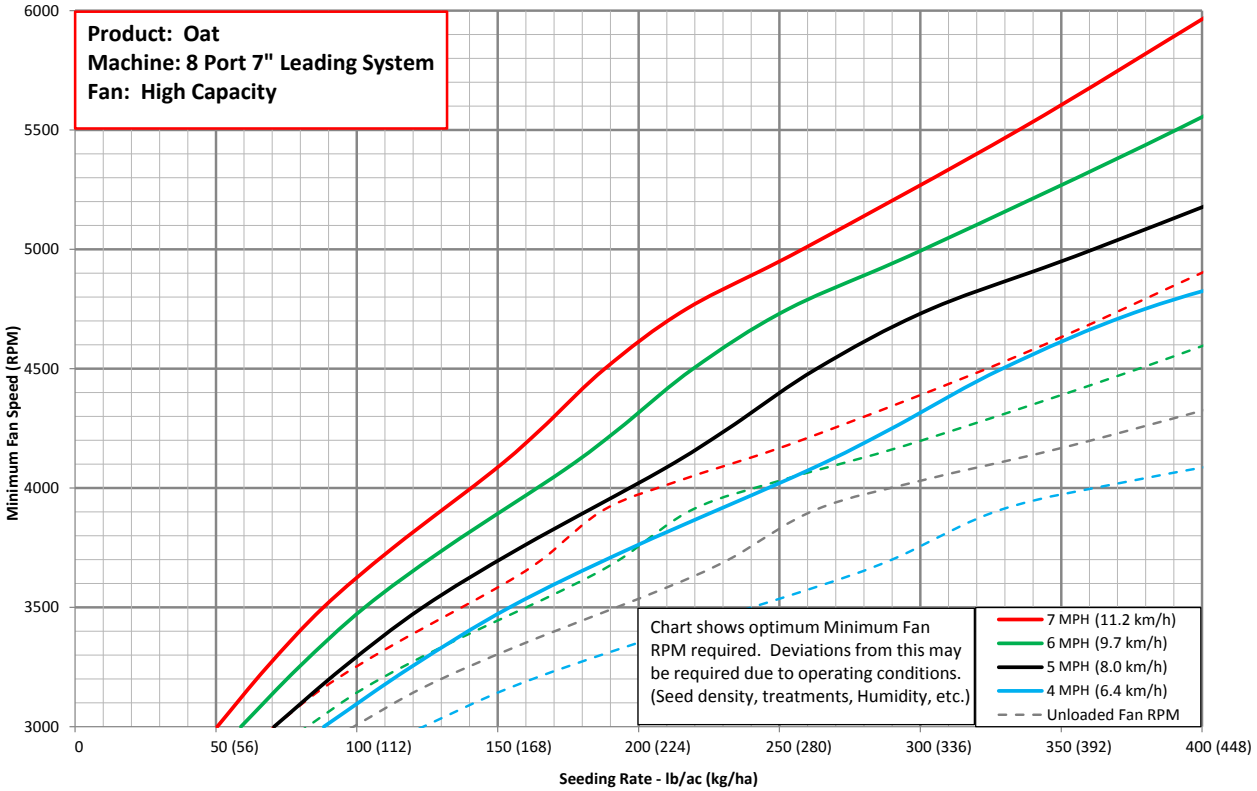
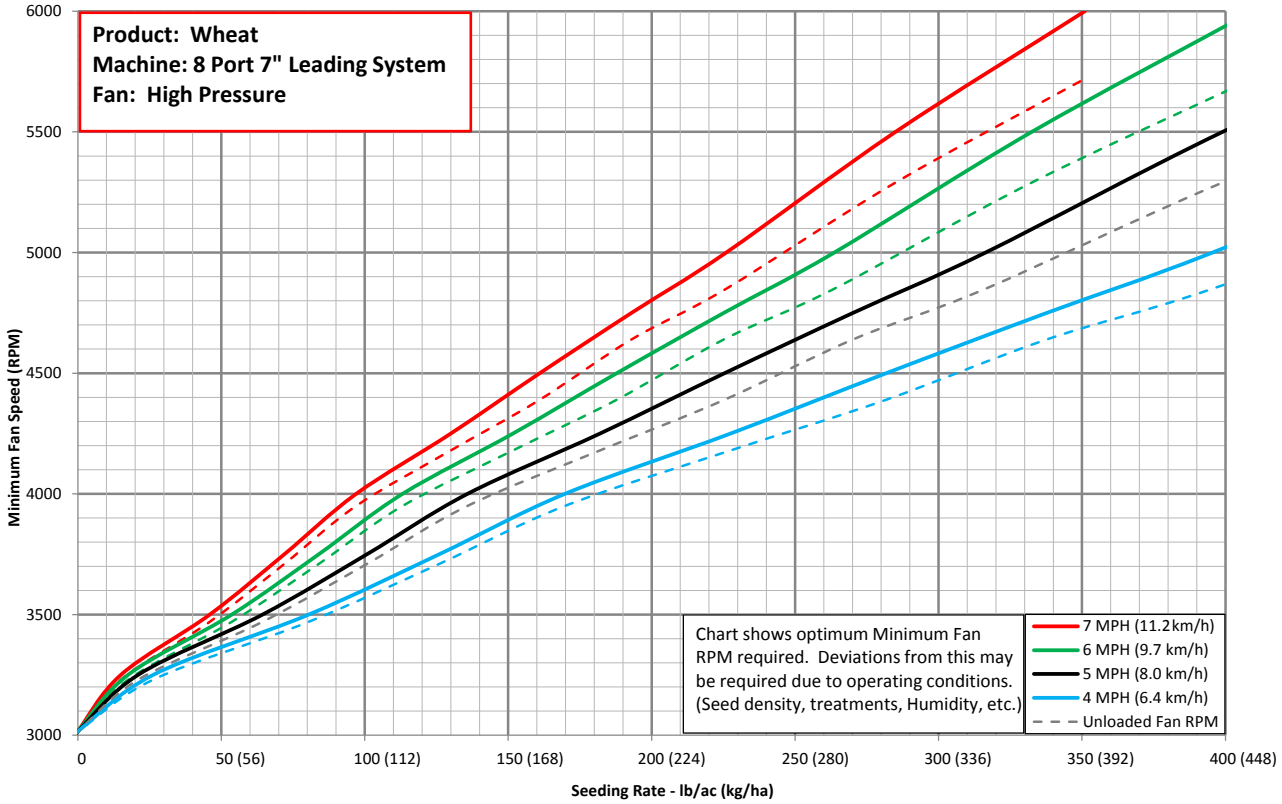


Chart 13A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 13B

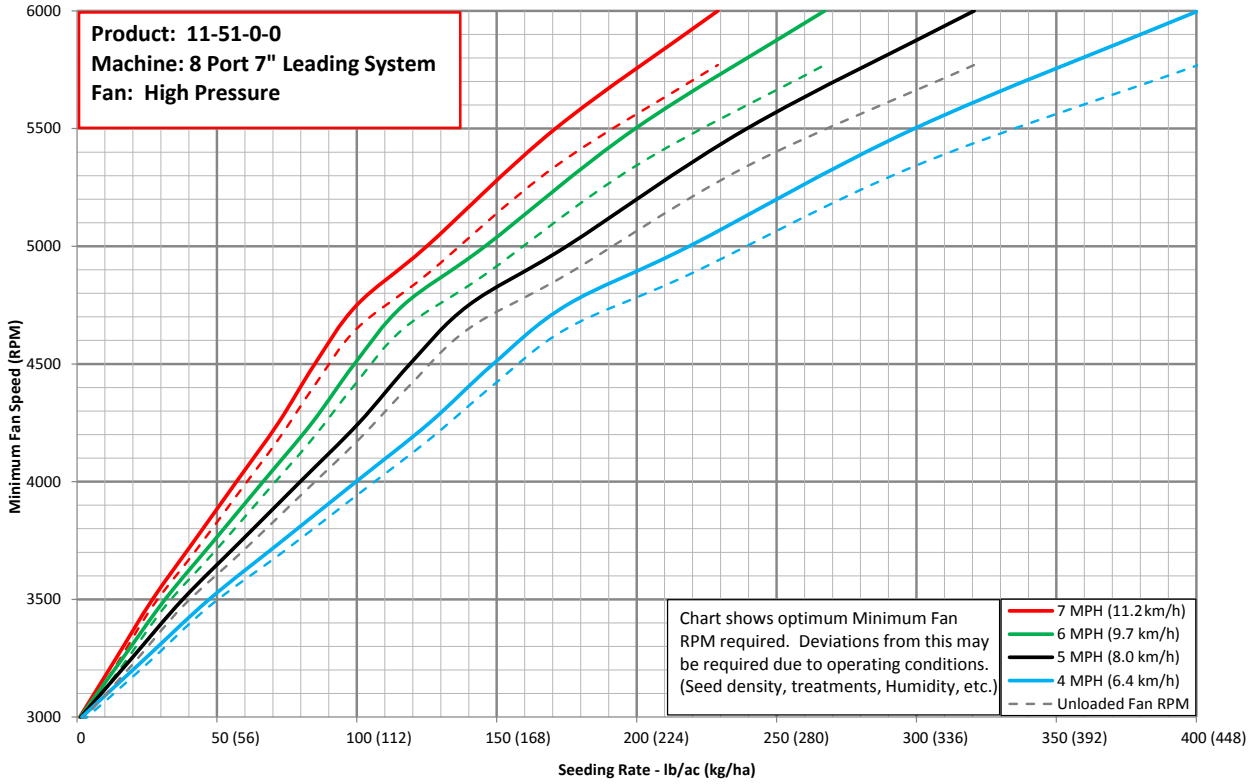
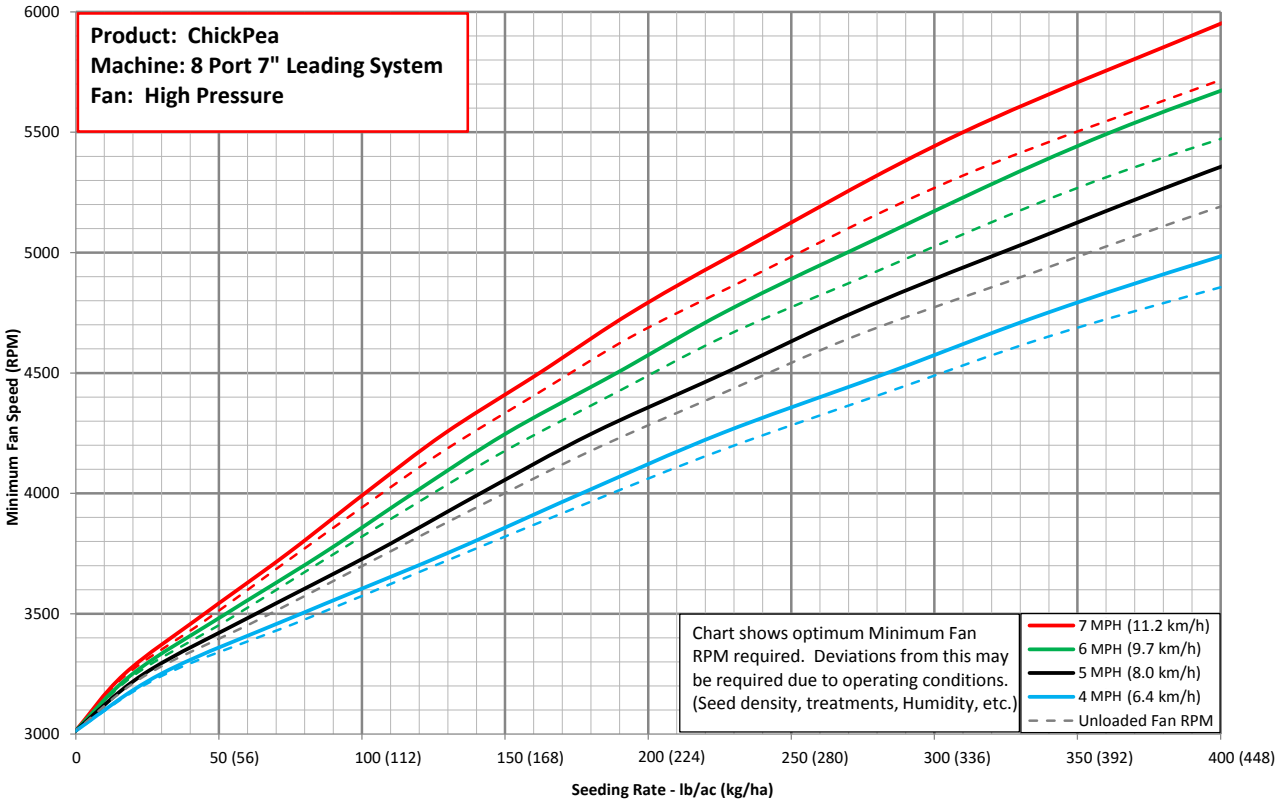


