New Holland’s Single-Pass Cut and Chip Coppice Harvester

Cellulosic Supply Chains for Bioenergy
Penn State Short Course
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CNH – New Holland Coppice Header Experiences

Woody biomass - collection
Traditional options for woody biomass harvesting

Facts and figures:
- Trees are planted in double rows (willow), spacing 150/75/150 cm
- Poplar is mostly planted in single row
- Harvest after 2-4 years, roots stay in the field for 20-25 years
- Fresh wood, 50% moisture
- Yield 10t DM/ha/year
- Energy equivalent of 4000 l fuel
- Energy balance of 5% (mechanisation)
• Combine harvesting and chipping in same operation for greater efficiency
High speed video of cutterhead
FR 9000 ready for chopping coppice

600kg standard drum with grass knives can handle up to 150 mm stems

Turbocompound engine for fuel efficient operations

Standard lateral float

hydrostatic header drive

CNH – New Holland Coppice Header Experiences

CNH first started with wood crops in 2003/4 working with Dr Volk SUNY - EFS

SUNY testing NH FX45 & modified Kemper 2004

SUNY testing NH FX45 & modified Kemper 2005

SUNY testing NH FX45 & CRL testing 2005
Continued working with SUNY and CRL in 2006 and 2007

Woody biomass – collection
CNH’s logical options

Case IH 7000 series Austoft® Cane Harvester
New Holland FR 9000 series forage harvester
CNH – New Holland’s 130FB Coppice Header

CNH Sugar cane gearbox
2 fast rotating knives (cut stems) - 3000 RPM
2 slow rotation feeding towers (center stems) - variable 0-168 RPM
1 paddle roll (lift stems) – 250 RPM
2 grab/feed rollers (pull and feed stems) - 350 RPM max
Hydrostatic drive (in cab speed setting)

Header drives & components

- Strong push bar, hydraulically adjustable (guide and stretch the stems before they are cut off)
- Big diameter pivotable gauge wheels (even stubble in muddy winter fields)
- Gearbox and PTO drive of the feed rolls (synchronised with harvester feed rolls)
Did the prototype work the first time out in the field?
Biomass header 130 FB

- Test results UK (2008)
- FR 9060 with coppice header
- Willow (5-6m, 7-8 cm diam.)
- 7 kmh capacity
- Clean stubble
First customer exposure

- UK 2009
- FR 9090 with 130 FB
- Willow 5-8 cm diam. (3 yrs)
- Willow 9-13 cm diam. (6 yrs)
Public demo UK, March 09

- Lockerbie power station
- 100% biomass power plant
- 50 Mw power (70,000 households)
- Wood chips from timber, recycled wood and SRC willow

A new level of Willow/Poplar harvesting

FR 9000 with 130 FB header
Double tree size (150 mm max)
Double capacity (up to 2 ha/h)

Reduce harvest frequency (1-2 years more)
Lower harvesting costs
Increase profitability of Willow and Poplar culture

Extend sphf application
Reduce sphf operating cost
FB130 in Willow

FR 9000 Coppice Header 130 FB

- Max. stem Diameter: 150 mm (Willow, poplar)
- Cutting length (2 x knives): 844 mm
- Cutting length (2 x 8 knives): 644 mm
FB130 in Poplar

CNH – New Holland’s 130FB Coppice Header

World reveal at SIMA, Paris, Feb 09
CNH – New Holland’s 130FB Coppice Header

Public demo Oregon, March 09

CNH – New Holland’s 130FB Coppice Header

Demo New York, March 0
• Lyonsdale power station, N Y
• 19Mw burning 750 tons chips/day
First customer exposure

• UK 2009
• FR 9090 with 130 FB
• Willow 5-8 cm (3 yrs) (3.2 inches dia.)
• Willow 9-13 cm (6 yrs) (5.2 inches dia.)

First customer feedback

• ‘We have harvested fields that we were not able to harvest 2 years ago with our previous machine’
• ‘I have cut more acres of willows in three weeks than in a whole season with my previous headers’
• ‘The std FR 9090 was eating trees of 12cm diameter and 10m high!!’ (4.8 inches dia. / 30ft height)
Observed maximum performance data:
• 2 hectares per hour (logistics critical) (5.2 ac/hr)
• 10 hectares per 8 hour day (typical average over 3 weeks in UK) (26 acres/8 hrs)
• 120 tons of harvested green wood chips per hour
• trees up to 15 cm in diameter (6 inches)
• 45 semis per 8 hours (@ 22tons/ld)

Features
• The drives are all hydraulic/hydrostatic. The speeds of the individual components (knives, feeding towers, feed rollers) can be adjusted independently and from the operator seat.
• The cutting angle of the header is adjusted.
CNH – New Holland’s 130FB Coppice Header

- Better wood chip quality – clean cut and no dirt

FR 9000 Coppice Header

- Max. stem Diameter: 12-15 cm (willow, poplar)
- Cutting length (2*6 knives): 8-66 mm
- Cutting length (2*8 knives): 6-33 mm
FR 9000 Coppice Header 130 FB

FR 9000 Self Propelled Forage Harvesters

Solutions for the biomass industry
Biomass Collection for Energy

- Short Rotation Willow
- Cane / Energy Sorghum
- Corn Stover
- Miscanthus
- Corn Cobs

Biogas

- Energy source: methane gas from anaerobic digestion is burned in stationary engines, which drives a generator to create electricity in biogas installations
- Crops harvested: corn, rye, grasses
- Harvesting equipment: spfh with corn header, special 2x16 knife drum for short chop lengths (3-4 mm)
Coppice – fast growing woody crops

- Possible future use for FR
- Second revenue source
- Harvest in winter
- Use existing equipment

Coppice – fast growing woody crops

- Wood chips are burned or gasified to produce heat and/or electricity, or can be converted to ethanol via cellulose conversion
- Crops: fast growing wood varieties (poplar, willow, rubinia)
- Harvesting equipment: spfh with coppice header
Miscanthus, switch grass

- Miscanthus and switch grass are chopped in bulk or processed to pellets, to use as fuel for heat generation
- Crops: Miscanthus (elephant grass), switchgrass
- Harvesting equipment: spfh with maize header, long chop lengths (100-150mm)
Switchgrass

Sweet Sorghum - TN
Switchgrass Activities

CNH Single Pass Activities
Single Pass Baling – Corn Stover

The ultimate clean, renewable energy driven transportation?
Questions?