Chart 13C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 13D

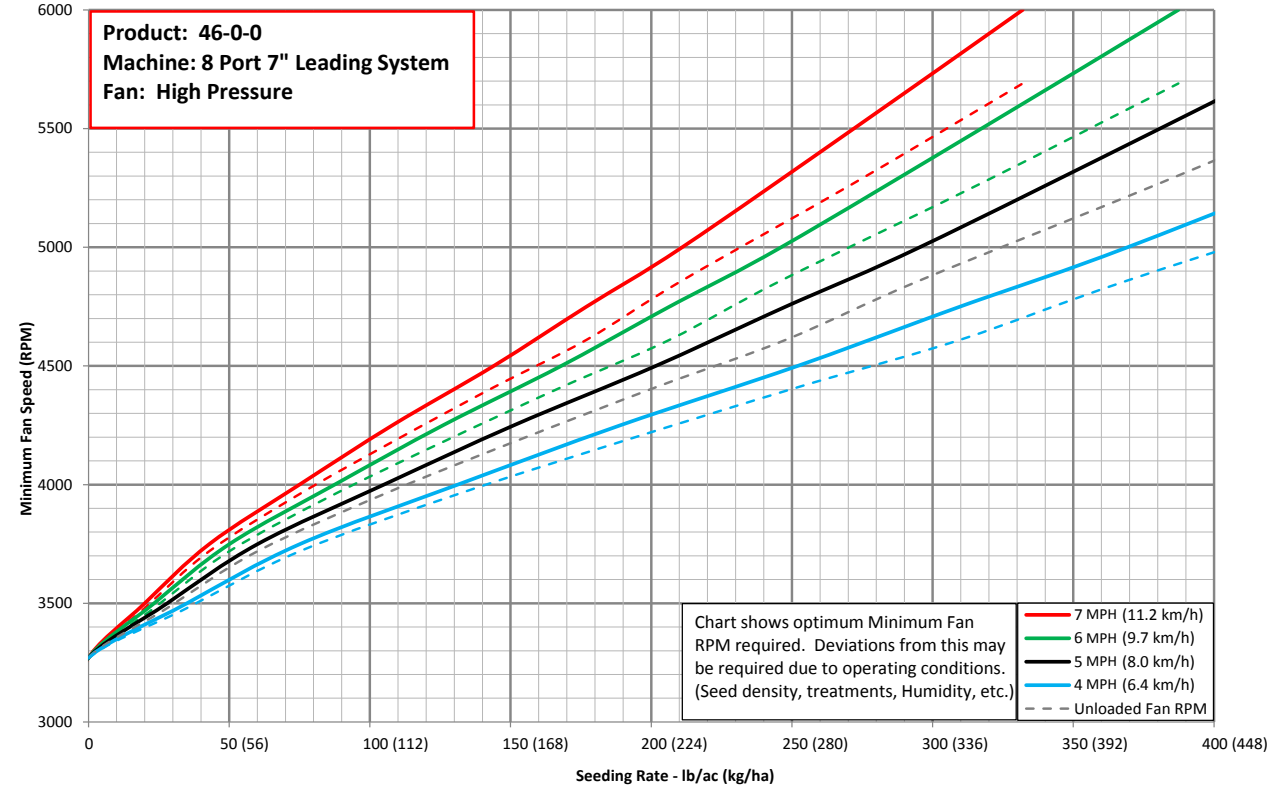
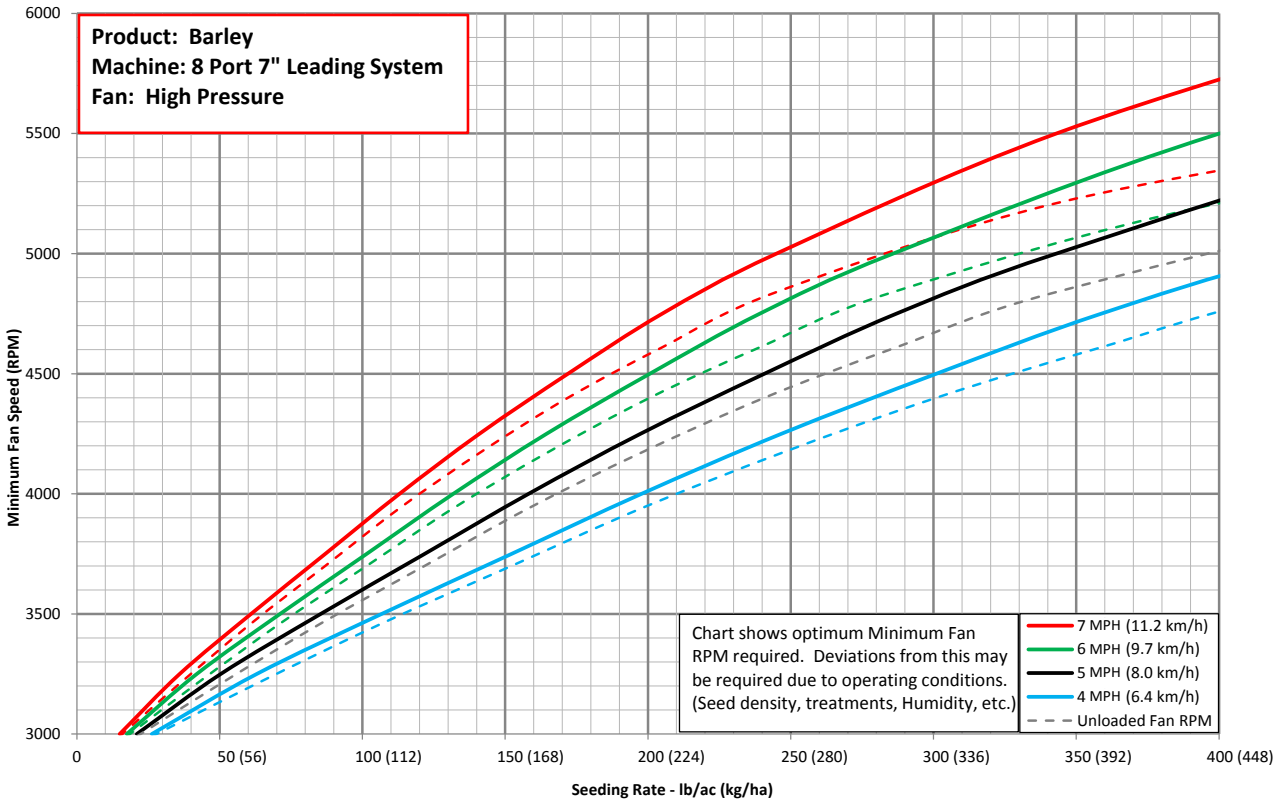


Chart 13E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 13F

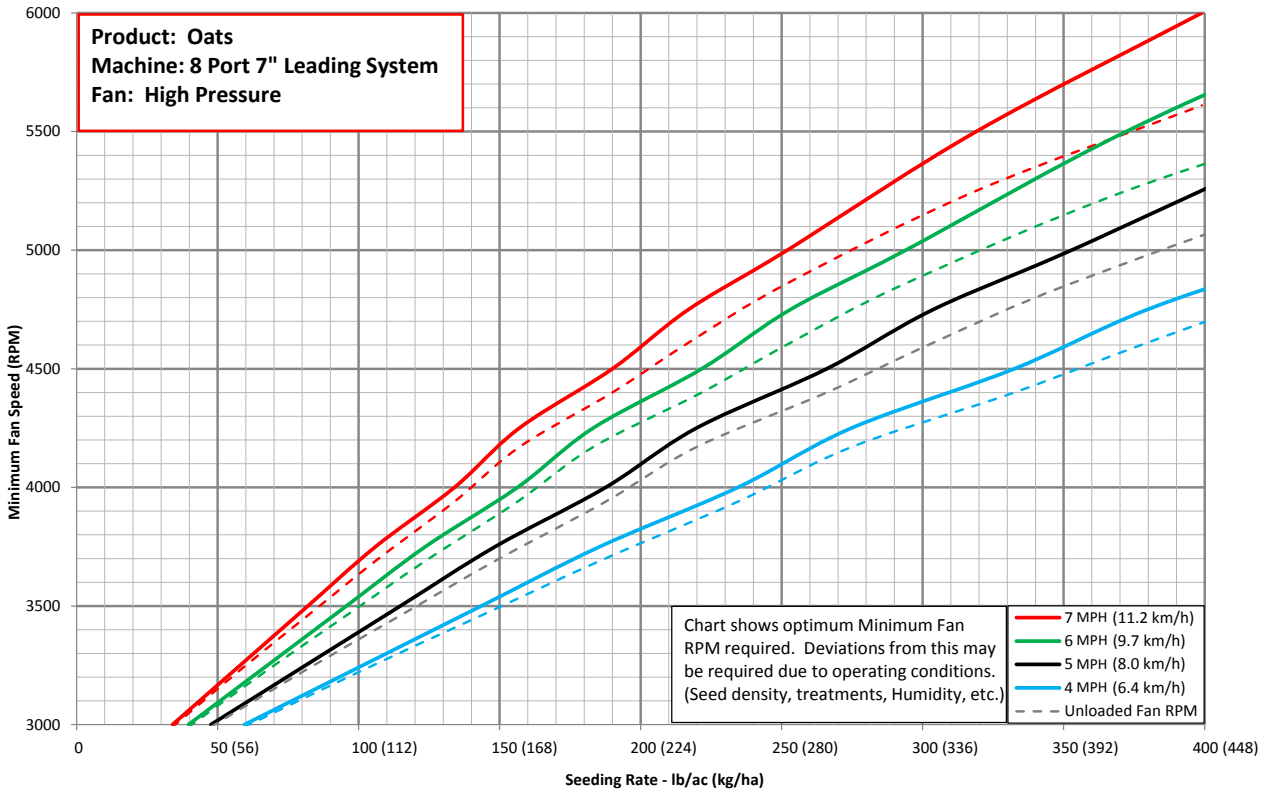
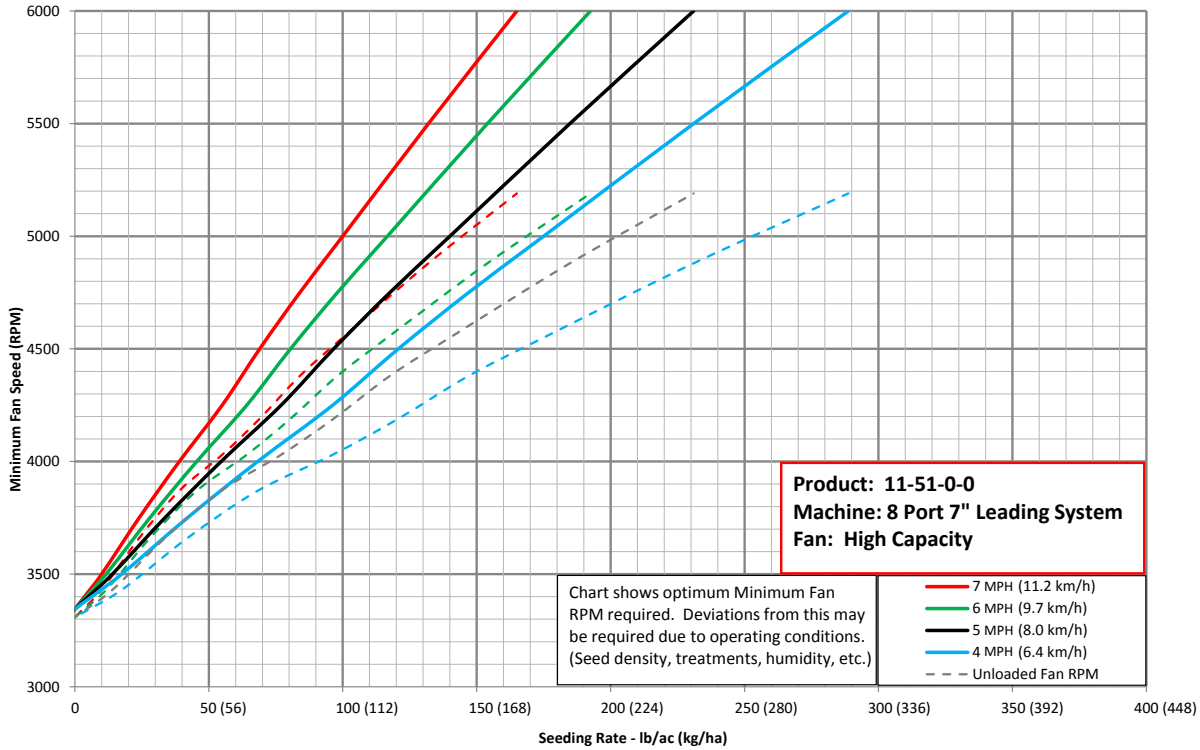


Chart 14A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 14B

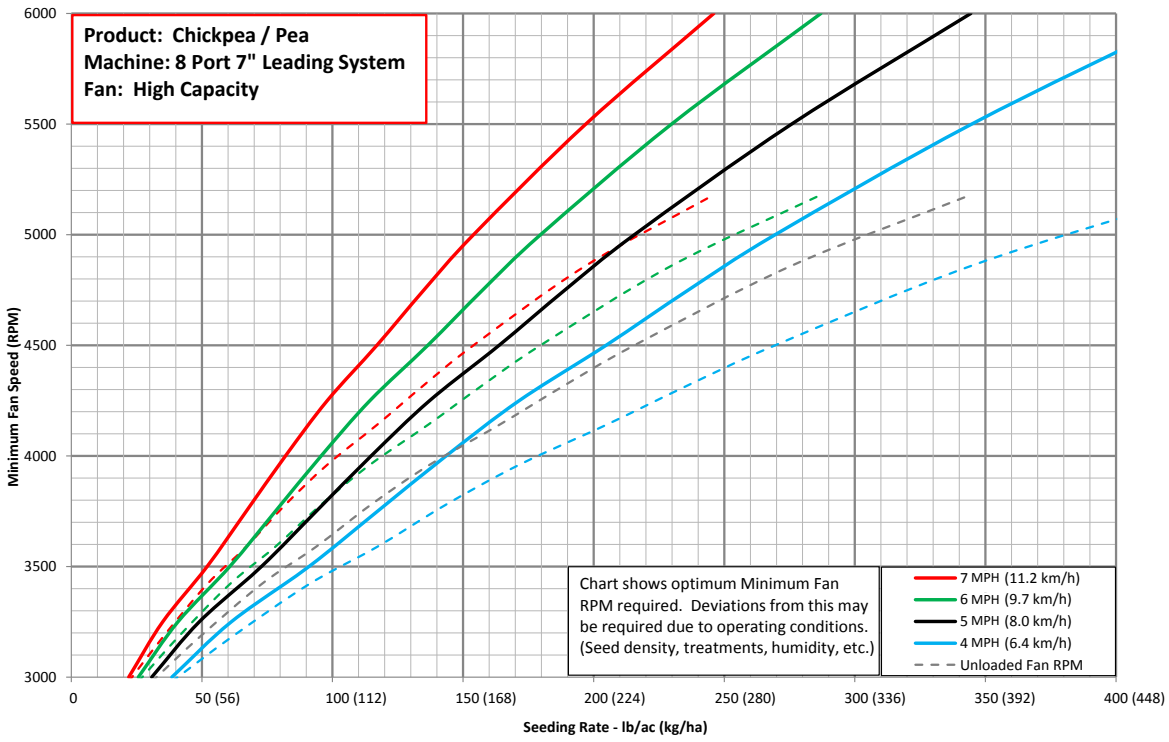
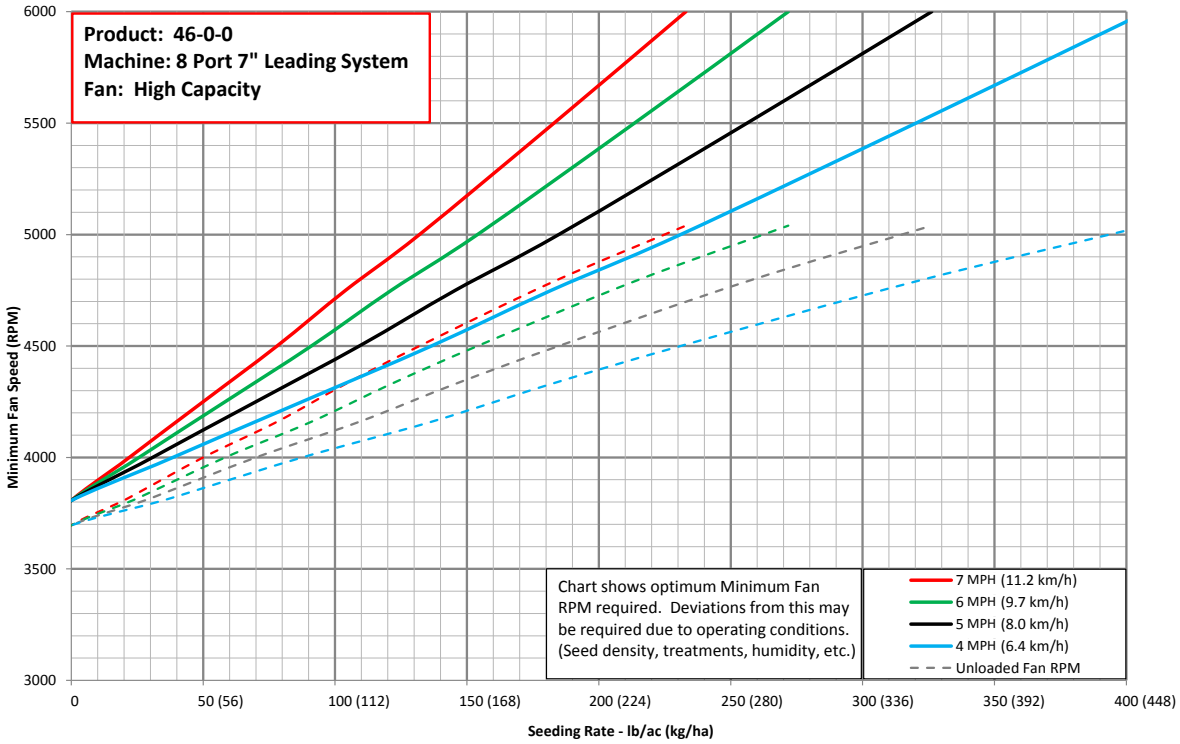


Chart 14C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 14D

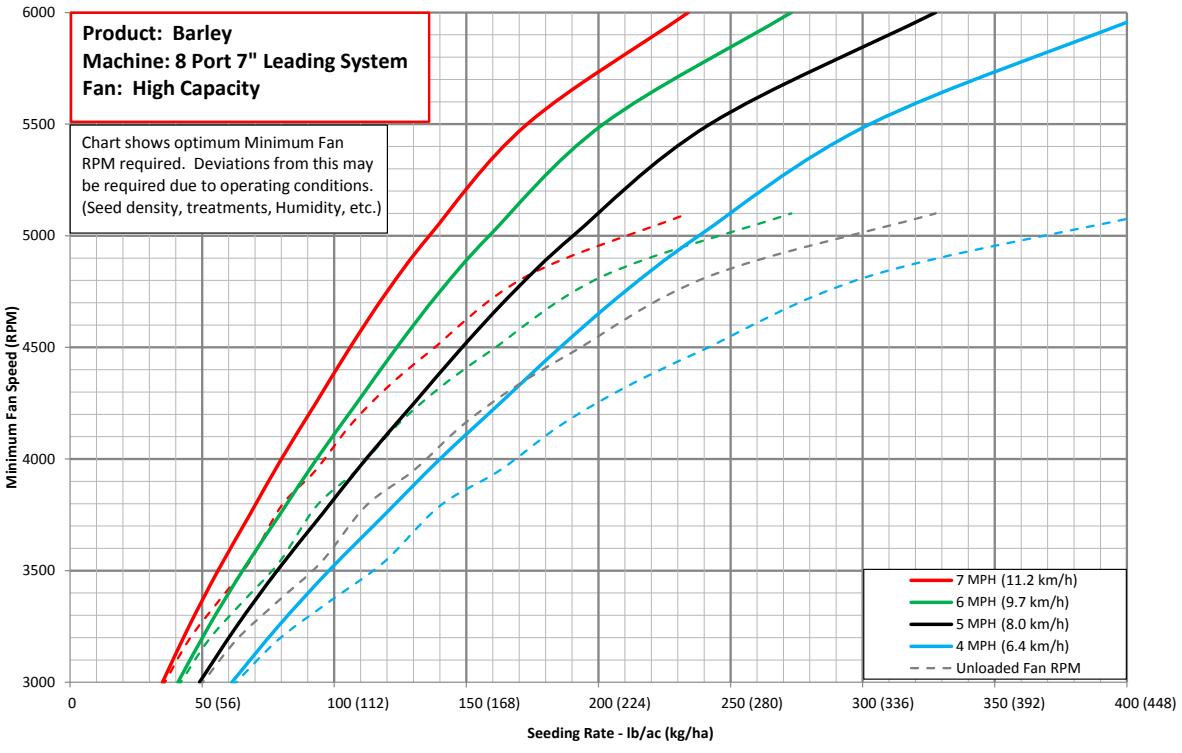
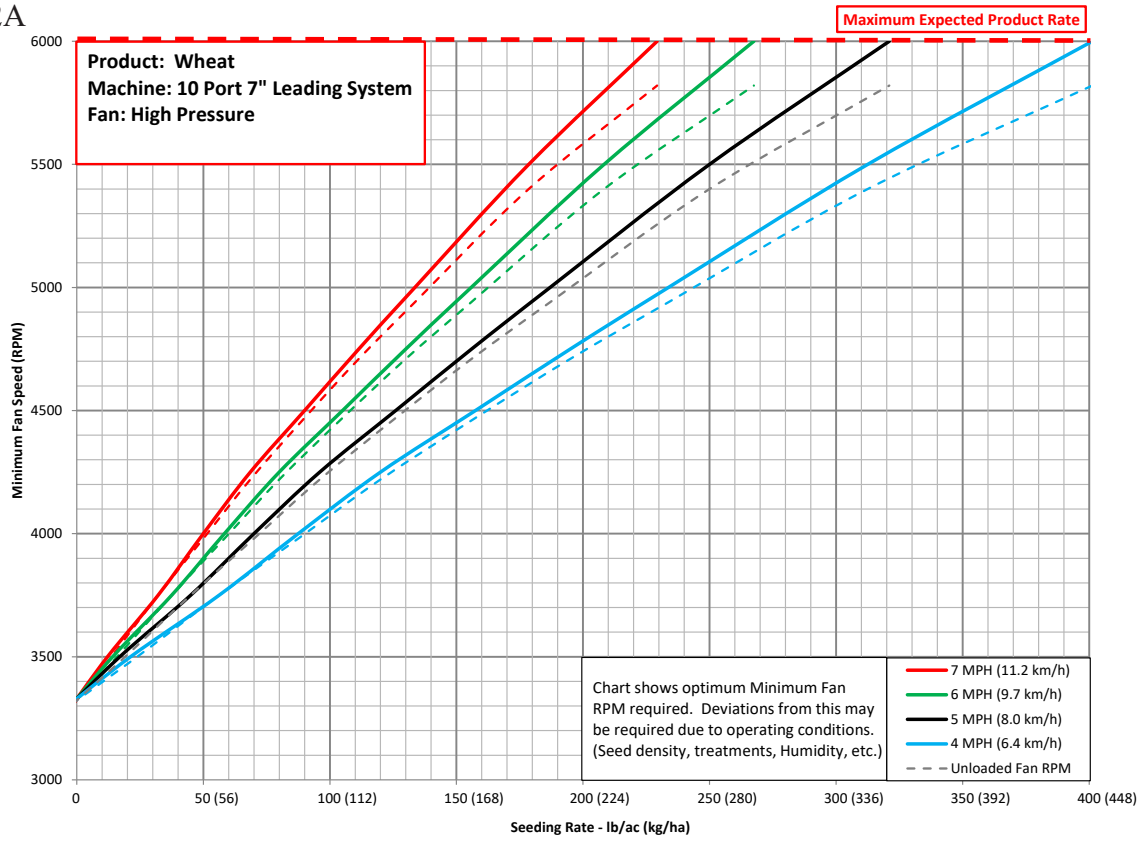


Chart 32A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 32B

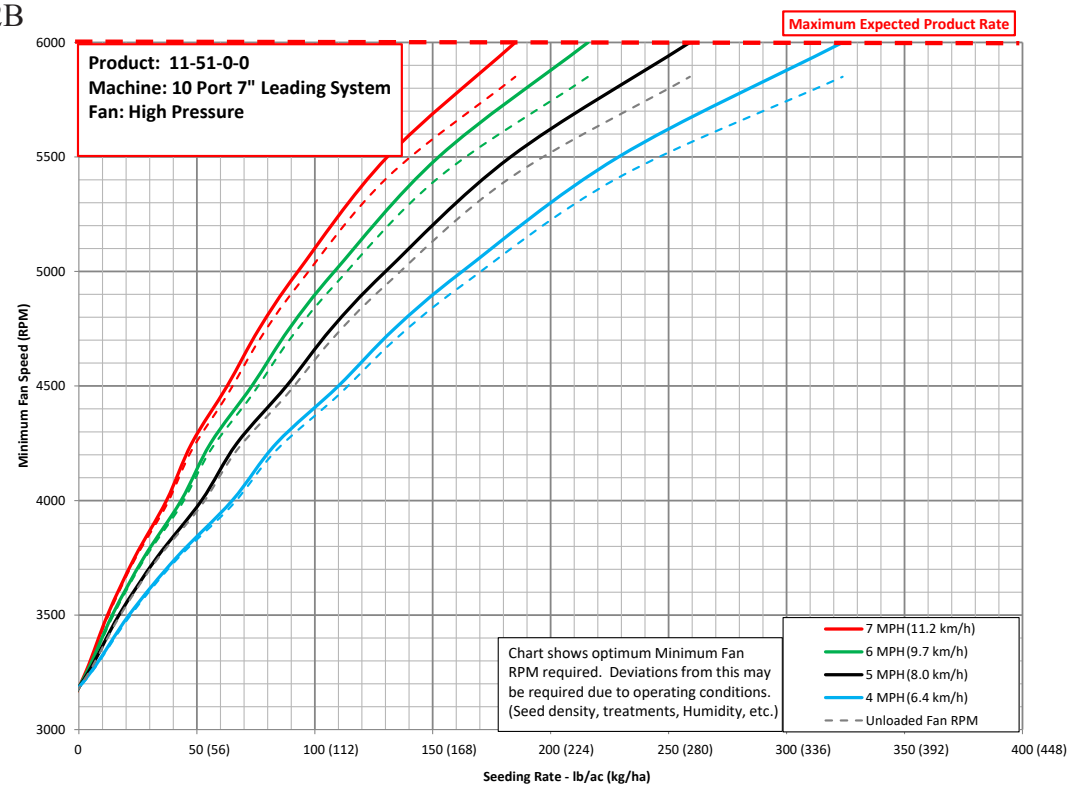
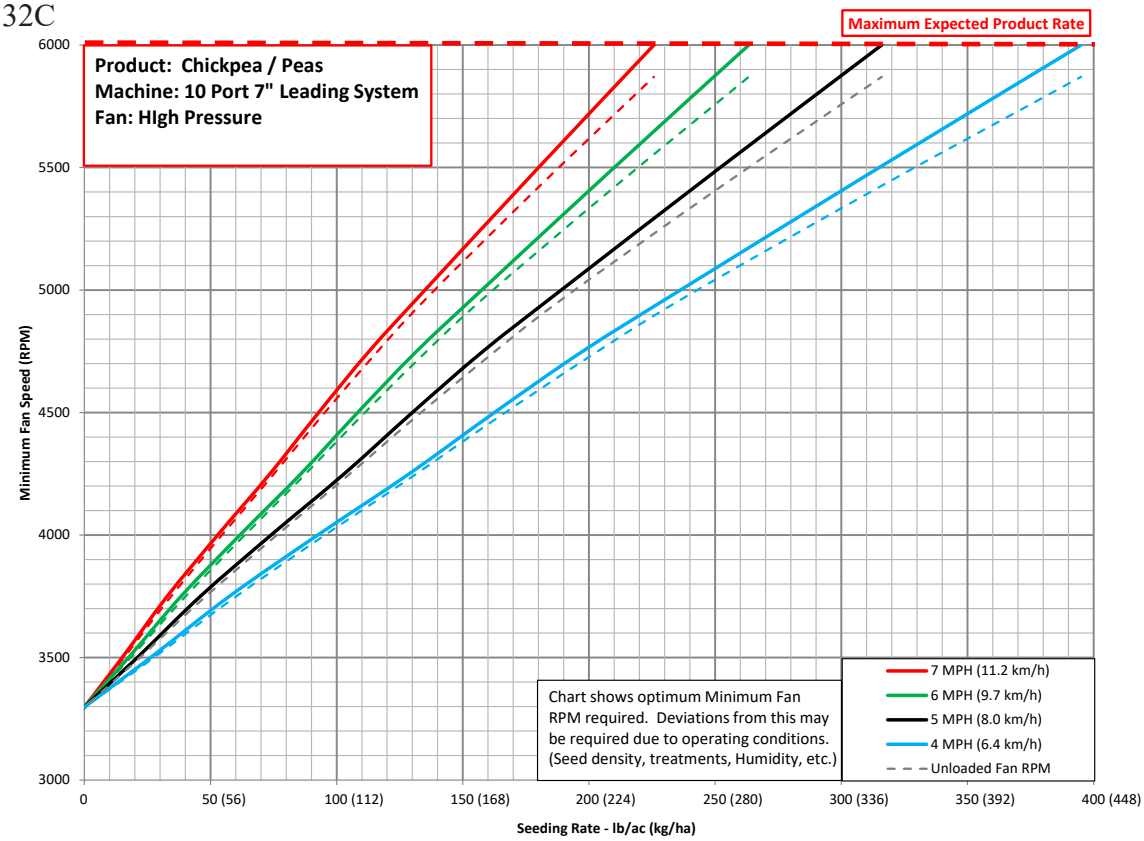


Chart 32C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 32D

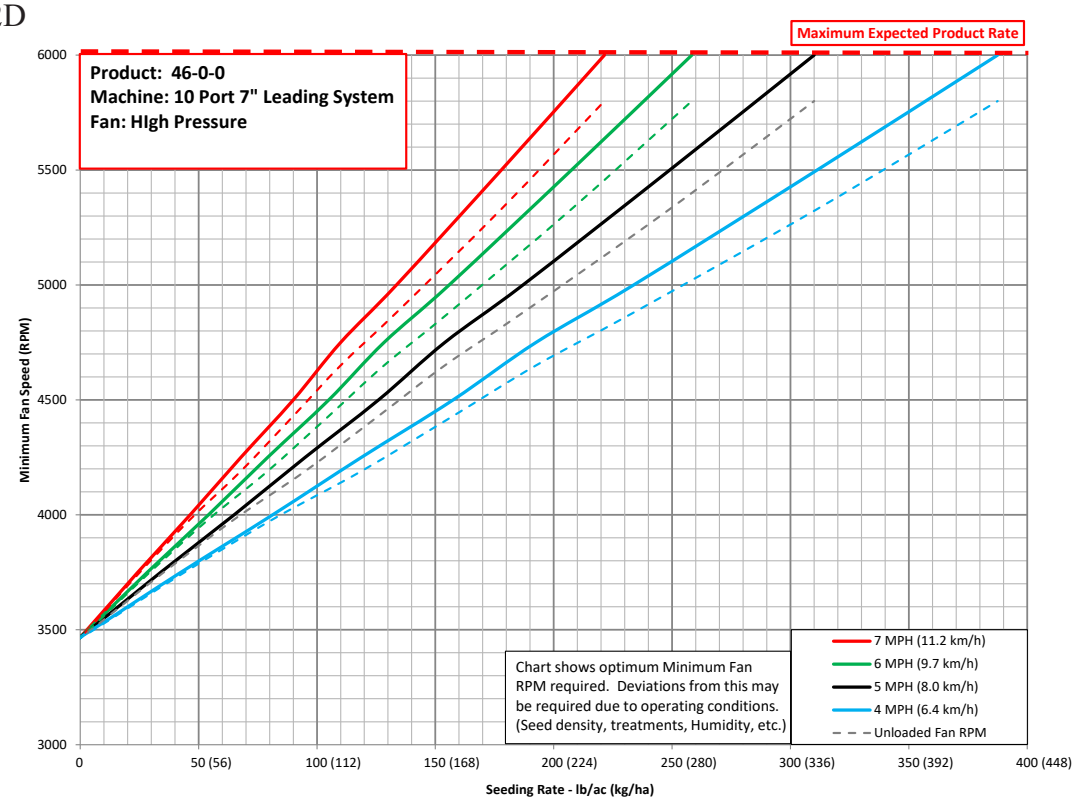
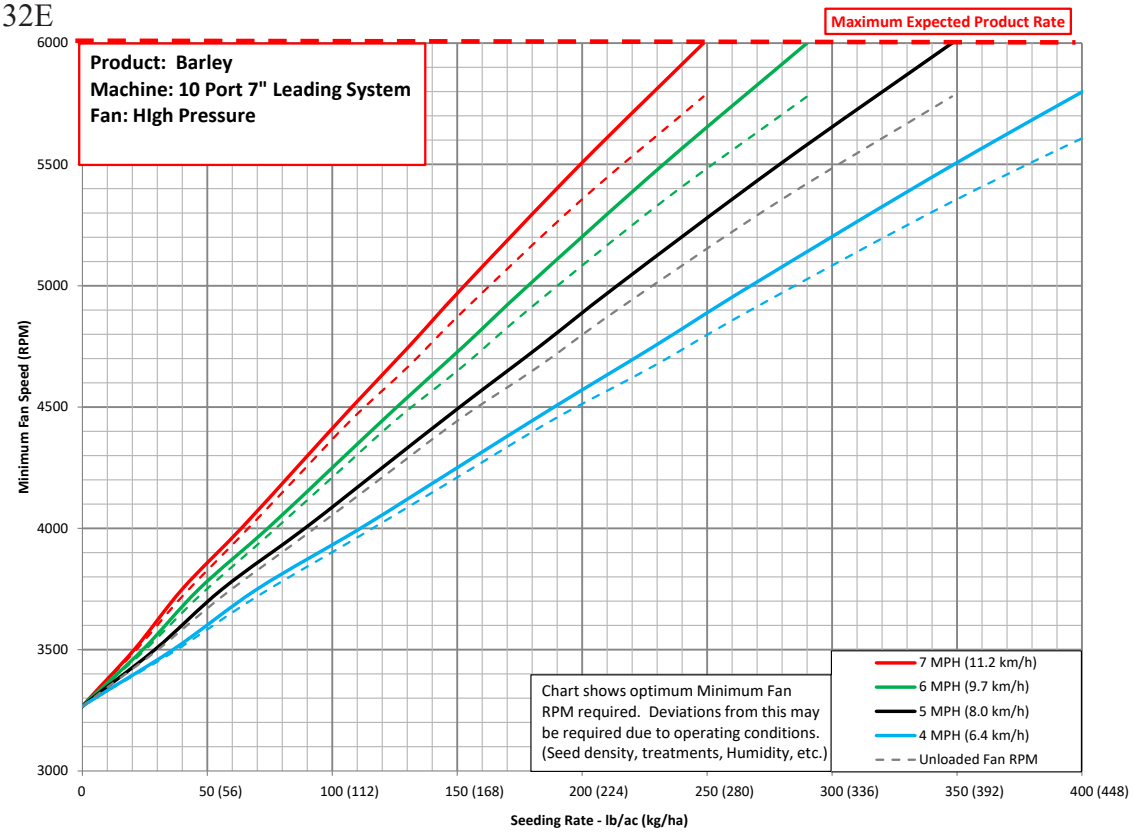


Chart 32E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 32F

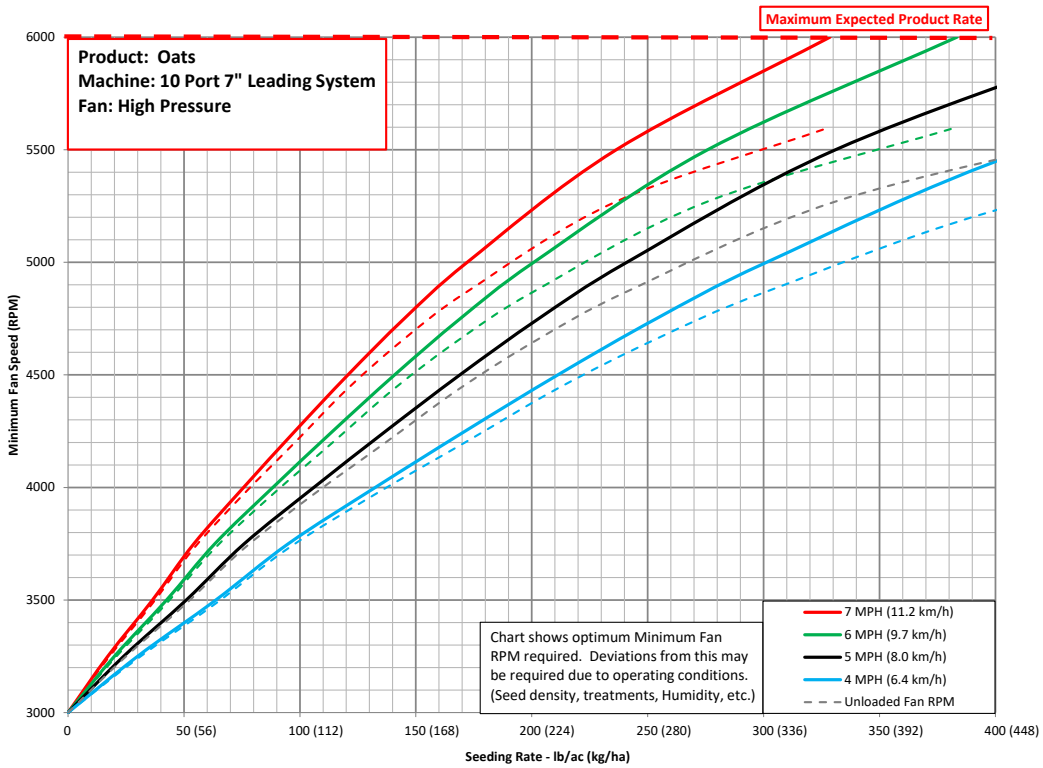
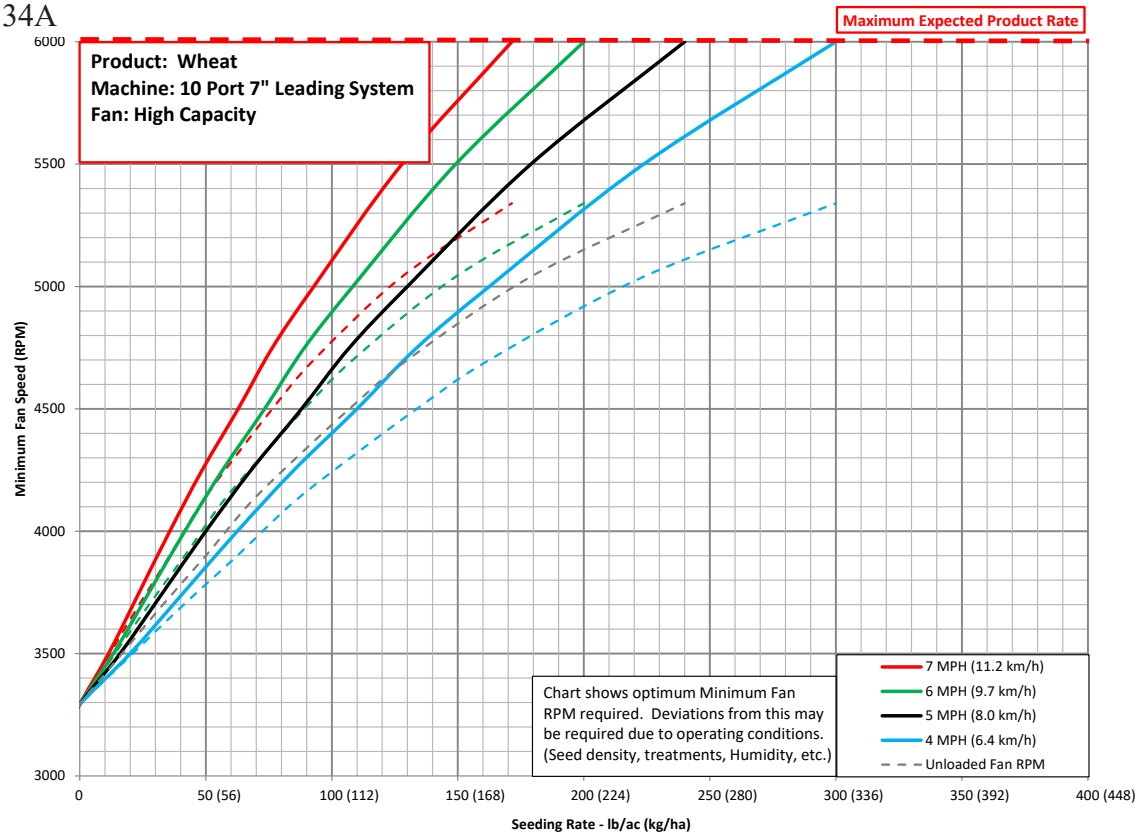


Chart 34A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 34B

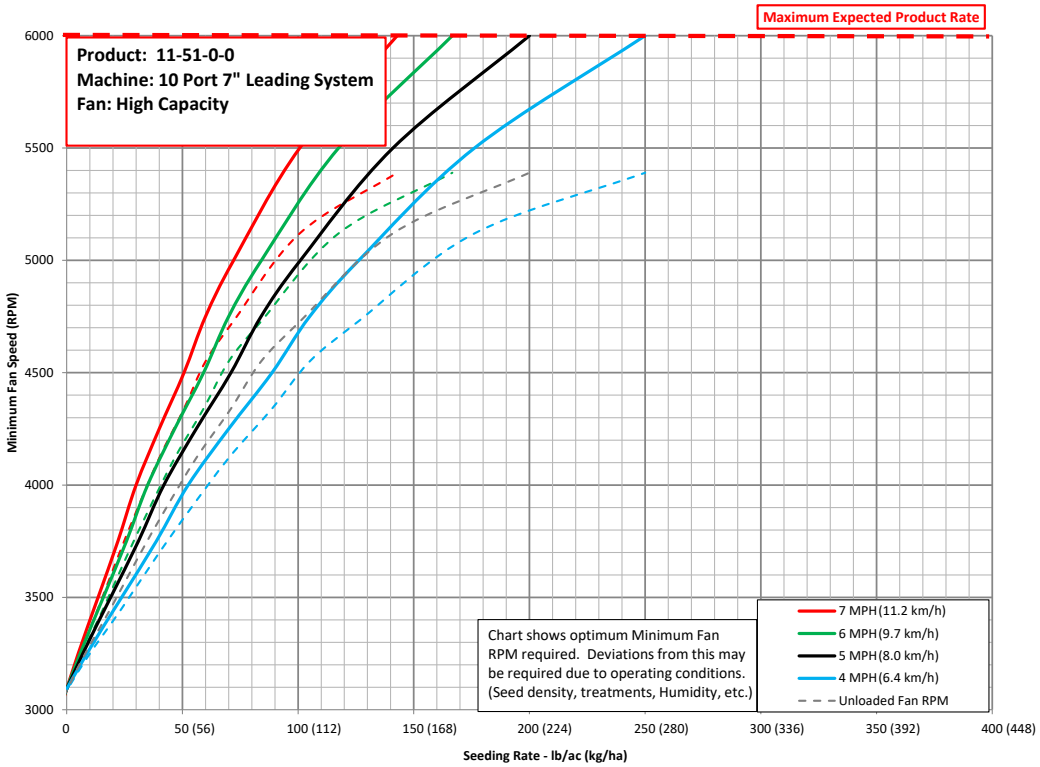
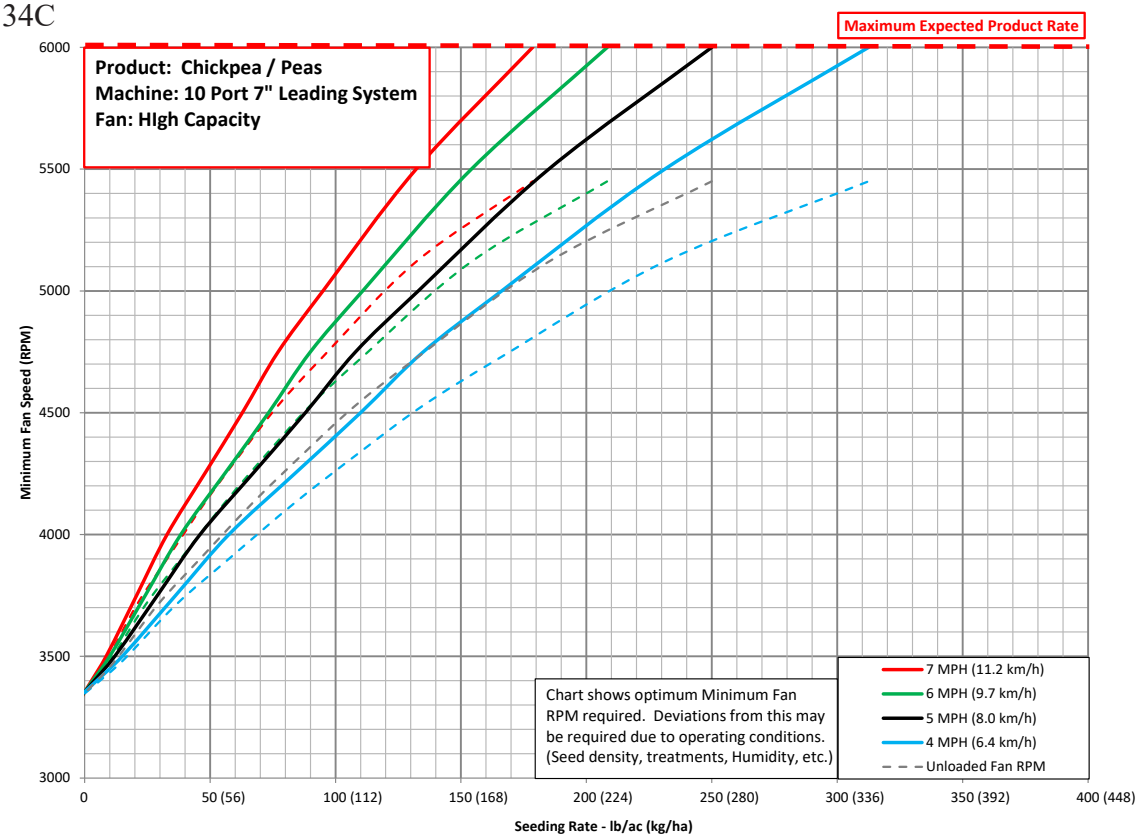


Chart 34C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 34D

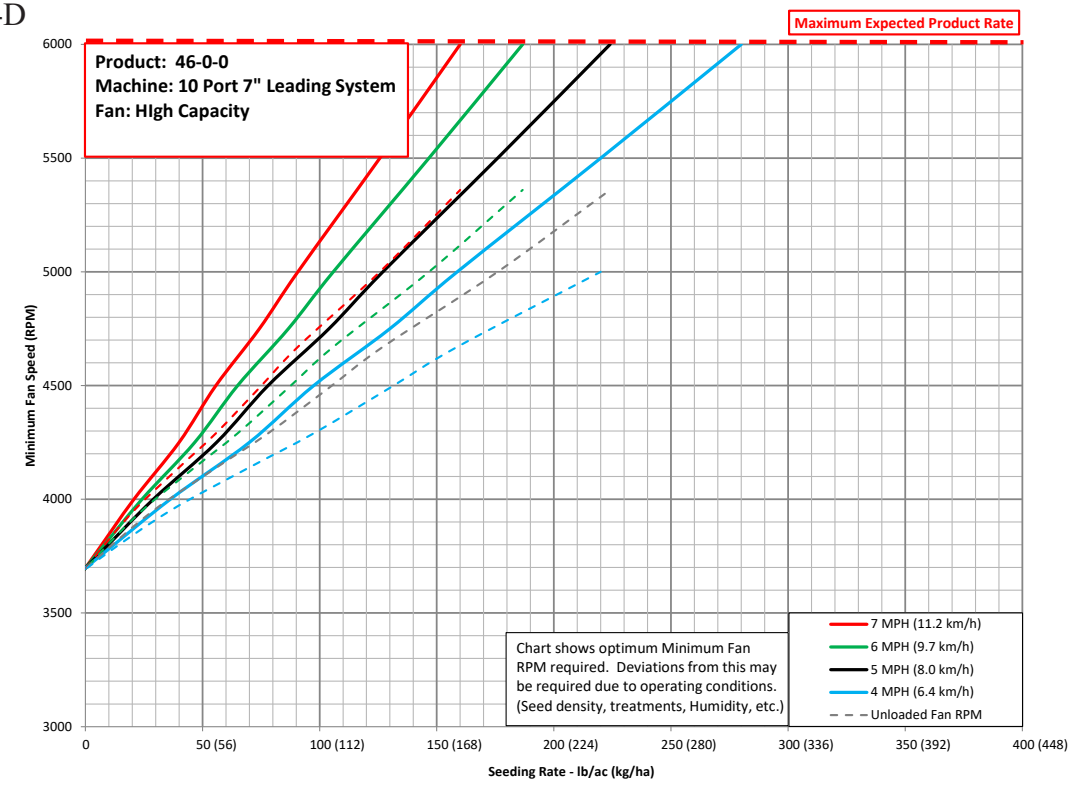
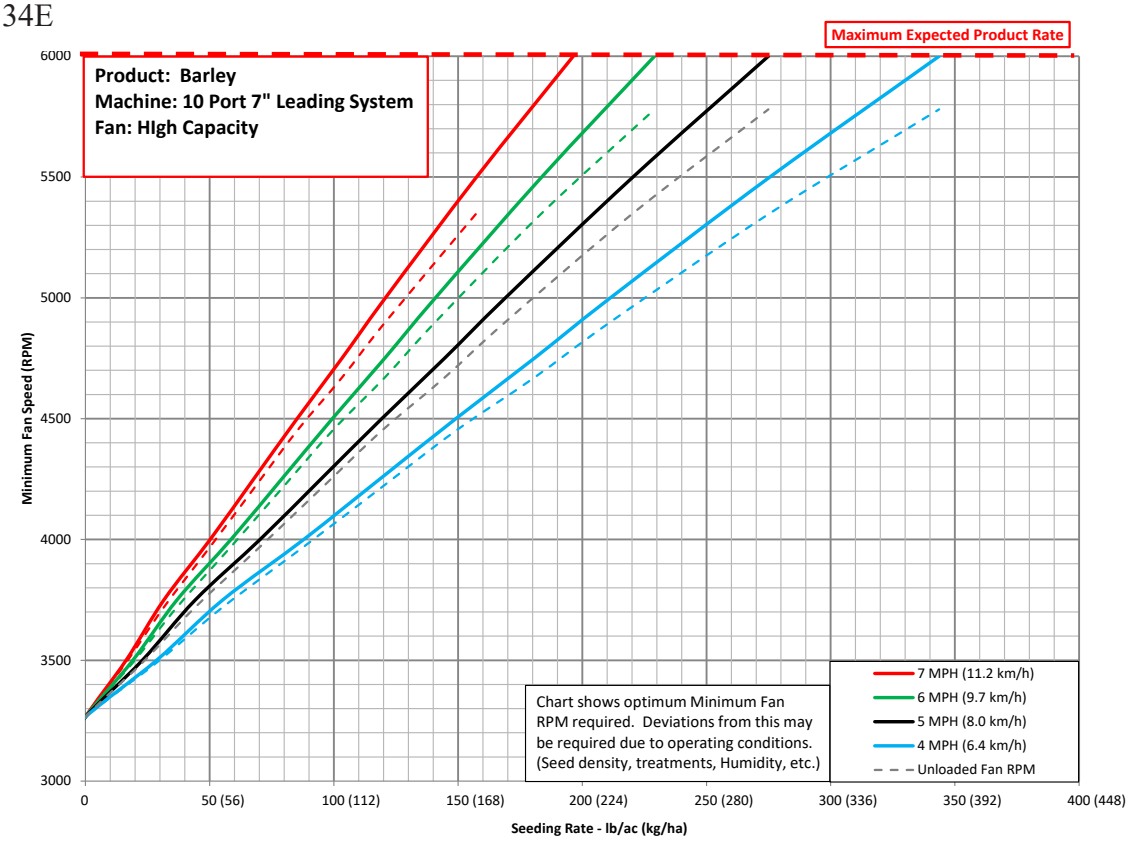


Chart 34E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 34F

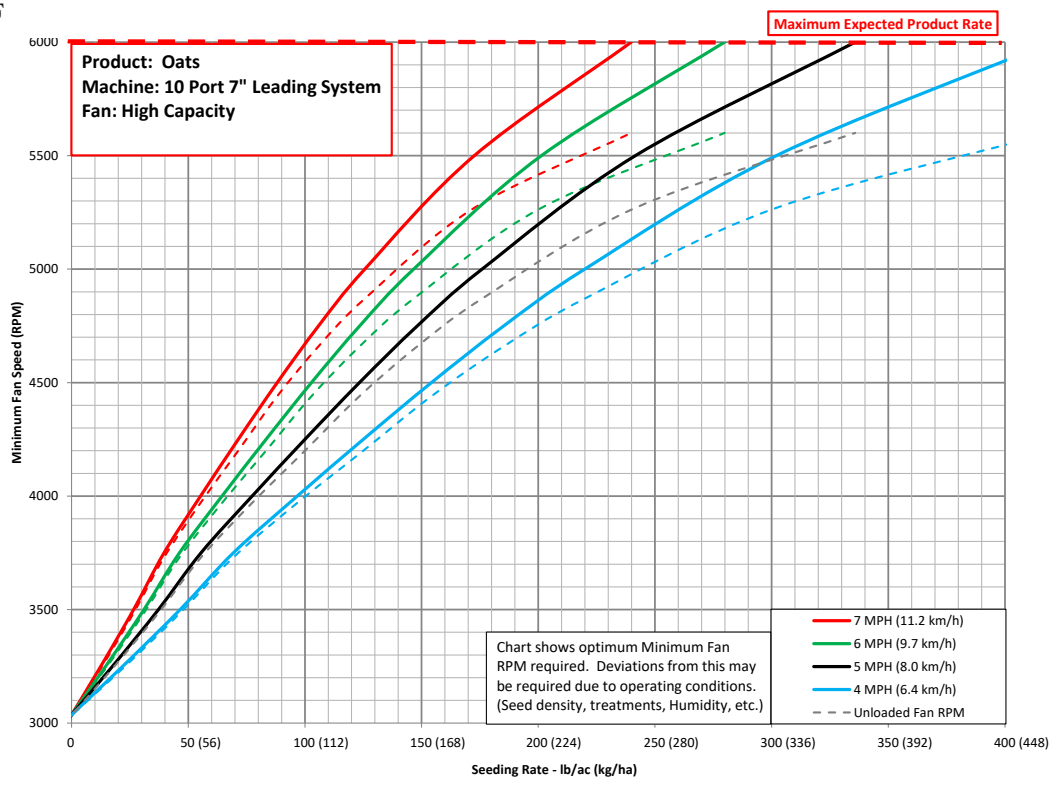
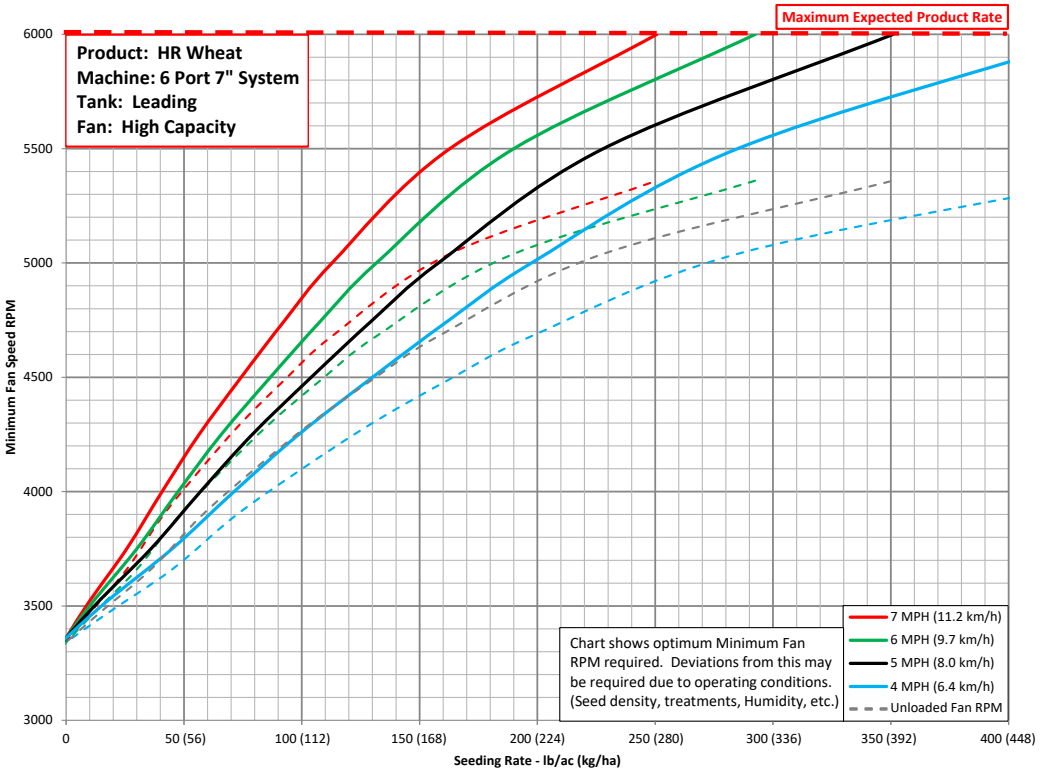


Chart 37A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 37B

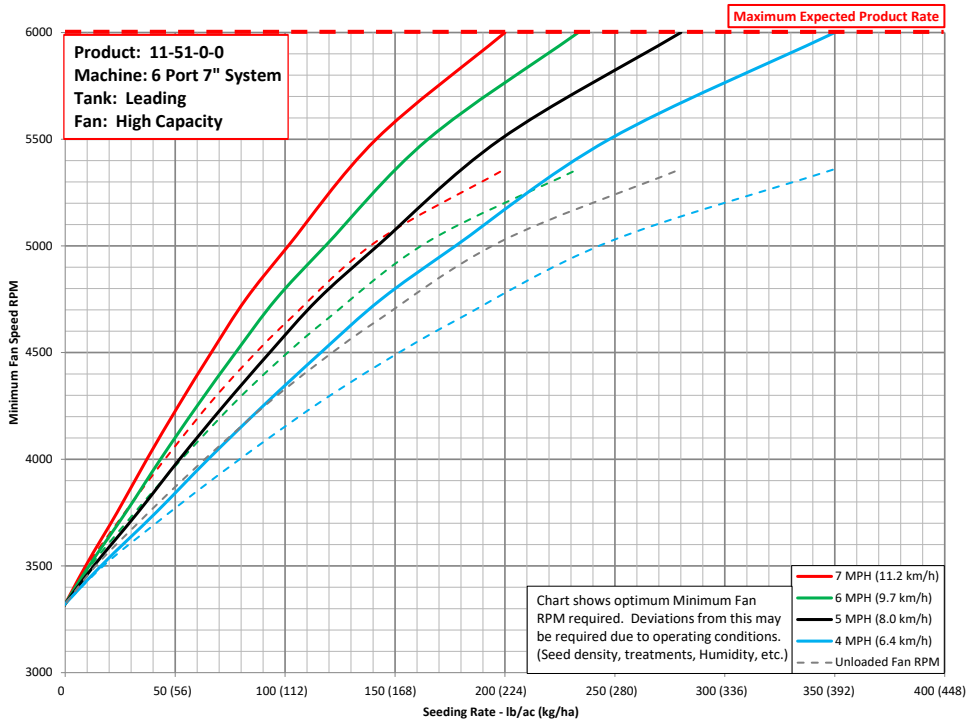
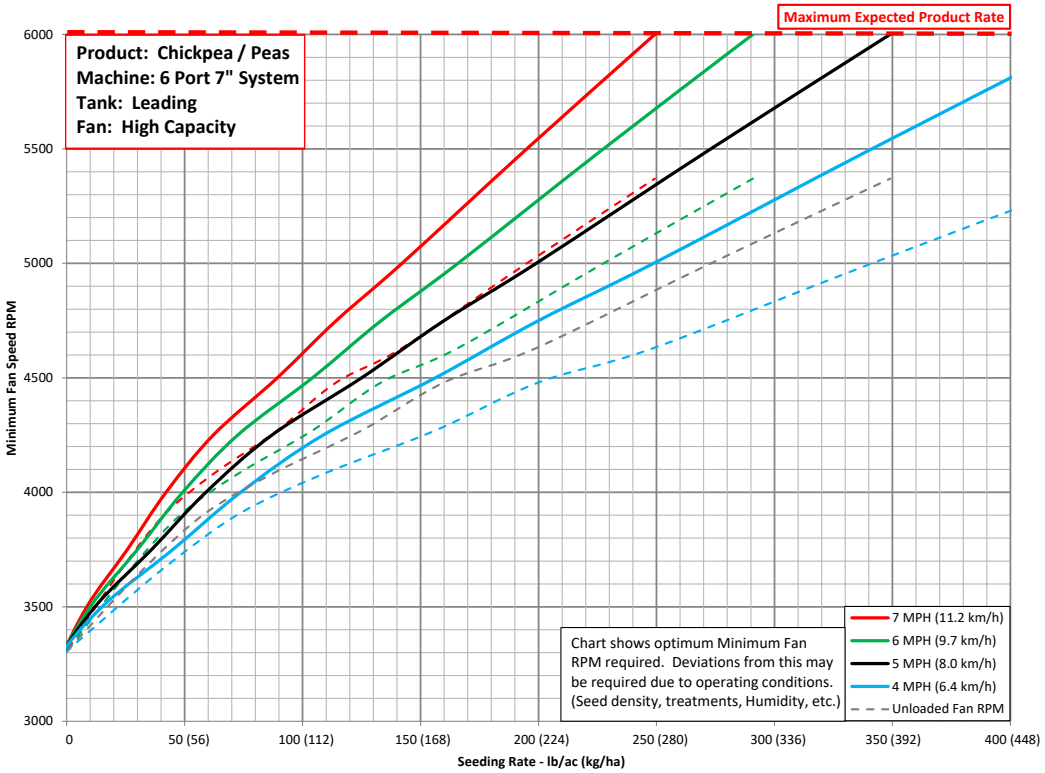


Chart 37C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 37D

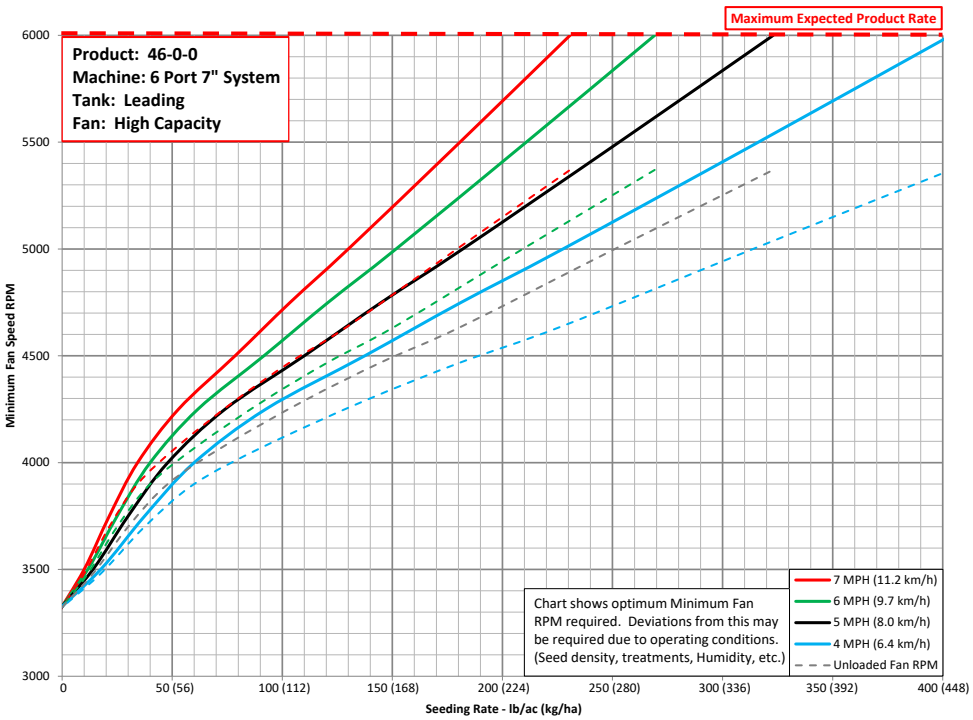
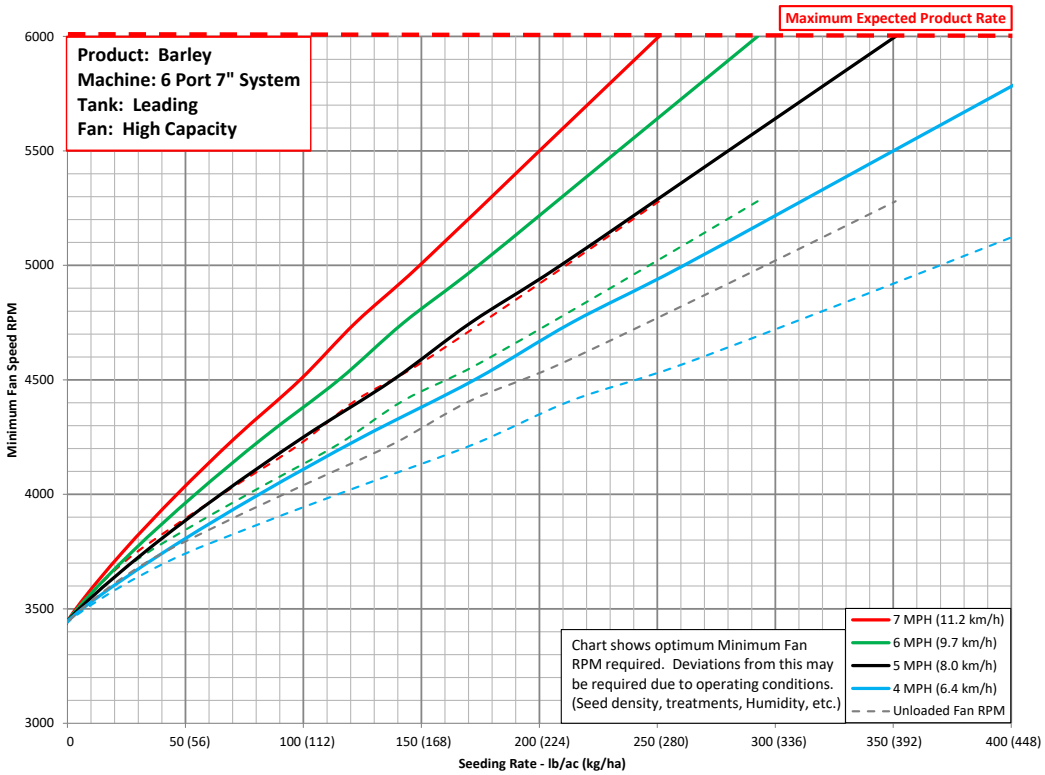


Chart 37E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 37F

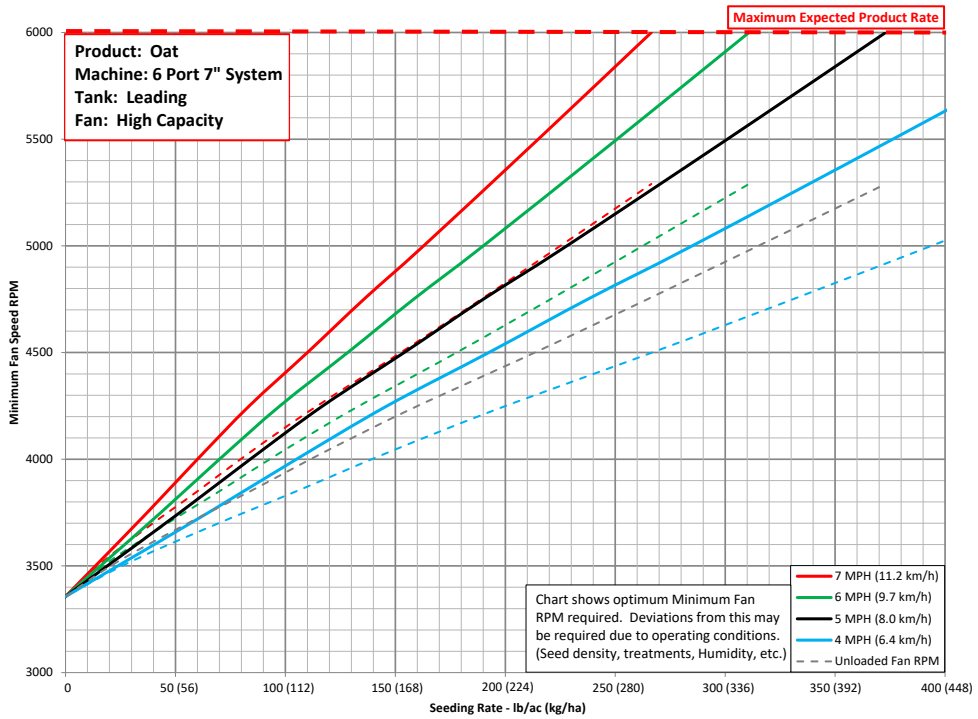
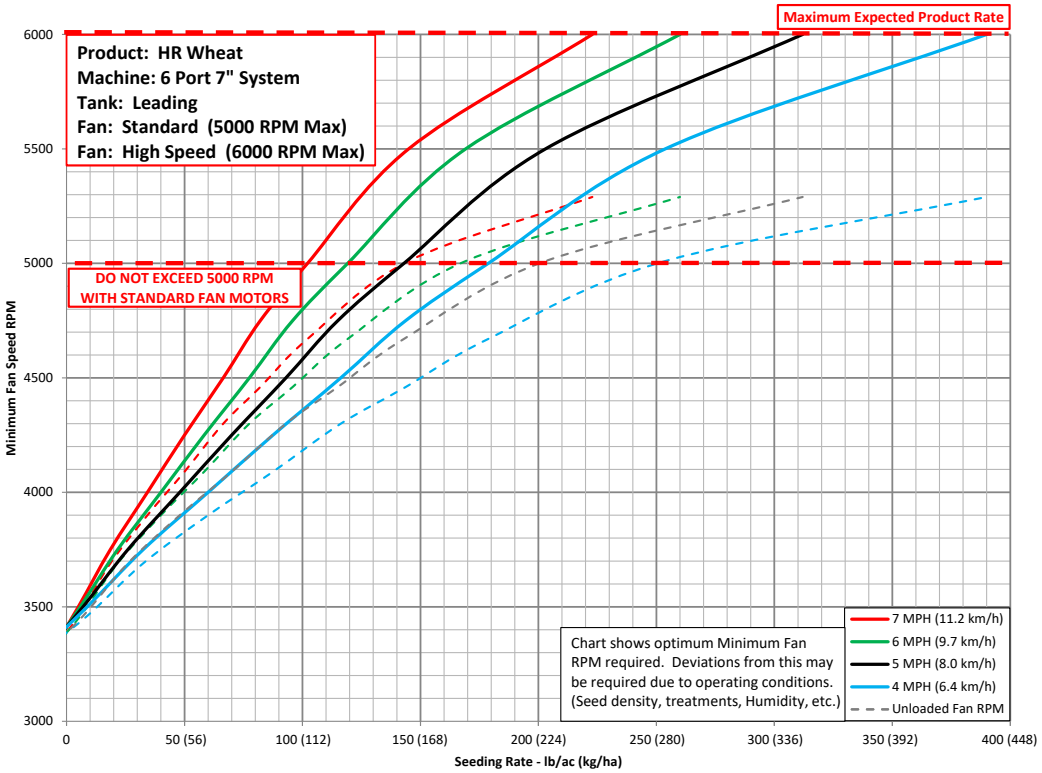


Chart 38A



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 38B

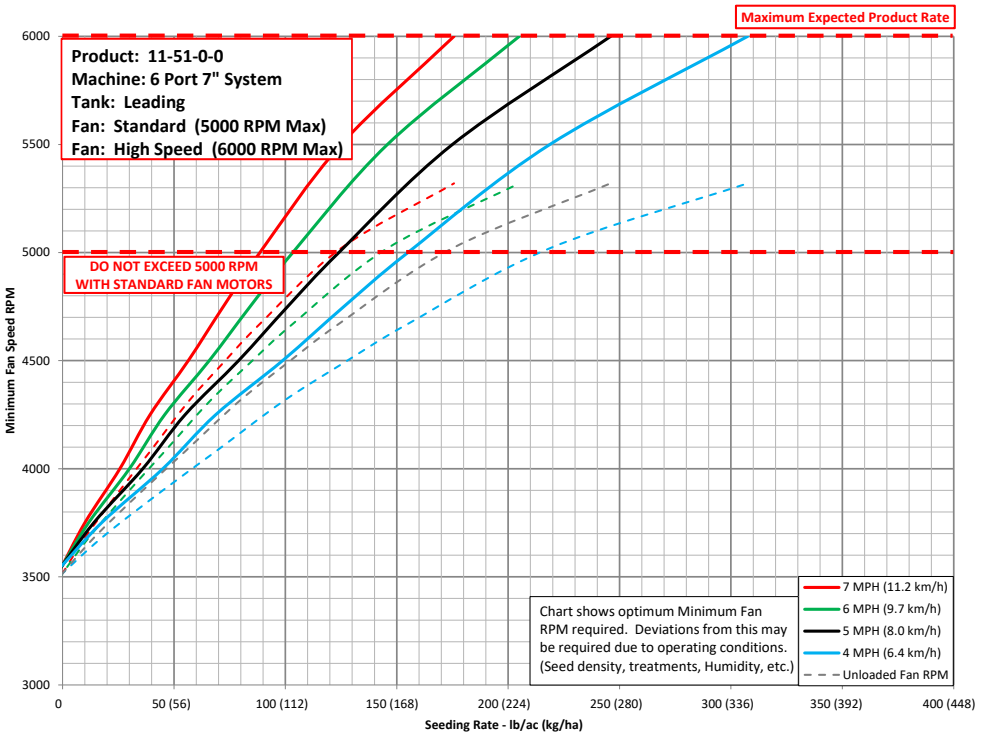
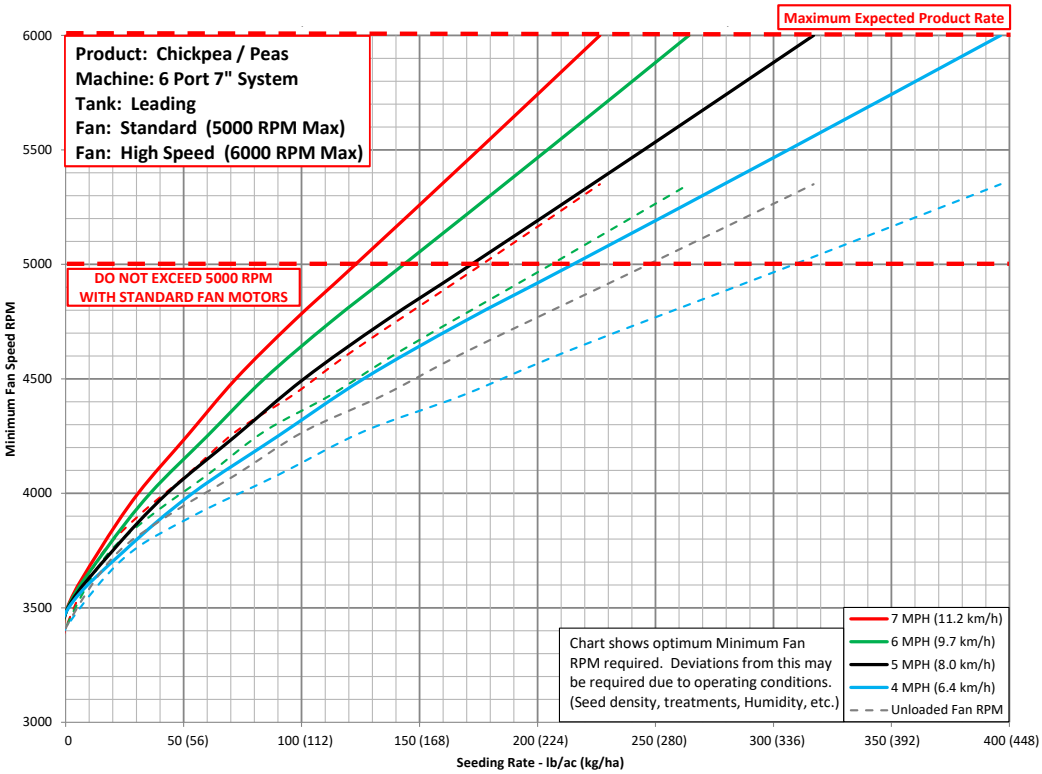


Chart 38C



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 38D

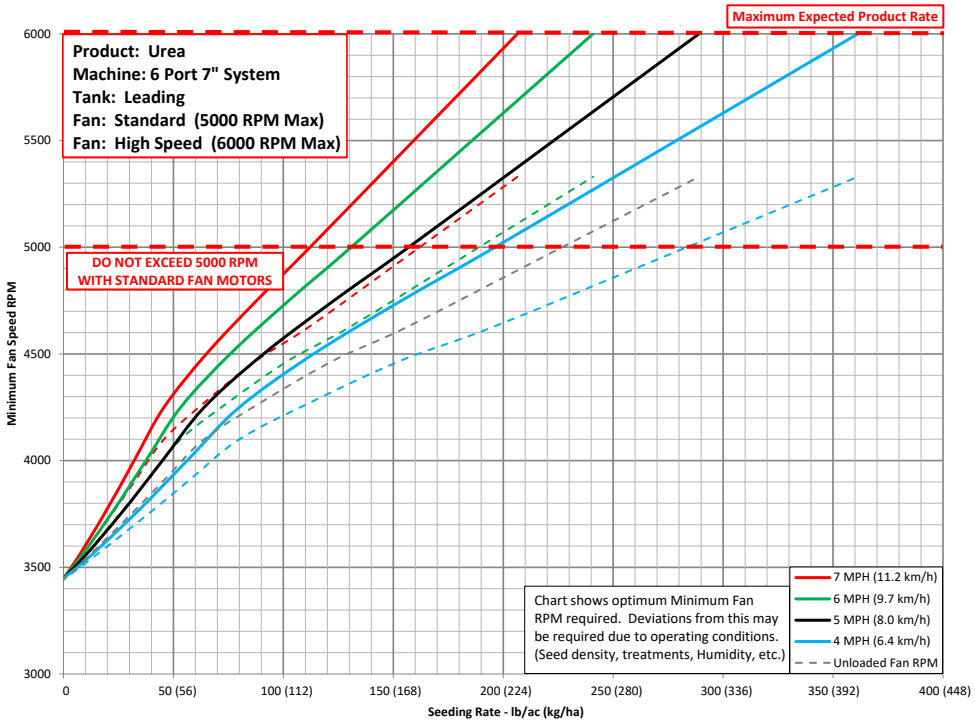
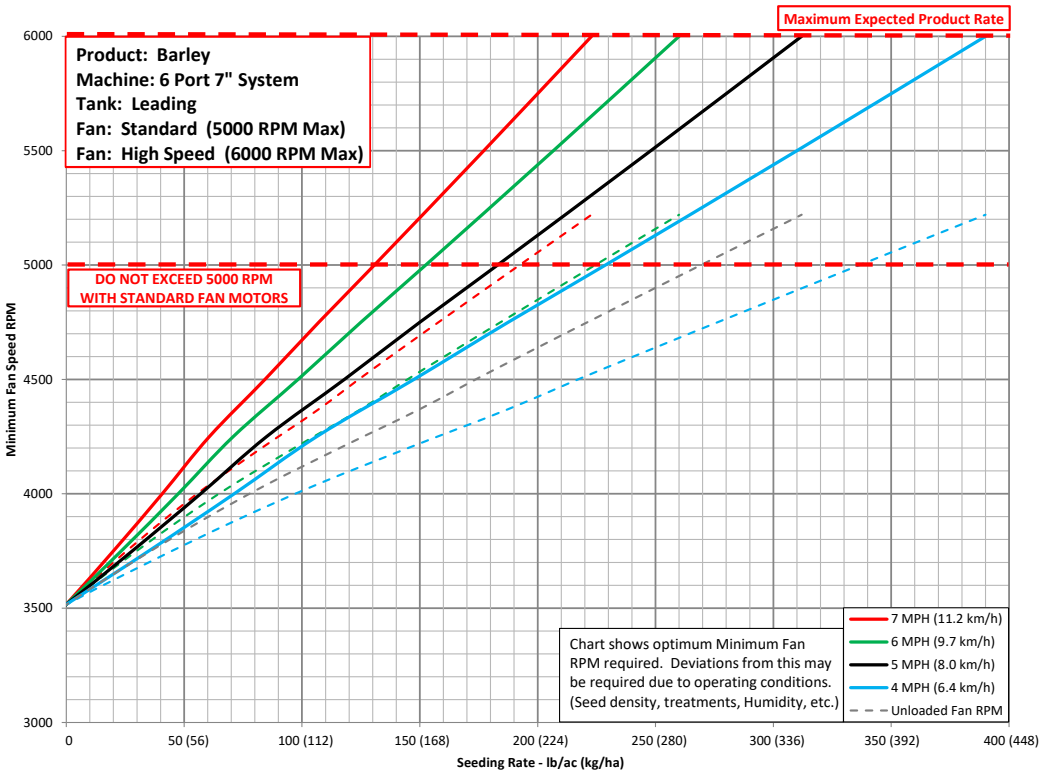


Chart 38E



Note: FOR RATES BELOW 50 LB/AC USE A MINIMUM FAN SPEED OF 3000 RPM.

Chart 38F